Using Case Method to Explicitly Teach Formative Assessment in Preservice Teacher Science Education

Amy Elizabeth Bentz
*Western Michigan University, wittenstrom@yahoo.com*

Follow this and additional works at: https://scholarworks.wmich.edu/dissertations

Part of the Educational Assessment, Evaluation, and Research Commons, Science and Mathematics Education Commons, and the Teacher Education and Professional Development Commons

**Recommended Citation**

This Dissertation-Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Dissertations by an authorized administrator of ScholarWorks at WMU. For more information, please contact wmu-scholarworks@wmich.edu.
USING CASE METHOD TO EXPLICITLY TEACH FORMATIVE ASSESSMENT IN PRESERVICE TEACHER SCIENCE EDUCATION

by

Amy Elizabeth Bentz

A dissertation submitted to the Graduate College in partial fulfillment of the requirements for the degree of Doctor of Philosophy Educational Leadership, Research and Technology Western Michigan University June 2014

Doctoral Committee:

William Cobern, Ph.D., Chair
Marcia Fetters, Ph.D.
Katharine Cummings, Ph.D.
The process of formative assessment improves student understanding; however, the topic of formative assessment in preservice education has been severely neglected. Since a major goal of teacher education is to create reflective teaching professionals, preservice teachers should be provided an opportunity to critically reflect on the use of formative assessment in the classroom. Case method is an instructional methodology that allows learners to engage in and reflect on real-world situations. Case based pedagogy can play an important role in enhancing preservice teachers’ ability to reflect on teaching and learning by encouraging alternative ways of thinking about assessment.

Although the literature on formative assessment and case methodology are extensive, using case method to explore the formative assessment process is, at best, sparse. The purpose of this study is to answer the following research questions: To what extent does the implementation of formative assessment cases in methods instruction influence preservice elementary science teachers’ knowledge of formative assessment? What descriptive characteristics change between the preservice teachers’ pre-case and post-case written reflection that would demonstrate learning had occurred?

To investigate these questions, preservice teachers in an elementary methods course were asked to reflect on and discuss five cases. Pre/post-case data was analyzed.
Results indicate that the preservice teachers modified their ideas to reflect the themes that were represented within the cases and modified their reflections to include specific ideas or examples taken directly from the case discussions. Comparing pre- and post-case reflections, the data supports a noted change in how the preservice teachers interpreted the case content. The preservice teachers began to evaluate the case content, question the lack of formative assessment concepts and strategies within the case, and apply formative assessment concepts and strategies within their own case descriptions. The results of this study further strengthen the existing literature on formative assessment instruction in preservice teacher education, and support the call for further attention given to utilizing case methodology to improve preservice teachers’ knowledge of the formative assessment process.
DEDICATION

For my parents, Keith and Gay Wittenstrom
ACKNOWLEDGMENTS

I would like to acknowledge my committee members (Dr. Bill Cobern, Dr. Marcia Fetters, and Dr. Katharine Cummings) for their support, constructive feedback, and encouragement throughout my dissertation process. Their knowledge and expertise was an invaluable resource.

Secondly, I would like to acknowledge my Assessment for Learning cohort (Dr. Ziebarth, Dr. Cummings, Robert McCowen, Lindsay Noakes, and Diane Rogers) as well as my Mallinson colleagues for their helpful input and unwavering encouragement. Their support was instrumental in the quality of my research and writing.

Thirdly, I would like to thank Dr. Tracy DeMars for allowing me to conduct my dissertation research in her classroom. Her commitment to improving preservice teacher learning is commendable and her drive to continually improve her own teaching is most admirable. Dr. DeMars’s open and honest feedback helped me to not only improve my research, but also helped me to become a better teacher educator.

Lastly, I would like to thank my friends and family, especially my husband Andy, for their patience, understanding, and unending support throughout this long journey.

Amy Elizabeth Bentz
TABLE OF CONTENTS

ACKNOWLEDGMENTS .................................................................................................................. ii

LIST OF TABLES ............................................................................................................................ viii

LIST OF FIGURES .......................................................................................................................... ix

CHAPTER

1. THE PROBLEM ............................................................................................................................. 1
   1.1 Introduction ......................................................................................................................... 1
   1.2 The Case for Formative Assessment .................................................................................. 2
   1.3 The Ideal Situation ............................................................................................................. 3
   1.4 The Reality of the Situation .............................................................................................. 5
   1.5 The Possibilities ............................................................................................................... 7
   1.6 Terminology .................................................................................................................... 9
   1.7 Theoretical Framework: Cognitive Apprenticeship and Situated Learning .................... 9
   1.8 Significance ..................................................................................................................... 14

2. LITERATURE REVIEW .............................................................................................................. 18
   2.1 Introduction ..................................................................................................................... 18
   2.2 Formative Assessment and Teacher Education ............................................................... 21
      2.2.1 Distinguishing the meaning of assessment ............................................................... 21
      2.2.2 Historical context of formative assessment ............................................................ 23
      2.2.3 A summary of the review of literature on formative assessment in education .............. 25
   2.3 Formative Assessment in Education: The Literature ....................................................... 29
## Table of Contents – Continued

### CHAPTER

- 2.3.1 Teacher implementation of formative assessment ................................. 29
- 2.3.2 Perceptions of formative assessment at the college level ....................... 41
- 2.3.3 Integrating formative assessment into teacher education ....................... 59

- 2.4 Preservice Teacher Education and Case Method ...................................... 82
  - 2.4.1 Case method: meaning, history, and review ........................................... 83
  - 2.4.2 Case method in teaching: The literature .............................................. 97

- 2.5 Formative Assessment and Case Method ............................................... 125
  - 2.5.1 Characteristics of formative assessment .............................................. 126
  - 2.5.2 Using case method to teach formative assessment strategies: The literature ............................................................... 130

- 2.6 A Synthesis of the Literature .................................................................. 163
  - 2.6.1 Introduction ......................................................................................... 163
  - 2.6.2 Summary ............................................................................................ 172

- 2.7 A Review of Methodologies ................................................................. 174
  - 2.7.1 Introduction ......................................................................................... 174
  - 2.7.2 Reflection ........................................................................................... 177
  - 2.7.3 Cases used as a teaching tool .............................................................. 183
  - 2.7.4 Modeling the formative assessment process ....................................... 186
  - 2.7.5 Perceptions of formative assessment ................................................ 189
  - 2.7.6 Summary ............................................................................................ 190

- 2.8 Research Questions .................................................................................. 193

iv
### CHAPTER

#### 3. METHODOLOGY

- 3.1 Research Design ................................................................. 195
- 3.2 Participants and Sampling .................................................. 199
- 3.3 Instrumentation and Data Sources ...................................... 201
  - 3.3.1 Validation of the instrument .......................................... 202
- 3.4 Data Collection ................................................................. 205
- 3.5 Data Analysis ................................................................. 207
  - 3.5.1 Inter-coder agreement ................................................. 208
  - 3.5.2 Level of detail in pre- and post-case responses .......... 211
  - 3.5.3 Vocabulary usage within the pre- and post-case reflections ... 214
- 3.6 Validity and Reliability Measures ..................................... 216
  - 3.6.1 Validity ................................................................. 216
  - 3.6.2 Reliability .............................................................. 217
  - 3.6.3 Generalizability ....................................................... 218
- 3.7 The Researcher ............................................................... 219
  - 3.7.1 The researcher’s background ...................................... 219
  - 3.7.2 Role of the researcher during this study ....................... 220

#### 4. RESULTS AND DISCUSSION

- 4.1 Providing Clear Learning Objectives: Pre/Post Questions One, Two, and Three ................................................................. 224
  - 4.1.1 Pre/post question one: Are these appropriate learning objectives for this lesson? ................................................................. 225
CHAPTER

4.1.2 Pre/post case question two: Do you think this lesson provided students with a good understanding of what the teacher expected them to learn from the lesson? ......................................................... 239

4.1.3 Pre/post case question three: What did Ms. Miller do to help students understand the lesson objectives? What could she do to improve student understanding of the lesson objectives? ..................................................... 258

4.2 Collecting Appropriate Evidence of Learning: Pre/Post Questions Four and Five ................................................................................................................................. 290

4.2.1 Pre/post case question four: Over the four-day period, do you think Ms. Miller collected enough evidence that her students understood the learning objectives for this lesson? Explain your answer. ............... 292

4.2.2 Pre/post case question five: Based on the lesson objectives, in what way do the lesson activities provide an assessment for student learning? ..... 311

4.2.3 Discussion: Question five. ........................................................................ 318

4.3 Providing Guided and Scaffolded Feedback: Pre/Post Question Six ......................................................... 324

4.3.1 Pre/post case question six: How does Ms. Miller incorporate feedback in the lesson? In what ways do you think the feedback encouraged student learning? In what ways do you think the feedback encouraged improvements in teaching? ................................................................. 326

4.3.2 Discussion: Question six. ........................................................................... 341

4.4 Offering Opportunities for Peer- And Self-Assessment: Pre/Post Question Seven and Eight .................................................................................................................. 350

4.4.1 Pre/post case question seven: When thinking about student learning throughout this lesson, what purpose did both group and individual work serve? Did these activities provide an opportunity for students to peer- and self-assess their work? Explain your answer. ............................................ 352

4.4.2 Discussion: Question seven. ....................................................................... 365

4.4.3 Pre/post case question eight: How would you incorporate additional self- and peer-assessment opportunities? ............................................... 371
4.4.4 Discussion: Question eight ................................................................. 382

5. CONCLUSIONS, IMPLICATIONS, STRENGTHS AND LIMITATIONS, AND FUTURE WORK .............................................................. 385

5.1 Conclusions .............................................................................................. 385

5.1.1 Addressing the research questions ...................................................... 387

5.2 Implications .............................................................................................. 395

5.3 Strengths and Limitations ........................................................................ 397

5.3.1 Strengths of case methodology ............................................................ 397

5.3.2 Limitations of case methodology ......................................................... 401

5.3.3 Future work ......................................................................................... 405

REFERENCES .............................................................................................. 409

APPENDICES .............................................................................................. 424

A. Human Subjects Institutional Review Board Approval and Consent Form .... 424

B. Pre- and Post-Case with Facilitator’s Post-Case Guide ......................... 429

C. Instructional Cases One, Two, Three, and Four ..................................... 437

D. Preliminary List of Codes ........................................................................ 453

E. Complete List of Codes .......................................................................... 455
LIST OF TABLES

2.1 Summary Table of Methodologies Used ................................................................. 175
2.2 Summary of Sub-Groups Within Educational Studies .......................................... 178
3.1 Relationship Between Qualitative Characteristics and Proposed Research .......... 197
3.2 Preservice Teachers’ Educational Major and Minors ............................................ 200
3.3 Preservice Teachers’ Self-Report on Familiarity with Formative Assessment ....... 200
3.4 Summary of Data Collection for Spring 2013 ....................................................... 206
4.1 Formative Assessment Characteristics Associated With Each Case Questions ...... 223
4.2 Summary of Preservice Teachers’ Responses to Pre/Post Case Question One ...... 226
4.3 Summary of Preservice Teachers’ Responses to Pre/Post Case Question Two ...... 240
4.4 Summary of Preservice Teachers’ Responses to Pre/Post Case Question Three ...... 259
4.5 Summary of Preservice Teachers’ Responses to Pre/Post Case Question Four ...... 292
4.6 Summary of Preservice Teachers’ Responses to Pre/Post Case Question Five ...... 312
4.7 Summary of Preservice Teachers’ Responses to Pre/Post Case Question Six ...... 326
4.8 Summary of Preservice Teachers’ Responses to Pre/Post Case Question Seven:
   Individual and Group Work .................................................................................... 353
4.9 Summary of Preservice Teachers’ Responses to Pre/Post Case Question Seven:
   Self- and Peer-Assessment .................................................................................... 357
4.10 Summary of Preservice Teachers’ Responses to Pre/Post Case Question Eight .... 372
LIST OF FIGURES

1.1 Venn Diagram of Literature Topics................................................................. 18

5.1. Preservice Teacher Change Between Pre/Post-Case Reflections for Pre/Post Case Questions ................................................................................................................. 388
CHAPTER 1
THE PROBLEM

1.1 Introduction

Student assessment can serve many different purposes. The three most common purposes of assessment are to act as a: measure to hold students, teachers, or schools accountable; means of standardizing results for the use of summative comparison; or way to inform teaching and learning based on student data. Gathering information for the use of accountability and standardization most often reflects the summative nature of assessment; when global rather than individual learning is emphasized (McMillan, 2007). The use of assessment to inform teaching and learning most often reflects assessment for learning (AfL), or the formative nature of assessment. Cizek (2010) states that for an assessment to be summative, it must be administered at the end of instruction with the intent to categorize student or school performance. On the other hand, Cizek states that formative assessment is done during instruction in which the primary purpose is:

- to identify the student’s strengths and weaknesses;
- to assist educators in the planning of subsequent instruction;
- to aid students in guiding their own learning, revising their work, and gaining self-evaluation skills;
- and to foster increased autonomy and responsibility for learning on the part of the student (p. 4).

It’s important to note that it is not necessarily the timing of the assessment or the actual instructional activity that determines whether the assessment is summative or formative, rather it is what the teachers and students do with the data collected. Is the data used to help improve teaching and learning? For teachers and students to benefit from formative
assessment, both groups must identify and understand what formative assessment looks like in the classroom. Wylie and colleagues (Wylie et al., 2012) proposed a model of the cyclical nature of formative assessment, emphasizing the “cycle-within-the-cycle” process of assessment. This is a straightforward, yet comprehensive model because it emphasizes the multiple processes that occur between teachers and students during the learning process; highlighting how the entire cyclical process of teaching and learning relies on data, or feedback, collected during the “within-the-cycle” assessment process.

1.2 The Case for Formative Assessment

Formative assessment has been shown to have powerful effects on student motivation and learning (Black & Wiliam, 1998b; Wiggins, 1998); it also influences the nature of classroom instruction (McMillan, 2000). Evidence regarding the effectiveness of AfL principles on student learning is abundant (e.g. Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Black & Wiliam, 1998a; Brookhart, 2007; Crooks, 1988; Fuchs & Fuchs, 1986; Hattie, 2009; Kluger & DeNisi, 1996; Natriello, 1987). Black and Wiliam (1998a) conducted a meta-analysis of AfL and reported effect sizes for student achievement between 0.4 and 0.7. For point of reference, this type of gain in effect size is described as placing an average student in the top third of his peers. Hattie (2009) conducted a synthesis of over 800 meta-analyses and reported that feedback, the backbone of formative instruction, has an average effect size of 0.79. This score, when compared to the typical student gains of 0.15 to 0.4 expected during an average school year, indicates the possible shift from a “C” to an “A” student’s level of understanding.
The American Federation of Teachers, the National Education Association, and the National Council on Measurement in Education (1990) drafted a statement regarding important assessment competencies for all teachers. Competencies were identified in which teachers should be able to:

- choose and develop assessment methods appropriate for instructional decisions;
- administer, score, and interpret results of assessment methods;
- use assessment results when making decisions about student needs and planning and developing curriculum;
- develop valid grading procedures; communicate assessment results; and

Recognizing and acting on such formative assessment competencies has powerful effects; when implemented and utilized properly, formative assessment practices have repeatedly contributed to gains in student achievement (Black & Wiliam, 1998a).

1.3 The Ideal Situation

To successfully implement formative assessment, teachers must identify and clearly communicate the student learning goals, assess these goals accurately, and then use this assessment data to inform instruction (Stiggins, 1999). Teachers must initiate and
facilitate a line of communication with their students; this involves gathering student
data, scaffolding instruction based on the collected data, and perhaps most importantly,
offering appropriate opportunities for students to use guided feedback to improve their
learning (Black, Harrison, Lee, Marshall, & Wiliam, 2004). The ability to structure
curriculum and lesson activities around the formative assessment process is challenging.
Black and Wiliam (1998a) state that professional support is key to the successful
implementation of formative assessment in the classroom. Development and support of
using formative assessment strategies for in-service teachers is indeed critical, but this
type of education and guidance should ideally begin during a preservice teacher’s
education (Sadler, 1998; Stiggins, 2002). Teacher educators should model the formative
assessment process throughout the preservice teacher’s coursework and lead discussions
on how and when formative assessment strategies would be appropriate during teaching
(Buck & Trauth-Nare, 2009; Buck, Trauth-Nare, & Kaftan, 2010).

McMillan (2000) describes professional judgment as being the foundation for
effective and accurate assessment, stating that professional judgment
is needed to properly understand and use all aspects of assessment. The
measurement of student performance may seem "objective" with such practices as
machine scoring and multiple-choice test items, but even these approaches are
based on professional assumptions and values. Whether that judgment occurs in
constructing test questions, scoring essays, creating rubrics, grading participation,
combining scores, or interpreting standardized test scores, the essence of the
process is making professional interpretations and decisions. Understanding this
principle helps teachers and administrators realize the importance of their own
judgments and those of others in evaluating the quality of assessment and the
meaning of the results (p. 1).

The professional judgment exhibited by an experienced teacher might look very different
from the judgment of a novice teacher. How do teacher educators address the importance
of professional judgment with their preservice teachers? Preservice teachers often have minimal pedagogical experience, so how can teacher educators promote the skills needed for preservice teachers to accurately make such professional judgments in the classroom? Which pedagogical methodology would allow students to gain valuable instruction in formative assessment? Ideally, preservice teachers should be provided with continuous modeling of how formative assessment works within teaching and learning; teacher educators should not only model the formative process for their students, they should also intertwine this process throughout the curriculum to demonstrate the pervasive nature of formative assessment (Buck & Trauth-Nare, 2009; Buck, et al., 2010; Grimmett, 1988; Shulman & Colbert, 1989; Volkmann, 2000). In addition, preservice teachers should be provided an opportunity to critically reflect (Grimmett, 1988; Shulman & Colbert, 1989; Volkmann, 2000) on the use of formative assessment in the classroom, using peer and teacher feedback to help advance their use and understanding (Hughes & Large, 1993; Orsmond, Merry, & Callaghan, 2004; Orsmond, Merry, & Reiling, 1996), both prior to and during student teaching.

1.4 The Reality of the Situation

With the multitude of research-based evidence that supports the advantages of using formative assessment practices to improve student understanding, the topic of formative assessment in preservice education has been severely neglected (Bond, Roeber, & Branskamp, 1997; Stiggins, 2001). Separate assessment courses are sometimes offered to preservice teachers, but these courses usually focus on the summative aspect of
assessment. In addition, this method of segregating assessment practices from other pedagogical courses can lead to students to have difficulty relating how assessment can and should inform all aspects of instruction. In other words, to demonstrate the usefulness of formative assessment, it should be intertwined with all coursework and emphasized as a central theme in quality teaching (Sheppard, 2000). As expected, preservice teachers use the knowledge and tools they have acquired during their teacher education programs (Buck, et al., 2010); if quality formative assessment instruction is not modeled in their own educational courses, how will they view the usefulness of formative assessment when they are professional teachers? Will preservice teachers understand how and when to effectively use formative assessments?

Noonan and Duncan (2005) found that teachers understand the value of reflection, self-analysis, and collaboration (all parts of a formative assessment process) as components of a quantity learning experience. If this is truly the case, the question remains; why is formative assessment underutilized? Higgins, Hartley, and Skelton (2002) claim that students recognize the positive attributes of formative feedback and feel that if they put the effort into completing an assignment, they deserve feedback. Higgins et al. also point out that formative feedback makes a difference to students, but inquires to what extent this really happens within higher education. Yorke (2003) suggests that the theoretical constructs that support formative assessment are not widely recognized, especially amongst faculty in higher education. A question arises from this literature. What perceptions of formative assessment do instructors hold that might create a lack of appreciation of formative assessment and are these perceptions passed on to their
students? This is an especially intriguing question if the college level instructors are teaching educational courses to students who will eventually become teachers themselves.

1.5 The Possibilities

While many authors have argued the importance of knowing and practicing assessment strategies and concepts (Cizek, 2010; Gullickson, 1996; McMillan, 2001; Schafer, 1991), there continues to be relatively little emphasis on assessment for in-service and preservice teachers (Stiggins, 2001).

If it [assessment] is done well, the evidence is compelling: all students prosper, but especially struggling learners. If it is done poorly, all students suffer. The vast majority of teachers and school leaders carry out their assessment practices with neither the confidence nor competence needed to do so productively to support student learning (Stiggins, 2008, p. 6).

An overarching question may be, what can be done to boost confidence and competence of pre- and in-service teachers using formative assessment? In this proposal, an argument is made for not only explicitly discussing formative assessment strategies, but also explicitly modeling them in a context that is relevant and applicable to the experiences teachers will face in the classroom. Explicit modeling also includes providing teachers with an opportunity to discuss and reflect on formative assessment practices within the classroom experience. In doing so, teachers are afforded an opportunity to receive feedback from peers and instructors, increasing their understanding and utilization of formative assessment; this is especially important to demonstrate because assessment is one of many objectives a teacher must accomplish during their already busy teaching day.
(McMillian, 2003). As competence increases via explicit instruction, modeling, and personalized feedback, confidence levels also can increase (Andrews, 2002; Brookhart, 2007; Cowen, 2009).

Modeling the concept and process of assessment can be done multiple ways. Within the teacher education classroom, teacher educators can model the formative assessment process for their students as the preservice teachers are learning about pedagogical and methodological practices. Modeling can also include providing pre- and in-service teachers with an opportunity to critically think about, reflect, and discuss specific cases in which formative assessment is the central topic within real classroom situations. Using real-world cases as teaching tools has been a highly successful method of instruction for law, business, and medical students (Garvin, 2003). In these disciplines, case method allows learners to engage in challenging decision making situations (Kim et al., 2006) by providing students with real-world situations and experiences the students can relate to and learn from. Case method is a unique methodology because it can be used to foster multiple student outcomes. Case method has been shown to help students apply the theory and principles of law, develop diagnostic and persuasive skills required for effective management, and prepare students to be independent problem solvers (Garvin, 2003). Even though law, business, and medical disciplines use case method for different pedagogical outcomes, they all provide students with meaningful and recognizable situations that encourage students to relate to the curricular material. I argue that case method is also an appropriate and effective method for explicitly incorporating formative assessment instruction in teacher education.
1.6 Terminology

Within the topics of assessment and case method, research literature reflects multiple interpretations for common terms used within the literature. Before each of the corresponding section of this literature review, I have described the associated terms and defined how I will be using these terms through out the proposal. Within the assessment literature, the common terms defined are: assessment for learning, formative assessment, summative assessment, and feedback. Within the case method literature, the common terms defined are: case study, case methods, case-based instruction, scenarios, vignettes, and cases.

1.7 Theoretical Framework: Cognitive Apprenticeship and Situated Learning

In the preservice teacher educational literature, strong arguments are made for more personalized and professional learning experiences. Sheppard (2000) recommends embedding instructional and curricular assessment within methods courses. There is need to model and assess preservice teachers in ways that exemplify formative assessment practices because teachers tend to teach the way they were taught (Andrade, 2010); viewing “good practices” as those they experienced as students themselves (Calderhead & Robson, 1991). Science teacher educators and researchers should, therefore, place high priority on studying the effects of formative assessment curriculum on preservice teachers. By informing, implementing, and reflecting on formative assessment practices during preservice education, preservice teachers may find it easier to implement such strategies into their own professional classrooms. Mitchell (2006) conducted a study in
which she recognized the effectiveness of aligning teacher education with formative assessment policy. Students’ deep understanding of formative assessment principles was identified; however, the students did not always transfer this knowledge into their own classrooms. This particular issue is of great interest. How can teacher educators help their students transfer assessment knowledge and promote greater implementation of formative assessment strategies once the preservice teachers enter into the classroom?

Williams (1992) points to the use of cognitive apprenticeships and anchored instruction as forms of case-based instruction that help students contextualize the curriculum, in this case, the use of formative assessment in daily teaching and learning.

Cognitive apprenticeship emphasizes the social context of instruction and draws its inspiration from traditional apprenticeships. Anchored instruction provides a model for creating problem context that enable students to see the utility of knowledge and to understand the conditions for its use. (Williams, 1992, p. 369)

During a traditional apprenticeship, learning is often associated with a trade and characterized by learning a job in the exact manner in which it will later be performed (Collins, Brown, & Newman, 1987). In the field of education, the luxury of performing a job in the exact manner in which it was taught is absent; however, particular skills help teachers deal with the ever-changing classroom environment. Cognitive apprenticeships emphasize a process that demonstrates how the experts, through these particular skills, solve problems (Williams, 1992) and through this apprenticeship expertise, the apprentice receives feedback to improve their skills (Collins, et al., 1987). Rather than focusing on physical skills and processes as one would with a traditional apprenticeship, cognitive apprenticeships focus on cognitive and metacognitive skills and processes. Collins et al. stated, “Cognitive apprenticeship teaching methods are designed, among other things, to
bring these tacit processes into the open, where students can observe, enact, and practice them with help from the teacher and from other students” (p. 4). Engaging students in argumentation and discussion about real dilemmas they will face in the field creates an environment of discovery (Lave, Smith, & Butler, 1988); both in students’ understanding of patterns within learning situations and the ability to invent and justify answers (Hennessy, 1993).

Collins et. al (1987) discuss the importance of the apprentice to observe modeled behaviors and skills demonstrated by the teacher, and then be provided the opportunity to independently practice these skills while the teacher scaffolds and guides the learner.

Development of a conceptual model, which can be continually updated through further observation and feedback, encourages autonomy in what we call reflection (Collins & Brown, in press). Reflection is the process that underlies the ability of learners to compare their own performance, at both micro and macro levels, to the performance of an expert. Such comparisons aid learners in diagnosing difficulties and incrementally adjusting their performance until they reach competence. A conceptual model serves as an internal model of expert performance, and, thus, as a basis for development of self-monitoring and -correction skills (Collins, et al., 1987, p. 3).

Collins et al. (1987) defined three teaching methods that are the core of the cognitive apprenticeship: modeling, coaching, and scaffolding. Interestingly, these methods are also well aligned with formative assessment strategies. Collins et al. suggest that a teacher should be focused on providing students with the opportunities to “observe, engage in, and invent or discover expert strategies in context” (p. 4). In the teacher education setting, this can be a difficult task to accomplish because preservice students have limited opportunities to see an “expert” teacher modeling very specific conceptual processes. By providing case opportunities in which these processes are demonstrated,
students are provided with an explicit picture of how the factual and conceptual knowledge fits together with the strategies displayed. Providing cases that model particular problem solving episodes offers the readers an opportunity to develop a mental picture of the cognitive and metacognitive processes involved in such circumstances. In addition, discussing their views with the teacher allows for coaching via immediate feedback to occur. Through coaching, teachers have the ability to identify and help correct possible misconceptions regarding the concepts or procedures demonstrated in the case. Through this process, scaffolding is also encouraged. Teachers can use student feedback to inform their practice; assisting students in accomplishing certain tasks that they may not have been able to accomplish on their own. Reflection also plays a key role within the cognitive apprenticeship because the act of comparing ones own process of solving a problem with that of an “expert” in the field can lead to cognitive growth.

Williams (1992) describes anchored instruction as an approach in which the concepts and skills being learned are situated in a particular context, with the argument that students can use the problem solving skills acquired to solve other problems that arise (Adams et al., 1988). Williams defines a framework for comparing and evaluating methods of case-based instruction based on the characteristics of both cognitive apprenticeship and the anchored instruction. The framework is divided into a teaching and learning category, as well as a materials and curriculum category; under each category are a list of questions in which the methods of each category are evaluated. Under the teaching and learning category, the questions focus on direct assessment strategies and include:
• Does the teacher model expert problem solving in the context of a complex problem?
• Are students given the opportunity to engage actively in solving problems, and does the teacher provide specific immediate feedback while students are solving problems?
• What type of scaffolding is used to support students as they solve problems?
• Are there frequent opportunities for both teacher and student to assess how well earning is progressing? Is the type of assessment used appropriate for measuring the skills that are taught? (Williams, 1992, p. 375)

These questions focus on the process of student learning. Modeling, scaffolding, immediate feedback, and teacher- and self-assessment are not only key components of anchored instruction, they are also features described within the five key strategies of formative assessment practice (Wiliam, 2010). The category of materials and curriculum focuses on the act of instruction; these questions include:

• Are the problems authentic; that is, are they ones that would be solved by practitioners?
• Are the problems realistically complex? Do their solutions involve multiple steps? Are the settings rich and detailed? Are multiple skills and concepts linked to each problem?
• Are the problems presented in a way that makes complexity manageable; for example, using a story format, presenting them on video, and providing all relevant data?
• Are problems sequenced to support students’ needs at different stages of learning? (Williams, 1992, p. 376)

These questions highlight the authentic learning experience. Hennessy (1993) states, “Cognitive apprenticeship programmes promote situated learning by giving students the critical opportunity to observe, engage in and invent or discover expert strategies in context” (p. 20). This is done by emphasizing the development of the learner’s own resources, gradually allowing and encouraging students to take control of their own learning (Hennessey, 1993). The theory of situated cognition calls for embedding
instruction in an authentic context (Jonassen, 2000). Andrews (2002) describes the difficulty in finding ways for preservice teachers to be exposed to and participate in authentic instruction, but states that connecting preservice teachers with authentic instruction stimulates transfer of learning. In addition, expert feedback provides a stimulating and motivating learning environment for preservice teachers. Within the situated learning experience, problems arise out of dilemmas and learning arises through the process of solving the problems (Hennessy, 1993). Hennessy concludes by stating, “The implication are that formal educational settings need to encourage active intellectual engagement in mathematical, scientific, and technological thinking, and that tasks should relate to those encountered in daily life” (p. 33). Using case method as an instructional tool to relate the employment of formative assessment in everyday teaching addresses this very issue.

1.8 Significance

From a review of the literature on classroom assessment, research suggests that teachers need to improve the quality of the assessments they use in the classroom (McMillan & Workman, 1998). At this point in time, most preservice teachers’ have little to no training in assessment (Bond, et al., 1997; Stiggins, 2001), so it is unclear to what extent preservice teachers will implement effective formative assessment strategies into their own classrooms. Andrade (2010) states, “If the assessments students are exposed to in postsecondary education are transparent, formative, collaborative, and constructive,
students will gain first-hand experience with effective assessment tools that they can then employ in their own teaching” (p. 348).

If a major goal of teacher education is to create reflective teaching professionals (Gideonse, 1984; Schön, 1983; Shulman, 1992b), I would argue that for such reflection to take place, teachers must have the ability to adequately assess their own teaching as well as assess student understanding. Furthermore, teachers must have the ability to analyze the assessment data to accommodate for the necessary changes. Based on the evidence provided from the assessments, teachers use prior experiential and pedagogical knowledge to make informed decisions. In the case of preservice teachers, many have limited teaching experience and lack the pedagogical knowledge to make such informed decisions. How can preservice teachers gain such experience if they are not yet in the classroom?

The Carnegie Task Force on Teaching as a Profession acknowledged that “teaching cases illustrating a great variety of teaching problems should be developed as a major focus of instruction” (Carnegie Forum, 1986, p. 76). Cases have been used in teacher education to help preservice teachers deal with classroom management, grading, diversity, instructional practices, and student learning issues (Silverman, Welty, & Lyon, 1992). Case content is important; it helps set a “real world” picture in the minds of novice preservice teachers, as well as affords them with the opportunity to become familiar with what happens in the classroom. Perhaps more importantly, cases allow preservice teachers’ to internalize, discuss, and reflect upon classroom experiences. Merseth (1999) states that using cases as an instructional tool “can help students of teaching develop
skills of analysis and problem-solving, gain broader repertoires of pedagogical technique, capitalize on the power of reflection, and experience a positive learning community” (p. xi). If cases have been used to demonstrate this type of success, why couldn’t cases be used to teach and model the use of formative assessment in teaching and learning?

If we can identify preservice teachers’ perceptions of formative assessment, we can get a better understanding of what type of changes are needed in assessment education for preservice teacher education. Case method offers an opportunity for preservice teachers to reflect upon and discuss assessment issues within the classroom. In return, through discussion and written reflection, it offers teacher educators an opportunity to understand how well the preservice teachers understand the process of formative assessment and where improvements can be made. If preservice teachers are familiar with formative assessment, its uses, implications, and advantages, they may be more likely to embed such assessment practices into their class lessons. Cizek (2010) states, “In the end, however, addressing the challenges and embracing the potential power of formative assessment offers substantial promise for stimulating greater gains in students’ achievement and responsibility for their learning” (p. 15). I argue this is true not only for primary and secondary school students, but also for preservice teachers. If preservice teachers are better informed about the formative process, they will have a better chance of implementing formative assessment strategies in the classroom. When classroom teachers can identify clear learning targets for their students and have an understanding of where their students are in this learning process, science instruction and
learning can drastically improve. The process of formative assessment not only improves teacher instruction, but most importantly, it improves student learning.
2.1 Introduction

Creswell (1994) describes three main criteria for a literature review: “to present results of similar studies, to relate the present study to the ongoing dialogue in the literature, and to provide a framework for comparing the results of a study with other studies” (p. 37). The purpose of this literature review is directly related to Creswell’s criteria. Within this literature review, I have highlighted current research in three separate, yet overlapping topics: formative assessment in teaching and learning, preservice teacher education, and case method. Figure 1 represents the organization of this literature review by topic and chapter.

Figure 1.1. Venn Diagram of Literature Topics
The overarching purpose of this literature review is to highlight the relationships and gaps in the literature between these three topics. Each circle within the Venn diagram represent a cluster of studies around similar topics. Within each topic, pertinent literature is highlighted. Each piece of literature is described and summarized, and then evaluated in relationship to the other central research literature. Chapter 2 includes a synthesis of the central research relating to the topic of formative assessment and preservice teacher education. Chapter 3 includes a synthesis of the central research relating to the topic of preservice teacher education and case method. Chapter 4 includes a synthesis of the central research relating to the topic of formative assessment and case method. Finally, Chapter 5 represents the synthesis of all three topics. In addition, I have included Chapter 6, a review of the methodologies used within the literature of this review, and Chapter 7, a final reflective chapter.

It is important to note that the relationships between each topic are not uniform, as one might assume when looking at a Venn diagram. The current literature base for the individual topics of formative assessment in teaching and learning, preservice teacher education, and case method are extensive. The literature base that relates formative assessment and preservice teaching is also extensive; however, the literature on utilizing case method in preservice teacher education is less broad and the literature on using case method as a teaching tool to highlight formative assessment practices is non-existent. Regardless of the amount of literature directly relating these three topics together, based on the current research, an argument has been made within this literature review for these
relationships to exist. These detailed arguments are shared within each of the chapters of this literature review.

The literature critiqued in this review was selected based upon a set of inclusion criteria. All critically reviewed literature were empirical studies published within peer-reviewed journals. Other inclusion criteria included: seminal work in the field of study; research that studied particular populations related to my research (e.g. preservice teachers, teacher educators); and research that studied particular topics related to my research interest (e.g. specific formative assessment strategies).

The three different content areas represented within this literature review were held to different exclusion criteria. The literature surrounding formative assessment practices is extensive; therefore, exclusion criteria included research conducted more than a decade ago. I also excluded studies that were not well cited or conducted by prominent researchers in the field of formative assessment. The literature pertaining to case method used within a teacher educational setting is limited. Exclusion criteria included research conducted in different fields of study other than preservice teacher education. I also excluded studies that were not conducted by prominent researchers in the field of case method in teacher education. Lastly, the literature pertaining to case method used to teach formative assessment strategies is extremely limited; therefore, finding appropriate and rigorous research was not an easy task. Exclusion criteria included research pertaining to case method used to gain an understanding of non-formative attributes.
2.2 Formative Assessment and Teacher Education

2.2.1 Distinguishing the meaning of assessment

The term assessment can invoke different meanings between disciplines as well as between colleagues within the same discipline. Within the field of education, the term assessment is often associated with testing, to serve as an avenue for providing numerical results to help make schools and teachers accountable for student learning (Black, 1998). Another purpose of assessment is to produce reliable measures in which a students’ scores are used to provide data that is consistent across schools, districts, states, and even nations (Black, Harrison, Lee, Marshall, & Wiliam, 2003). These two types of assessments thus far are describing the summative nature of testing, in which final results are used to judge value, worth, or merit of student and teacher performance (Forunier, 1995); they are a measure of assessment of learning. Assessment for learning, on the other hand, is a process that promotes student learning during the learning process (Black, et al., 2004). Assessment for learning is often perceived as synonymous with formative assessment (Weeden, Winter, & Broadfoot, 2002) and both terms are used extensively in the educational literature and research; however, I prefer to use Black et al.’s (2004) definition in which assessment for learning describes the general process of assessment to promote student learning and becomes formative assessment when the evidence collected is used to modify teaching and learning. When assessment of student knowledge is done formatively, a teacher helps the student determine the gap between the students’ actual level and the reference level of attainment of the learning goal, and then
provides feedback to the student in order to address this gap in knowledge (Ramaprasad, 1983). Student awareness of their own learning is vital if students are to acknowledge the gaps in their understanding (Sadler, 1989). Paired with self-assessment, receiving task-specific feedback is also vital for successful formative assessment to occur (Crooks, 1988). Without student or teacher feedback, the cycle breaks down and there is little chance that formative assessment will help advance student learning.

Sadler (1989) makes a distinction between summative judgments of student achievement and the formative judgments students make regarding their own learning. Sadler states, “Formative assessment is concerned with how judgments about the quality of student responses (performances, pieces, or works) can be used to shape and improve the student's competence by short-circuiting the randomness and inefficiency of trial-and-error learning” (p. 120). In doing so, the feedback cycle between teacher and students is imperative. Sadler goes on to state,

Few physical, intellectual or social skills can be acquired satisfactorily simply through being told about them. Most require practice in a supportive environment which incorporates feedback loops. This usually includes a teacher who knows which skills are to be learned, and who can recognize and describe a fine performance, demonstrate a fine performance, and indicate how a poor performance can be improved” (p. 120)

Here, Sadler is making a point that teachers must find ways to recognize student gaps in knowledge, and then teach and guide students to utilize the feedback provided to lessen or eliminate these gaps. Questions arise about the actual level of interest and work students will put forth in their own learning. Is formative assessment a reasonable endeavor in a science classroom? Will student-centered formative assessment strategies,
one that diverge from the standard summative measures, foster and encourage appropriate student learning gains?

2.2.2 Historical context of formative assessment

Although one could argue that teachers throughout history have been gathering and using student information to advance learning, the connection of this formative instruction to the act of teaching and learning has often been credited to Michael Scriven after he referred to this concept as *formative* evaluation (Scriven, 1967). Scriven used this term to describe a process that occurred within program evaluation. Subsequently, Bloom (1968) was among the first to incorporate this idea into his model of mastery learning; students did not move on to the next level until they were able to demonstrate mastery of their current level. The process of mastery learning mimics the process of scaffolding we see today. In 1971, the *Handbook of Formative and Summative Evaluation of Student Learning* (Bloom, Hastings, & Madaus, 1971) helped distinguish between the purpose of summative (e.g. after instruction) and formative (e.g. during the process of learning) evaluation in the field education. Over the next few decades, the term “evaluation” was replaced with “assessment” when the focus turned from educational accountability to student learning. Bloom identified the use of feedback as a key element of formative assessment. In doing so, feedback was seen as information not only provided by the teacher, but also used by the student to advance learning (Bloom, 1977).

Continuing with the idea of formative assessment in education, much of the initial work on formative assessment was done in Great Britain. In England, projects that
supported the implementation of formative assessment emerged (e.g. Concepts in Secondary Mathematics and Science project, Graded Assessment in Mathematics Project); however, new national curriculum criteria from the General Certificate of Secondary Education and the National Curriculum Task Group on Assessment and Testing focused on summative examination scores. Black and Wiliam (2003) suggest that the new standardized national curriculum movement, which focused on summative evaluations and accountability, lead to a decline in the development of formative assessment as seen throughout the 1970s and 1980s. Discussions continued throughout the 1990s that sought a resolution for this either-or position of formative and summative assessment and evaluation; however, in the end, the focus remained on summative judgments (Black & Wiliam, 2003). Although governmental regulations focused on summative assessments, research on formative assessment continued. Educational researchers became increasingly concerned with how formative assessment and student learning were being ignored; this concern lead to a renewed awareness of the importance of formative assessment in teaching and learning (Black & Wiliam, 2003). In the late 1980s, two major publications highlighted the importance of classroom assessment and student learning gains. Crooks (1988) reviewed the literature on the effect of classroom assessment practices on students and Sadler (1989) studied the connection between embedded assessment practices that allow students to monitor their own progress. Both made a compelling case for the use of formative assessment in education. The British Educational Research Association Policy Task Group on Assessment commissioned Black and Wiliam to review the research on formative assessment. This review lead to
one of the most referenced publications within the formative assessment literature (i.e. Black & Wiliam, 1998a) and offered strong evidence that the implementation of formative assessment practices raised standards of achievement in every single country in which it was studied (Black & Wiliam, 2003). An interest in implementing formative assessment to improve student learning was renewed; rapidly gaining primary, secondary, and colligate professional and researcher awareness worldwide.

2.2.3 A summary of the review of literature on formative assessment in education

Numerous reviews of the literature have been conducted concerning classroom assessment of student learning (Bangert-Drowns, et al., 1991; Black & Wiliam, 1998a; Brookhart, 2007; Crooks, 1988; Fuchs & Fuchs, 1986; Hattie, 2009; Kluger & DeNisi, 1996; Natriello, 1987). In this section, I will provide a short summary of the findings from some of the highly referenced meta-analytic and reviewed pieces of literature pertaining to formative assessment.

Fuchs and Fuchs (1986) reviewed 21 studies featuring the use of formative assessment practices within special education populations. The authors found that systematic formative evaluations produced significant student learning gains with an overall effect size of 0.70. Fuchs and Fuchs conclude that systematic formative evaluations, rather than the deductive approach often taken in developing instructional programs based on initial descriptions of learners, can be used to successfully formulate individualized educational programs (IEPs). Natriello (1987) reviewed research on the impact of classroom and school evaluations on student achievement and motivation. He
summarized several aspects of evaluation that were important in the classroom; these included a focus on the learning task (as opposed to a focus on the comparison of student achievement), clear evaluation criteria, setting high standards, differentiated feedback, and comprehensive assessment of student work. Natriello claims three major issues with the research: a majority of the research lacks descriptive information on the evaluation process in classrooms, most of the research concentrates on only one or two aspects of the evaluation process, and few studies consider the different purposes for evaluation in the classroom. In his review of the literature on effective feedback, Crooks (1988) was also interested in the effects of evaluation on motivation and achievement, as well as learning strategies. Crooks summarized three main ways in which feedback could be enhanced: (1) feedback is most effective when it draws attention to student’s progress towards mastery, rather than right or wrong answers, (2) feedback should occur soon after the task, with opportunities for students to demonstrate learning from the feedback provided, and (3) feedback should be specific and related, that is feedback should be provided consistently and should be directly related to learning goals. Bangert-Drowns, Kulik, Kulik, and Morgan (1991) also focused on the effects of feedback. Looking at 40 reports, Bangert-Drowns et al. found that feedback from frequently administered student tests made positive contributions to student achievement with an effect size of 0.26. Bangert-Drowns et al. evidence suggests moderate frequency of testing was desirable, as opposed to the two extremes: less frequently or with high frequency. Bangert-Drowns et al. did not, however, address the depth of information tested (i.e. cumulative or non-cumulative) or the cognitive level of test questions. These two factors could affect how
well feedback is re-conceptualized into the students’ learning process. Acknowledging
the findings and limitations of Natriello, Crooks, and Bangert-Drowns et al. research on
assessment, Black and Wiliam (1998a) synthesized over 250 research papers between
1987 and 1998. Through this seminal review, Black and Wiliam demonstrated that the
variety and quality of formative assessments used in the classroom made a difference in
student learning outcomes. Specifically, Black and Wiliam found that setting clear and
appropriate learning goals and tasks, as well as incorporating feedback cycles in which
both the teacher and student uses feedback to guide learning, had substantial implications
for raising student achievement with reported mean effect sizes ranging from 0.4 to 0.7.
Subsequently, Brookhart (2007) reviewed literature on effects of formative classroom
assessment on student achievement and found effect sizes to be in the same general range
as reported by Black and Wiliam (1998b).

Kluger and DeNisi (1996) conducted a meta-analysis of 131 studies focusing on
various types of feedback and found that feedback is most effective when it is focusing
on correct responses as oppose to incorrect responses. In addition, feedback is more
effective when it builds on the responses from previous attempts. Kluger and DeNisi
calculated the average effect size to be 0.38. In one of the largest reviews of research on
effective teaching strategies, analyzing over 800 meta-analyses, Hattie (2009) concluded
that feedback is the single most powerful moderator of increased student achievement
gain, with effect sizes ranging from 0.3 to 0.7.

As Natriello (1987) emphasized, it is important to acknowledge the limitations of
findings in any review or meta-analysis; the myriad of analyzed studies are rarely ever
testing the exact same phenomenon on the same generalized sample population while using the same outcome measures. It is a rare occurrence when a collection of studies does meet the same criteria. This does not mean, however, that the data collected from these reviews and meta-analyses is invalid, nor does it mean that the data cannot be generalized. On the contrary, the practice itself of utilizing formative assessment in teaching and learning is highly individualized within the classroom. The specific details may vary, but the outcomes have been highly consistent. These outcomes provide a powerful argument for the use of formative assessment and further demonstrate the fact that formative assessment is a *process* that occurs to help advance teaching and learning, regardless of the population in which it is applied.

Three main themes have emerged from the reviews of literature on formative assessment. These themes include: assessments used in a summative nature reduce the extent in which the assessments will enhance student learning, the kind of feedback (e.g. immediate or delayed) is effective for different types of learners, and feedback has been found to be most effective when it focuses on the “next steps” of learning as opposed to only focusing on what was correct or incorrect (Wiliam, 2010). Brookhart (2007) summarized the advantages of using formative assessment nicely when she stated

> Formative assessment helps give pupils both the information they need to improve and the confidence and self-regulation they need to use it. Done well, it does not conflict with external measures of achievement. Formative assessment is the sleeping giant in classrooms. It’s time to wake it up! (p. 57)
2.3 Formative Assessment in Education: The Literature

2.3.1 Teacher implementation of formative assessment

Reviews of research on formative assessment have demonstrated that, when employed as part of classroom practice, substantial learning gains can be achieved (Black & Wiliam, 1998a; Crooks, 1988; Natriello, 1987). The work of Black and Wiliam (1998b) demonstrated that teachers need living examples of how formative assessment can be implemented in the classroom; strategies that the teachers can identify with and subsequently adapt into their own practice. Wiliam, Lee, Harrison, and Black (2004) took this approach for their research project, in which the researchers worked collaboratively with teachers, providing direction and support, rather than scripted protocols. I believe this to be a novel idea; one in which the idea of formative assessment was not only administered to students, but also to teacher practice. In this sense, the teachers were able to implement formative assessment strategies in their own way, reflecting and revising as they put their ideas into practice.

Wiliam et al. (2004) chose two local education authorities (LEAs) in England in which to conduct their study. From the six schools that participated, 24 teachers were selected. The intervention was administered through two main components. This included a series of half-day and one-day in-service sessions and multiple visits to each school. The teachers were observed by project staff and had the opportunity to discuss their ideas for implementing formative assessment strategies as well as receive feedback on more effective practices. The in-service sessions, which occurred over a total of six-and-a-half
days, provided the teachers with an introductory view of formative assessment as it would relate to the teachers’ own classroom lessons. The main focus of the in-service sessions was the development of action plans. The teachers were encouraged to use the last half of the school year in which the project was started to experiment with some strategies and techniques suggested to be effective by the formative assessment research. These included comment only marking, sharing criteria with learners, peer- and self-assessment, and rich questioning strategies. After several months of experimentation, the teachers devised an action plan that specified which aspects of formative assessment they planned on implementing at the beginning of the next school year.

The 24 teachers complied a total of 102 activities, roughly four per teacher. When analyzed, almost every plan referenced teacher-questioning techniques, but only 11 provided further explanations on how the teachers would accomplish this task; this involved students in setting questions and using national curriculum test questions. Comment-only marking was a task mentioned in roughly half of the action plans, with only six teachers providing further explanation as to how they would accomplish this task; this included reducing marks and grades and assessing with time for remediation. Sharing lesson objectives was mentioned by most of the teachers through a variety of techniques including using exemplars and involving students in the creation of criteria. Almost all of the teachers included self- and peer-assessment in their plans. Strategies included ‘traffic lights’ and self-assessment targets, which placed responsibility on students. Lastly, group work activities were employed to help reinforce the subject matter.
The teachers were free to choose which class they would employ their strategies in as well as what techniques they chose to implement. There was no way for the researchers to standardize the input or output variables. Therefore, they decided to use whatever existing assessment instruments would be used in a normal year. In many cases, the General Certificate of Secondary Education test was used, but in other cases end-of-module tests were used. The researchers acknowledged the strengths and weaknesses of using externally mandated tests. A weakness, which is of major concern, is the lack of curricular validity. The tests may not accurately reflect what the teachers were realistically teaching in their classrooms. The authors stated that all the teachers were happy with the tests and felt they were an adequate measure of what each teacher was attempting to achieve in their classroom.

The researchers set up comparison groups to interpret the data they received from the participating teachers and classrooms. The comparison groups consisted of either a parallel class taught by the same instructor or a parallel class taught by a different instructor. This raises questions regarding the conclusiveness of the findings; if comparison groups were taught by different instructors, how do we know that the outcomes were not affected by teaching style rather than the implantation of formative assessment strategies? Wiliam et al. (2004) state that a vast majority of the teachers involved in this project fundamentally altered their views of themselves as professionals. This also causes concern as the teachers may have inadvertently applied formative assessment techniques to their comparison class. Both situations reflect validity issues with the research design. Classroom observations could reduce this threat as the
researchers could observe and initiate conversations about the teachers’ assessment practices; however, due to resource constraints, the researchers were only able to conduct one teacher observation per half term, totaling two observations per year.

Wiliam et al. (2004) conclude by providing insight on why this study is worthy of further investigation for the purposes of generalized knowledge for policy and practice in other locations. The authors admit that their research population was not typical; the teachers were initially interested in formative assessment and received a great degree of support throughout the year of study. Wiliam et al. still feel further investigation is warranted.

Wiliam et al. state that even though the teachers ranged in expertise and experience, all of the teachers improved during the course of this study. With only two observations to insure adequate implementation of the teachers’ chosen formative assessment strategies, caution should be taken when using the data to make conclusions. The teachers did, however, develop materials and strategies that they did not implement prior to this invention, and the teachers were able to share this information with others who are interested in implementing formative assessment into their classrooms. Previously, the researchers cited that the teachers’ plans indicated certain formative assessment strategies were to be implemented, yet less than half of the teachers provided further explanations on how the task would be accomplish. This finding should be interpreted with caution. On the one hand, lack of a written explanation of assessment use does not indicate that the teacher will not implement the planned assessment strategies. On the other hand, without an appropriate description of the implemented assessment, it is inappropriate to
assume the teachers will follow through with their plans. Either way, appropriate data
collection (i.e. observations and interviews) would be necessary to interpret such a claim.

The authors conclude with the following statement, “At the very least, these data suggest that teachers do not, as is sometime reported, have to choose between teaching well and getting good results” (p. 7). Based on teacher feedback related to the process of planning and implementing formative assessment into their classrooms, this is a realistic argument that encourages further discussion and study in formative assessment. There is an important message Wiliam et al.’s research provides the research community.

Formative assessment is a process. The teachers who participated in this study were interested in improving student learning through the process of formative assessment; however, the teachers themselves also improved on their own teaching and learning through this same process. I believe this is a powerful model; one that demonstrates how teachers can reflect and revise their teaching through the same formative process teachers employ in their classrooms.

Wiliam et al. (2004) demonstrated that with structured guidance and assistance, teachers could effectively implement formative assessment practices into their daily lessons. Without such guidance however, many teachers and students still struggle with its implementation and use. Buck and Trauth-Nare (2009) refer to several factors that may affect teachers’ views of formative assessment: holding more traditional views of learning, weak pedagogical content knowledge, lack of self-reflection on their own teaching and pedagogical views. If teachers are expected to effectively implement and use high quality assessment, Black and Wiliam (1998) recommend professional support.
Such professional development is extremely valuable, but Buck and Trauth-Nare (2009) warn that it cannot be viewed as merely another pedagogical strategy. The purpose of Buck and Trauth-Nare’s research was to develop an understanding of the challenges and benefits teachers faced when implementing formative assessment. Such research can provide clarity as to why the implementation of formative assessment is sometimes difficult. The authors sought out answers to the following research questions: 1. How does cooperative research affect teachers’ understanding regarding the process of formative assessment? 2. How did students react to formative assessment and did this influence instruction? 3. What practical implications emerged due to the implementation of daily formative assessment?

Buck and Trauth-Nare (2009) chose to investigate their research questions using cooperative inquiry, which is a form of action research. The authors chose this type of methodology because of its reflexive approach by which research and practice happen at the same time, influencing one another. This type of methodology is appropriate, especially addressing the authors’ first research question. In addition, using experiences to inform practice models the formative assessment process. The study took place in a middle school located in the Midwestern United States. As an ethnically diverse student population was valued, Buck and Trauth-Nare chose the sample of students for their study; this included one African American male, one Caucasian male, two Native American females, two Caucasian females, one Middle Eastern female, one African American female, and one Asian male. The authors worked with two sections of a sixth
grade life, physical, and chemical science class. Subject participation in this study
included two teacher educators and a sixth grade teacher.

Data was collected through weekly transcripts of the teacher’s planning sessions,
instructional lesson plans, classroom observations, teacher and student interviews, and
student work. Teacher interviews were conducted before and after the study. Prior to the
study, interview questions focused on teacher perceptions of formative assessment as
well as the teacher’s perceived impacts and barriers of implementing formative
assessment. At the conclusion of the study, the teacher was asked to reflect on the
implementation of formative assessment and any changes in the teacher’s understanding
of formative assessment. The teacher was asked about impacts of formative assessment
on students, barriers for implementation, and the strengths and weaknesses of such
implementation.

Transcripts were created from the nine weekly planning sessions. These sessions
focused on reviewing the assessment strategies implemented during that current week
and planning assessment measures for the following week. Buck and Trauth-Nare (2009)
stated that planning sessions were also shaped by what happened during the past lessons
as well as student interviews. The authors interviewed each student approximately seven
times during the study. The interview questions focused on formative assessments given
in class, clarifying the information elicited by the assessments. From Buck and Trauth-
Nare’s description, it appears that most of the questions asked were content related. In
this way, the authors seem to be testing the students’ ability to answer questions related to
past classroom lesson content. Is there an implicit assumption being made by the authors
that if the students could answer the content related questions correctly, the formative assessment implemented during that particular class lesson was successful? Formative assessments can be used to scaffold a student’s learning process, taking the student from one level to the next; however, the student may not, at that particular time, be ready to correctly answer specific content related questions. This does not mean the formative assessment was unsuccessful. Although not stated, perhaps the multiple interview sessions helped to alleviate this issue, as the student was able to share answers over the course of the unit. Buck and Trauth-Nare (2009) conducted eight classroom observations using a protocol created by the Systemic Teacher Excellence Preparation program (Online Evaluation Resource Library, 2001).

Buck and Trauth-Nare (2009) summarized their findings according to each of their research questions. For the first research question (How does cooperative research affect teachers’ understanding regarding the process of formative assessment?), the authors found a discrepancy between the teacher’s beliefs and students’ actual levels of understanding. The teacher assumed that student completion of in class assignments equated to student understanding, when in fact, during interview sessions, the students had difficulty explaining the concepts. This led the authors to conclude that these particular in-class assignments were not a good measure of student learning. In response to this finding, the teacher and researchers developed formative assessment “prompts” in a constructed response format. For an assessment to be formative, the student must receive feedback regarding his or her conception, and based on that feedback, revise their work. There is no indication that this was occurring after the prompts were given.
Perhaps the authors are simply demonstrating how to elicit student answers, as the first step of the formative assessment feedback loop. Buck and Trauth-Nare stated that the constructed response format elucidated differing levels of student understanding. At first, the teacher did not trust this new strategy, but Buck and Trauth-Nare stated that after the teacher was faced with students’ conceptions, she began to acknowledge her previous assignments were not an accurate judge of student understanding.

For the second research question (How did students react to formative assessment and did this influence instruction?), Buck and Trauth-Nare (2009) indicated that at first students were reluctant to demonstrate their understanding; most copied answers directly from other resources such as the textbook. The authors and teacher claim to have implemented a more process-oriented assessment, with the focus on promoting dialogue and student-teacher feedback loops, as well as explicitly educating students on formative assessment. The teacher wrote questions on student work to probe student thinking. At first the teacher was hesitant to provide descriptive feedback due to time constraints, but acknowledged the formative nature of such feedback. During classroom observations, the teacher engaged students in several whole class and individual discussions regarding the nature of formative assessment. This specifically included the need for students to reveal their understanding, not copy the correct information from the textbook. The teacher also stressed that formative assessments were not graded. Buck and Trauth-Nare stated that students needed a certain level of trust in their teacher before they felt comfortable in sharing their ideas. Through conversations with the students regarding the purpose of formative assessment, the teacher believed the students started to trust her more. Through
classroom observations, Buck and Trauth-Nare claim that most students responded to the process once they understood and trusted it.

For the third research question (What practical implications emerged due to the implementation of daily formative assessment?), Buck and Trauth-Nare (2009) stated that the teacher expressed anxiety regarding the time commitment involved in providing detailed feedback, and felt conflicted between using formative assessments to reveal student misconceptions and keeping up with curriculum for the purposes of her students doing well on summative assessments. The authors stated that after hearing a student’s interview dialog that revealed a misconception, the teacher went back over her instructional unit and offered a suggestion that addressed the conflict with time and coverage of material. The teacher began to explore the interconnections across the curriculum that might enable her to continue teaching even though every student might not have yet achieved complete understanding, perhaps not until the student encounters the unifying ideas in during another topic.

Buck and Trauth-Nare (2009) stated that collaborating with the middle school teacher presented the researchers with new insights on how to prepare science teachers to fully embrace formative assessment in their own classrooms. According the Buck and Trauth-Nare, the following insights needed to be addressed: “(a) assessment practices grounded in tacit understandings of student conceptual development, (b) pressures to maintain a pace necessary for covering content standards, and (c) students’ resistance to formative assessment due to naïve notions of assessment or mistrust of assessment processes” (p. 490). The authors’ claim that their findings support the need for making
teachers’ tacit feelings more explicit and suggest that teacher educators provide teachers with a chance to think about the efficacy of classroom assessments. Although this idea is not a novel one, it is one that is often neglected in practice. Andrade (2010) stated that the assessment students are exposed to in postsecondary education are transparent, formative, collaborative, and constructive, students will gain first-hand experience with effective assessment tools that they can then employ in their own teaching (p. 348).

2.3.1.1 Summary

The literature clearly states the importance of assessment practices in determining the extent of student learning as well as enabling the teacher to further guide student learning. Wiliam et al. (2004) demonstrated that through guided instruction, secondary teachers could learn to create and implement personalized formative assessment in their classrooms, and that this assessment could aid in the teachers’ understanding of student learning without being a detriment to classroom instructional time. Due to the lack of teacher observations, multiple outcome measures, and the selection method for research participants, generalizability was an issue. However, similar research focusing on teacher professional development of formative assessment has yielded similar results regarding teacher use of formative assessment (Ayala et al., 2008; Burns, 2010; Frohbieter, Greenwald, Stecher, & Schwartz, 2011; Sato, Chung, & Darling-Hammond, 2008; Wylie, Lyon, & Goe, 2009) and student achievement due to implementation of formative assessment (Parr & Timperley, 2010; Timperley, Parr, & Bertaneees, 2009).

Although both studies presented in this section were of a smaller scale and cannot be used to make generalizations, the data collected are still of great interest. For many
teachers, formative assessment is a process that is perhaps worthy of consideration, but unfamiliar and often viewed as more work than it’s worth. Buck and Trauth-Nare (2009) provided data that helps defuse this argument; the research provided an example of how guided implementation of formative assessment allowed a teacher to view classroom assessment differently. Buck and Trauth-Nare commented first on the teacher’s realization that misalignment existed between assessments and learning objective, secondly that students are an integral part of the formative assessment process and should be explicitly informed about the process in order for the students to “buy in,” and thirdly that the time dedicated to formative assessment improved teaching and learning.

Wiliam (2004) and Buck and Trauth-Nare (2009) provide examples of the types of research conducted on formative assessment use at the secondary level. In fact, much of the research on classroom formative assessment has been conducted in the primary and secondary school setting. Perhaps this is because current assessment practices focus more on preparing students to perform well on high stakes standardized testing (Stiggins, 2002); which may draw the focus of assessment away from engaging students in the learning process and towards using assessment as an indicator of student achievement. Maclellan (2001) spoke of similar conclusions, but her research was based on college students and instructors. Maclellan studied the role assessment plays in college students’ perceptions of learning. Just as high stakes testing may shift the role of assessment from one that engages student learning to one that judges student performance, Maclellan focused on such perceptions of assessment in relationship to college teaching and learning.
2.3.2 Perceptions of formative assessment at the college level

Teacher understanding of the utility of formative assessment is important, but just as crucial is student understanding of the purpose and process of formative assessment in their own learning (Bell & Cowie, 2001; Orsmond, et al., 2004; Orsmond, et al., 1996). According to Maclellan (2001), if the assessment instrument requires rote learning, the student is less likely to engage in higher-level objectives. Prosser and Trigwell (1999) state that students’ views of assessment are contextualized in their perceptions of the learning goals and teacher instruction, their workload, and the level of independence offered to direct their own learning. The quality of learning, therefore, will vary within students’ perceptions of their learning environment and how students respond to their perceptions.

Resnick (1989) states that learning is recognized as a process of knowledge construction rather than knowledge reproduction. Since learning is not linear or decontextualized, assessment should follow; assessment tasks should reflect real world use of knowledge and skills. How do teachers assess such knowledge? The teachers’ view of assessment can influence how students view knowledge construction. Taylor (1994) describes an educational shift in assessment from a measurement model of assessment, emphasizing individual differences, to a standards model of assessment, promoting the development of individuals. The purpose of Maclellan’s (2001) study was to describe instructor and student perceptions of assessment practices in a higher education setting with the intent to discern the type of assessment model being used; measurement versus standards model.
Maclellan (2001) described assessment as designed to promote learning; that is to enable learning rather than measure learning. The author was interested in obtaining student and instructor perceptions of learning; therefore, the author used a 40-item questionnaire to gather both students and instructors’ ideas about: why assessments were taking place, how useful the assessment process was, how and when judgments were made, who made the judgments, and what procedures were used for making such judgments. The author also stated the importance of understanding staff and student views regarding the learning being assessed, as what is deemed important to assess will determine what is important to learn.

Participants included 130 third-year students from an undergraduate Bachelors of Education honors course. The students in this program were selected because the sample was large and accessible, and they represented a degree course that constituted a major part of the faculty’s teaching. The author also stated that there was a range of assessment experiences within this group of faculty, although this range was not described. The survey was given to 100 faculty members, of which 80 returned the completed survey.

The questionnaire was divided into eight variables: (1) the purpose of assessment; (2) content of assessment; (3) the assessor; (4) timing of assessment; (5) mode of assessment; (6) marking of assessment; (7) feedback on assessment; and (8) identity of the participant. The results were shared in groups according to these eight variables. A rating scale was used to collect responses for all variables and was divided into four responses: (1) frequently; (2) sometimes; (3) never; and (4) don’t know.
From the data collected, five themes are of particular interest. First, regarding the purpose of assessment, both student and staff shared similar perceptions of assessment for grading purposes. Maclellan (2001) suggests that the importance placed on grading, by both the staff and students, is not surprising giving the expectation of university staff to communicate student achievement through grades. When referencing the process of assessment as a motivator, diagnostic tool, and evaluation of teaching, it is interesting to note that a majority of staff frequently agreed with all three, while a majority of students only sometimes agreed. If students do not view assessments as diagnostic tools, what then is the purpose of an assessment?

Secondly, a majority of students’ reported that self-assessment occurs ‘frequently’ to ‘sometimes’ but the majority of instructors’ report student self-assessment as occurring ‘sometimes’ to ‘never.’ This could indicate a possible lack of staff awareness in the self-assessment process; both in how staff perceive their students involvement in their own learning or perhaps in the importance many students place on assessing their progress.

Thirdly, staff and students’ responses to the timing of assessments indicate a low, if not absent, level of formative assessment practices incorporated in the classes. Interestingly, staff reported that assessment ‘sometimes’ (53%) or ‘frequently’ (29%) occurred during the module, whereas students reported that assessment ‘sometimes’ (82%) or ‘frequently’ (3%) occurred during the module. This rather large point difference between staff and students indicates a misunderstanding of the assessment process. This data may suggest that students believe only certain class activities are providing staff with assessment information. For both groups, a majority indicated that assessment only
occurs ‘sometimes’ during instruction. How do staff members know where their students are at in terms of reaching the learning goal if student evidence from the modules is not used to consistently assess learning? Furthermore, should such an infrequent assessment model be employed in preservice teacher education courses? What is this teaching the preservice teachers about the value of formative assessment?

Fourthly, students and staff appear to have differing views regarding the grading criteria used to assess student work. When referencing the use of grading based on implicit criteria, the following responses between student and staff were reported: ‘frequently’ (28% student and 9% staff), ‘sometimes’ (50% student and 29% staff) and ‘never’ (15% student and 63% staff). Conversely, when referencing the use of grading based on explicit criteria, the responses where: ‘frequently’ (54% student and 81% staff), ‘sometimes’ (39% student and 15% staff) and ‘never’ (4% student and 2% staff). Again, there is a rather large discrepancy between students and instructors’ views of the criteria used to assess learning.

Lastly, Maclellan (2001) mentions the “value of feedback,” however it is unclear what type of feedback the author is referencing. From a formative assessment stand point, it is shocking that only 12% of students and 49% of staff reported that feedback was ‘frequently’ helpful in its detail; a majority of student (73%) and a high percentage of staff (44%) indicated it was ‘sometimes’ helpful. A majority of staff reported that feedback ‘frequently’ prompted discussion (63%), enabled understanding of assessment (50%) and improved learning (49%). Contradicting staff responses, students reported that feedback ‘never’ prompted discussion (50%), and ‘sometimes’ enabled understanding
(62%) and improved learning (72%). This information is particularly telling from a formative assessment aspect. The expectation and usefulness of feedback are clearly different between staff and students. How and when, if ever, is this clarified to the students? Does staff view feedback as a place to point out errors or as a way to improve student understanding?

Maclellan’s (2001) results cannot be generalized because the instrument measured student and staff perceptions; however, the data is still of interest as it can provide insight into how assessment is viewed at the university level. Overall, it appears that this sample of staff and students infrequently carry out formative assessment measures and perceptions of assessments by both staff and students take on a more summative tone. Perhaps this is typical of the average university student and staff population; however, these staff and students were representatives of an honors program in education. Should assessment for learning be a stronger central theme for this college population? Should we expect teacher educators to model appropriate assessment strategies in preservice teacher education courses?

Maclellan (2001) discusses three educational implications regarding the summative view held by her research participants. First, neglecting to assess students at the beginning of a module eliminates the opportunity for staff to use student feedback to tailor the course material to suite the educational needs of the student. Second, assessing students on the teachers’ timeframe, rather than when the students are ready, deliberately ignores the fact that not all students learn at the same rate. Third, dismissal of students’ metacognitive processes occurs when student ‘judgment’ of their own work is neglected.
Maclellan points out that all three of these perceptual findings point to a measurement model of assessment rather than a standards model. Can student and instructor views of assessment be attributed to a misalignment or lack of alignment between learning goals, activities, and learning outcomes?

In regards to students’ reported perceptions, Maclellan (2001) concluded that students did not view teacher feedback as advantageous to their process of learning; rather feedback represented judgment of achievement as opposed to enabling learning. It is unclear from the responses from both staff and students if the idea of formative assessment is well known. It would be interesting to see how both staff and students in this study define formative assessment or to what extent staff actually care to implement formative assessment in a large scale higher education lecture course.

Maclellan’s (2001) study is one of importance because it demonstrates how a sample of staff and students perceptions of assessment differs. If formative assessment is to be considered an important strategy for improved teaching and learning at the university, it is equally important to determine how staff and students perceive assessment in relationship to their own teaching and learning. In taking a more detailed look into instructors’ views of assessment, Bailey and Garner’s (2010) research point out a relationship between staff perception of assessment and their pedagogical practices.

Bailey and Garner (2010) claim a student-centered, constructivist approach to teaching and learning is a growing trend in the higher education system. The authors also state that perceptions of assessment may be different between students and teachers,
pointing out a gap in the research into assessment, pedagogical practices, and teacher experience.

Communication between student and instructor is the key to reducing such a discrepant view of assessment. Bailey and Garner (2010) look specifically at the effects of the quality and quantity of feedback on student learning. Feedback is much more than just written comments on students’ assignments. Bailey and Garner state that “feedback is an interface between teachers’ pedagogical goals; students’ learning needs; and institutional and governmental education polices, which structure and regulate practices and procedures” (p. 188). However, in the age of accountability, many higher education institutions have systematized teaching and learning.

Bailey and Garner’s (2010) study was conducted at a university in England in which the educational policy stated that feedback must be formative as well as evaluative, and it must be timely. This type of policy is not unheard of in higher education, but Bailey and Garner state that even with such policies, feedback is actually decreasing in higher education due to factors such as standardized grading procedures and increasing class size, leading to less individualized face time. The authors also state that such institutional procedures have depersonalized the educational experience for teachers and students. To complicate matters more, Bailey and Garner state that when feedback is provided, it is subject to student scrutiny, as students’ perceptions of their teachers affect the credibility of the feedback.

Bailey and Garner (2010) interviewed 48 academic staff members from multiple departments within the university. The interviews were semi-structured. During the
interview the university faculty were guided by questions related to their conceptualization and experience with written feedback as well as what is done with the feedback. The interview consisted of the following questions: What is the purpose of written feedback? What do you hope to achieve in providing written feedback? What do you think you achieve? What do you think the students do with it? and Why is feedback sometimes ignored by students? Bailey and Garner (2010) presented their data under two headings: (1) perceptions of the professor’s role and utility of written feedback and (2) perceptions of student responses to feedback.

The perceptions of the professor’s role and utility of written feedback will be discussed in this paragraph, in which the general responses from the first four interview questions are shared. Bailey and Garner (2010) stated that common responses were provided regarding the formative and developmental role of feedback. Feedback was viewed as a learning and communication tool, allowing students to improve skills and knowledge as well as informing students about their developmental progress. During the interviews many professors recognized the significance of feed-forward; focusing comments to students on aspects of their work that needs improvement. Bailey and Garner also state that feedback played an affective role because it motivated students, but this only occurs if students use the feedback constructively. Some professors were skeptical, stating that students were really only interested in grades. Bailey and Garner described how some professors felt unable to judge the effects of feedback on student learning because the feedback was not administered until the unit is completed. Professors voiced their concern for regarding the limited time they spend with each
student, claiming that if courses were longer, they would be able to better assess how students use feedback. I would argue that length of the course would not matter in this situation because the feedback provided is summative in nature; once the unit is over, regardless of it’s length, a majority of the students will not use the teacher feedback to improve their understanding of the topic.

Interestingly, concerns were voiced that more than one person would be able to view the professor’s individualized feedback. The authors’ state that externally imposed standards affect the type of feedback the professor provides. Some professors claim to use feedback as a way to justify the grade, documenting for the purpose of accountability. The university in which the study took place also had standard forms used for student feedback. Some of the professors claimed that the forms forced feedback to be more formulaic and therefore less useful to the students.

The second heading, perceptions of student responses to feedback, grouped together the responses to the last two interview questions (What do you think the students do with feedback? and Why is feedback sometimes ignored by students?). In reference to what the professors thought the students did with the feedback, widespread uncertainty was recorded. Some of the responses were based off of students’ reactions in class. A number of the responses focused on the ability of the students, claiming that the ‘good’ students considered the feedback to make improvements while the ‘poor’ students did not. It is unclear if the instructors have data to back up this claim or if it is just an assumption. Some of the professors attributed the students’ perceptions of the usefulness of the feedback to the students’ understanding, or lack of understanding, of the language
used by professors. A gap in comprehension was described when the language used was too difficult or too abstract for the students to understand. Another professor commented that students are told what they did wrong, but not how to improve.

The final question asked the interviewees why they thought some of the students ignored feedback. Bailey and Garner stated that most respondents did not provide a definite answer. Some speculated that the issue might be the ability of the student to interpret the professors’ comments. The authors also reference the standardized feedback forms that did not allow professors to mark comments on students’ actual work; rather the comments were on a separate form. Students may find it difficult to match up the feedback comments to the correct location on their work.

In their discussion of the interview results, Bailey and Garner (2010) indicate that professors and students’ perceptions regarding written feedback are often divergent. The authors claim that this can be attributed to educational policy rather than the professors. In other words, the institutional requirements of the university cause professors to become indifferent to the educational value of written feedback. The authors’ state,

The policies and practices of the institution; the quality assurance agency; the stipulations of internal and external audit; and the often unclear and varied practices of colleagues across and within disciplinary and subject boundaries – all of these contribute to shaping the amount, form and quality of the feedback they can provide (p. 195).

It is clear that requiring an instructor to craft written feedback for these reasons is not the appropriate way to encourage student improvement. Such conformity in written feedback procedures leads to generalized feedback. This can be confusing to the students and it can send the wrong message about how and what feedback should represent. It is clear from
the authors’ description that the interviewees understood the purpose of formative feedback; it is a communication tool as well as a learning tool, both to support student learning. It is also clear that the instructors do not feel that this purpose is being met. Bailey and Garner state that many of the academic staff want their feedback to enhance student learning, but feel that the formal requirements from the institution limit the quality of such feedback. The practices designed to encourage student-instructor communication are actually causing the quality of the feedback to deteriorate.

Bailey and Garner (2010) send a clear message that external requirements have limited the instructors’ quality of written feedback. From a researchers’ standpoint, it is interesting to see how professors in a higher educational setting view formative assessment. In this particular study, much of the description of written commentary is not actually describing formative assessment. The authors indicated that many of the professors view written feedback as unproductive because, due to the accelerated speed of many courses, the students receive the feedback at the close of a unit. This type of assessment is summative in nature. The comments may be prompting student improvement, but if the students do not have the opportunity to use the written feedback to self-assess and revise their work or the professors do not use student information to formulate the lesson to suit the needs of the students, it is not formative assessment. It is also interesting that the professors participating in this study, and who claim to appreciate the affects of formative assessment, do not mention any movement past the university’s required feedback process to provide students with formative feedback to aid in continued learning.
Black and Wiliam (2009) state that quality interactive feedback is a central feature of pedagogy because feedback determines the quality of the learning experience. Similar to Maclellan (2001) and Bailey and Garner (2010), Reig and Wilson’s (2009) research also focused on teacher educators; however, Reig and Wilson investigated teacher education faculty’s perceptions and use of pedagogical methods and assessment in higher education classrooms.

Reig and Wilson (2009) conducted an exploratory study with teacher educators from two universities. The authors state that many university instructors have no teaching experience and little pedagogical knowledge prior to being hired. Other researchers have also noted this at the community college level (Grubb, 1999; Lail, 2009). To compound the problem, little professional development is usually offered once hired; therefore, an opportunity for instructors to learn, discuss, or share ideas associated with pedagogy and assessment is not present.

In setting the stage for the types of formative assessment deemed important in teacher practice, Reig and Wilson (2009) reference Drummond’s (1995) 12 practices for excellent college teaching. Of these best practices, five describe formative assessment strategies. These include creating thoughtful questions to engage students and increase student confidence, creating a logical connection between class goals and student grading, modeling, feedback that creates awareness of how students learn, and fostering responsibility through self-assessment. Such assessment practices are well known techniques, but not often practiced in the university class setting. The lecture remains one
of the top forms of knowledge transfer at the university, in which formative assessment is neglected.

Unlike lecture methods, Reig and Wilson (2009) mention other instructional methods that favor student retention of information and development of skills in thinking and problem solving. These include: discussion, cooperative peer learning, exploratory writing, debates, role-playing and case studies. Reig and Wilson argue that professors with extensive content knowledge feel more comfortable with the course material and are therefore willing to find ways to accommodate students to provide meaningful learning.

In a more student-centered classroom environment, instructors may have more opportunities to incorporate formative assessment practices. Reig and Wilson were interested in finding out what pedagogical methods teacher educators use in their classrooms, what are teacher educators perceptions of “best practices” in the pedagogy of teaching, what assessment strategies teacher educators’ use, and which assessment strategies teacher educators perceive to be most effective.

Reig and Wilson (2009) used a survey to gather data. The survey was distributed to faculty members from Indiana University of Pennsylvania (IUP) and from Bloomsburg University of Pennsylvania (BU). Of the 55 teacher-education faculty who returned the survey, 39 were from IUP and 16 were from BU. The surveys included 102 questions and responses to the survey questions were in a three-point Likert scale form. Mean scores ranging from 1.0-3.0 were tabulated, with 1.0 being not effective or never used, 2.0 being somewhat effective or sometimes used, and 3.0 being very effective or frequently used. This was a descriptive study and no statistical analysis was done.
Some of the questions addressed demographic information such as the discipline taught, and number of years teaching experience at the college and primary or secondary level. Interestingly, 32% of the education faculty surveyed had no primary or secondary teaching experience prior to working at the university.

Reig and Wilson (2009) used the surveys to collect data on the instructors’ perceived view of effective instructional strategies as well as the frequency each strategy was used in class. Of the top six most frequently used instructional strategies, four were also ranked in the top six for their perceived effectiveness; this leaves two of the frequently used instructional strategies not in the top six for effectiveness.

In 17 of the 20 categories, professors’ effectiveness mean was higher than the use mean, indicating that the strategies most of the professors are using in class are not strategies that they considered to be most effective. Reig and Wison (2009) also asked survey participants to rank the effectiveness and frequency of use of class assessments.

Some of the activities may be used to assign grades; however, they do not reflect student learning. The top two frequently used assessments were attendance and class participation. Attendance and class participation were also ranked first and third, respectively, for effective assessment strategies. This indicates a lack in understanding of formative assessment use by this sample of teacher educators for the purposes of assessing student knowledge. This is a troubling implication for preservice teachers, as their professors are teaching and modeling how to use assessment techniques by modeling them in the college classroom. Also of interest is the low ranking of self-evaluation and peer-evaluation on both the effectiveness and frequency of use scales. No
assessment technique scored below a 2.0 on the effectiveness rating, meaning that all of the teacher educators surveyed perceive these assessments as somewhat to highly effective. Unfortunately, the survey did not capture if the assessment tools were used in a formative or summative manner. Reig and Wilson considered this as one of the limitations to this study, indicating that this could impact the usefulness of these assessment tools. The results from this survey provide information on teacher educators’ perceptions and actual use of instructional strategies and assessment tools. This is important information to consider if we are interested in determining how preservice teachers are exposed to assessment, specifically formative assessment strategies.

In conclusion, Rieg and Wilson (2009) state that approximately one-third of the professors surveyed had no previous public or private school experience. The authors suggest that these participants may have sufficient content knowledge, but may lack pedagogical knowledge. There is no evidence from the data collected to support this claim. Although demographic data was collected, there was no correlation made between faculty’s views of assessment and instruction, and any type of formal pedagogical training. Furthermore, by referring to the number of years the faculty taught in the K-12 setting, the authors are implying that length of teaching experience increases ones pedagogical knowledge; this may not be the case. Regardless of these arguments, the results of Rieg and Wilson’s study are still of interest because they demonstrate how a sample of teacher educators view effective assessment and instruction, and show the frequency in which they use such strategies in their own classrooms.
Formative assessment is a pedagogical strategy; which is directly embedded in teaching, connected to instructional goals, and carried within instructional activities (Abell & Volkmann, 2006). The absence of pedagogical knowledge can play a considerably large role in how these professors view assessment effectiveness and use within the classroom. Although this is a small sample size to warrant generalization, similar research has been done linking pedagogical practice to views and use of assessment in teaching and learning (Beatty & Gerace, 2009; Torrance & Pryor, 2001; Yorke, 2003). Reig and Wilson (2009) describe the importance of pedagogical knowledge in teaching. If teacher educators lack such knowledge due to limited K-12 teaching experience, how will the preservice teachers they educate learn about proper pedagogical practice? In turn, how will this affect preservice teachers’ ideas of classroom assessment? Preservice teachers need to have a well-constructed and well-executed model of assessment throughout their educational coursework if there is an expectation for K-12 teachers to implement and utilize assessment in the way it is intended: to assess student knowledge to support student-learning gains. How does a teacher educator’s implementation of formative assessment into her own courses affect preservice teachers’ views of assessment? If formative assessment is not taught, discussed, or modeled for them, will preservice teachers know how to properly implement formative assessment strategies into their own teaching? With only having assessment experiences as students themselves, how do preservice teachers view assessment from a professional point of view?
2.3.2.1 Summary

The research done by Maclellan (2001) and Bailey and Garner (2010) demonstrate that an instructor’s use of formative assessment may affect the students’ view of its usefulness. Maclellan found a measurement model of assessment was commonly used, one where perceptions of assessments by both staff and students took on a summative or judgmental tone. Students did not view feedback on their learning as advantageous to their process of learning; rather feedback represented judgment of achievement as opposed to enabling learning. Likewise, Bailey and Garner also described a measurement model of assessment. This was in part because of the university’s focus on summative assessment measures. Bailey and Garner claim that the professors understood the purpose of formative feedback and that this purpose was not being met; the lack of formative assessment is evident from the data that describes professors feedback as only given at the end of the unit, offering no opportunity for students to use the written feedback to self-assess and revise their work. In addition, Bailey and Garner cited professors that felt written feedback was a tedious task, done to accommodate university mandates rather than for the purposes of aiding in student learning. If this is the case, it is possible that the professors’ view will be reflected in the feedback and noticeable to students. Is this the message we want to portray to our students? Feedback is the backbone of quality formative assessment because it is the avenue in which student-teacher communication occurs. The feedback instructors provide for their students should be used to guide and improve learning; however, if feedback is ignored
or considered unimportant, the student-teacher communication link is broken, which could affect students’ depth of understanding.

In line with Maclellan (2001) and Bailey and Garner’s (2009) research, Rieg and Wilson (2009) also studied college students and professors’ perceptions of assessment; however, Reig and Wilson investigated teacher education faculty’s perceptions and use of pedagogical methods and assessment in higher education classrooms. Perhaps not uncommon, Reig and Wilson found that approximately one-third of the education professors had no prior K-12 teaching experience. Do these professors have the pedagogical knowledge needed to appropriately teach teachers? The authors concluded that the absence of pedagogical knowledge could play a considerably large role in how professors view the effectiveness and use of assessments within the classroom. Reig and Wilson also report that even faculty members who were aware of effective assessment techniques are not always using them in their preservice education classrooms. In turn, students’ perceptions of the purpose of formative assessments may be altered. This is of great concern because these students will soon be teachers themselves and their assessment knowledge (or lack of knowledge) will perhaps affect the type of assessments implemented in their future classrooms, as well as how they use the information from these formative assessments to improve teaching and learning. If students, especially preservice teachers, continue to have incorrect or incomplete conceptions of formative assessment, how do we expect them to incorporate formative assessment into their own teaching?
2.3.3 Integrating formative assessment into teacher education

The National Research Council (1999) reported that teachers’ heavily rely on summative assessments, viewing formative assessments as a less essential activity. Most states do not require their preservice teachers to take assessment courses (Schneider & Randel, 2010), which lessen the opportunity for preservice teachers to learn about the variety and functionality of assessment methods. In addition, the lack of assessment awareness is compounded by that fact that many teacher preparation programs do not prepare their preservice teachers to adequately use formative assessment (Popham, 2009). In order to view formative assessment as a useful activity for gathering information to inform teaching and learning, perhaps teachers need to change their conceptions, beliefs, and pedagogy regarding assessment; but how can this be done?

Sato, Chung, and Darling-Hammond (2008) studied the effects of professional development on teachers’ use of formative assessment in the classroom. Through assessment focused professional development, Sato et al. (2008) concluded that providing teachers with rigorous and focused professional development could positively alter teachers’ formative assessment practices. To be successful, however, Sato et al. claim that teachers’ need an opportunity to: engage in reflection and analysis of teaching practices; validate performance assessments; and self and peer-assess strengths and weaknesses of teacher performance, providing feedback for improvement.

Sato et al. (2008) used the National Board Certification process as a vehicle for their formative assessment professional development. The authors describe the certification process as one that identifies and develops accomplished teaching through
professional learning. In their research, Sato et al. explore how professional development, such as the one that accompanies the National Board Certification, can improve formative assessment practices in the classroom.

The National Board for Professional Teaching Standards (National Board) mission is to “establish high and rigorous standards for what accomplished teachers should know and be able to do, to develop and operate a voluntary National system to assess and certify teacher who meet those standards, and to advance related education reforms” (Baratz-Snowden, 1990, p. 19). Teacher certification includes two assessments: creating a portfolio representing how their students’ needs have shaped teacher practice, and completion of assessment tasks which test the teachers’ content and pedagogical knowledge.

Assessment is embedded in many aspects of teaching; therefore, Sato et al. (2008) developed a framework that conceptualized teacher actions and decisions, and assessment roles. Six dimensions were identified: (a) views and uses of assessment; (b) range, quality and coherence of assessment methods; (c) clarity and appropriateness of goals and expectations for learning; (d) opportunities for student self-assessment; (e) modification to teaching based on assessment information; and (f) quality and appropriateness of feedback to students. Each of the dimensions was tagged with descriptors that were supported by a rubric.

National Board candidates are in-service teachers seeking Board certification. Sato et al. (2008) tracked National Board candidates over a three-year period of time. This included the year prior to pursuing certification, the year of candidacy, and the year
following certification. In January 2003, 60 teachers, identified by Stanford University’s support group for National Board Certification candidates, were interested in pursuing certification. Sato et al. offered an incentive of financial support to some of these 60 candidates in order to obtain a control group for their study. These “non-Board” candidates were teachers that had the option of pursuing certification, but delayed this process; therefore, they did not receive the professional development support that the Board candidates received.

The National Board candidates: had an average of 9.9 years teaching experience; were comprised of eight science and one math teacher; three middle and six high school teachers; and taught higher class sizes in higher need schools with lower achievement test scores. The non-National Board candidates: had an average of 11.7 years teaching experience; were comprised of five science and two math teachers; four middle and three high school teachers; one of which taught in a small private school.

Throughout the three-year professional development process, data was collected from both Board and non-Board candidates via videotape recordings, written responses, collection of student work, teacher interviews, student and teacher surveys, and reflective teacher interviews. Video recording and teacher interviews occurred twice yearly, with the videos in a sequence of three to five lessons. During the interviews, teachers were asked about the practices and assessment approaches related to the videotaped lessons. Reflective interviews gathered information regarding teachers’ perceived changes in practice over the three-year period. Teacher participants were paid for each data packet they submitted to the project staff, as well as a subsidy for their certification fees.
Surveys were distributed at the end of each year to students who were videotaped. Frequency of participation, use of measurement tools, and teachers’ emphasis on 33 different classroom activities were covered in the survey. Four free response questions were also administered during the survey covering the topics of goals for learning, oral feedback written feedback, and self- and peer-assessment.

Rubrics were used to help analyze classroom data. Each candidate had a data set for each of the six dimensions. Data was collected each year and analyzed across the three years for evidence of changes in teachers’ assessment practices. A rubric score was also assigned to the data packets containing teacher descriptions, lesson plans, student work, videotapes and interviews.

Sato et al. (2008) reported that the National Board teachers’ overall mean rubric scores increased from 2.62 in the first year to 3.45 in the second year, but then slightly decreased to 3.38 in the third year. The increase between year one and two was explained by the teachers incorporating formative assessment changes into their teaching practice. The decrease between year two and three was explained as, “according to some theories of learning, we would expect a plateau in performance after a period of accretion of new experiences and information; thus it seems reasonable that we do not see a continued increase in their year scores for the National Board group” (p.14). There were no further explanations as to which learning theories the authors referenced. The non-National Board teachers’ overall mean scores over the three-year study were 2.90 in the first year, 2.85 in the second, and 3.12 in the third year.
It was reported that gains were substantial for seven of the nine National Board teachers. Overall, the National Board teachers improved by at least 0.5 points on every rubric score and by one point on three of the dimensions (i.e. views and uses of assessment and range, quality, and coherence of assessments) over the three years. The non-National Board teachers, on average, did not increase their scores more than 0.5 points on any of the dimensions over the three-year study.

An ANOVA test was performed to compare year-to-year trends in average student ratings for each group on clusters of survey items. Across 24 survey items, the National Board teachers rated higher on nine more items in the second year than in the first and on six more items in the third. The non-National Board teachers scored higher on three items in the second year and lower on one.

In conclusion, the authors suggest that professional development strategies like the ones provided through the National Board Certification could positively alter teachers’ formative assessment practices. These strategies included providing teachers with an opportunity to engage in reflection and analysis of teaching practices, to validate performance assessments used to guide teachers, and to give feedback about strengths and weaknesses of teacher performance. Multiple components of the Board Certification experience reflected features within effective professional development models (Hawley & Valli, 1999). Chittenden and Jones (1997) identified these features as: (a) a framework that provides a vision for what good teaching looks like; (b) a process for grounding the framework into practical classroom life; (c) collaborative work with colleagues; (d) defining specific meeting times within a teacher’s hectic schedule; and (e) accountability.
thought criteria for evaluation of both formative and summative assessment. Would the adoption of such a professional development model into teacher education courses provide the same increased assessment knowledge as it did for in-service teachers?

Sato et al. (2008) encourage additional studies to analyze the factors that were more or less influential on teacher practice. The authors also encourage additional studies that explore the degree of professional development impact on teachers as well as the duration of the changes to teacher practice. These are all relevant research topics that would add to the existing literature regarding the professional teachers’ implementation of formative assessment. Such topics could inform and motivate the current practicing teacher to begin implementing formative assessments on a more consistent basis. An argument can be made, however, that this process should occur within preservice teacher education. In fact, Sheppard (2000) recommends *embedding* instructional and curricular assessment within methods courses. We need to model and assess preservice teachers in ways that exemplify formative assessment practices because teachers tend to teach the way they were taught (Andrade, 2010); viewing “good practices” as those they experienced as students themselves (Calderhead & Robson, 1991). Science teacher educators and researchers should focus their efforts on studying the effects of formative assessment curriculum on preservice teachers. By informing, implementing, and reflecting on formative assessment practices during preservice education our preservice teachers may find it easier to implement such strategies into their own professional classrooms. Mitchell (2006) conducted a study in which she recognized the effectiveness of aligning teacher education with formative assessment policy. Students’ deep
understanding of formative assessment principles was identified; however, the students did not always transfer this knowledge into their own classrooms. This particular issue is of great interest. What development and assistance can teacher education programs provide their students to promote greater implementation of formative assessment strategies once the preservice teachers enter into the classroom?

Sato (2008) demonstrated that professional development could improve in-service teachers' use of formative assessment. Cowen (2009) took a similar approach; however, she focused on preservice teachers' implementation of formative assessment after undergoing a countrywide assessment development initiative. Assessment is for Learning (AifL) was initiated in Scotland to address the shift from assessment instruction to classroom implementation; in doing so, using assessment evidence helped develop teachers’ professional practice. AifL consisted of ten projects. Project 1 dealt with supporting teachers through formative assessment. Teachers were given time to investigate the principles of formative assessment and encouraged to model their classroom strategies off the work of Black et al. (2003). Cowen claims that the AifL initiative helped improve self-esteem and competence, and confidence in the students’ ability to learn.

Cowan’s (2009) research focused on three university teacher education cohorts within the Scottish educational system. Cowan focused her research on two groups of preservice teacher candidates: students within a four-year undergraduate Bachelor of Education (BEd) degree and students enrolled in a one-year post-degree Professional Graduate Diploma in Education for secondary (PGDE-S) certification.
Cowan (2009) first described the BEd students involvement in the AifL Project. During the 2003-2004 school year BEd students were introduced to AifL and formative assessment in their coursework prior to placement. Students read relevant literature and were given supplementary materials. During their placements, students were required to implement peer- or self-assessment. Discussions about implementation were held between the students and visiting instructors. The same requirements were established for the 2004-2005 and 2005-2006 cohorts.

Starting in June 2004, BEd students’ final assignments were reviewed for the following: setting targets for final placement, describing action research that occurred during placement, and setting goals for induction (internship placement). Exit interviews between instructors and 11 students were also reviewed. In 2005, assessment benchmarks were used to evaluate student progress and students who attended the final lecture of the course completed a survey. In 2006, students were asked to complete a longer survey and four interviews were completed.

The AifL Project was in the pilot phase for the 2003-2004 cohort. Students had decided on their placement targets, action research topics, and goals before the introduction of AifL in their coursework. During the 2004-2005 year, students were again asked to indicate their placement targets, goals, and topic of action research. This was done prior to students being made aware that formative assessment would be the focus of their final assignment. During the 2005-2006 cohort, students were given more formative assessment support before and during their placements than the previous years. This included formative assessment readings, AifL resources, and in-service during placement.
Significant changes between the 2004 and 2005 school year were reported. These included: sharing learning intentions, sharing success criteria, peer-assessment, self-assessment, and other feedback. When asked about effective peer- and self-assessment, many of the students noted that both types of assessment required practice from the students and teachers and that it was a skill to be practiced, which was not an easy strategy to learn. Approximately 10% of the students stated that peer- and self-assessment served as a distraction from their time and was an issue when referencing their teaching workload. Interestingly, the use of open questioning and wait time was not highly employed by either cohort. Cowan (2009) attributes this to the possibility that these strategies require more confidence from the students when implementing.

In 2006, Cowan (2009) surveyed both BEd and PGDE-S students. At this point in time, the BEd students had three school placements, perhaps allowing the students to feel more comfortable than the PGDE-S students who were involved in an intensive one-year certification with little classroom experience. The responses from both groups indicate a significant difference in confidence and consistency of using formative assessments: 73% of BEd responses indicated strong agreement that strategies were used consistently as opposed to 47% of the PGDE-S responses. Similarly, 70% of BEd responses indicated strong agreement that strategies were used confidently as opposed to 44% of the PGDE-S responses. Other significant differences were reported in the daily use of formative assessments. These included self-assessment, traffic lighting, detailed written feedback, and brief feedback.
Cowan (2009) claimed that BEd students were more *confident and consistent* in using formative assessment classroom strategies than their PDGE-S counterparts. Cowan attributes this to the close guidance and support the BEd students were offered during their extensive placement experiences. In addition, the two additional years allotted for BEd students to learn about and practice implementing formative assessment strategies into classroom teaching could also be a strong factor for the increased confidence and consistency. Cowen’s research highlights the importance of explicit and integrated formative assessment instruction for preservice teachers. Based on Cowen’s data, structured assessment instruction and guidance throughout the program allowed preservice teachers the opportunity to practice implementing formative assessment before entering the classroom as an in-service teacher. Serving as a knowledge base in which to grow from, this explicit formative assessment instruction may allow the preservice teachers to more easily implement formative assessment into their own future classrooms.

Buck, Trauth-Nare, and Kaftan (2010) add to this area of research by investigating how the utilization of formative assessment strategies during teacher education experiences help preservice science teachers gain an understanding of what formative assessment is and how it can help shape science teaching and learning.

Classroom assessment, although integral to the learning processes, is underrepresented in preservice teacher preparation programs causing new teachers to enter the classroom with little knowledge on how to utilize assessment to improve both teaching and learning (Stiggins, 1999). Buck et al. (2010) suggest that preparing new teachers to successfully employ formative assessment in their own teaching will occur
through examination, reflection, and learning about their own practice. In other words, by employing formative assessment strategies during teacher education experiences, preservice teachers will gain an understanding of what formative assessment is and how it can help shape their own teaching, and perhaps more importantly, their students’ learning.

The purpose of the research carried out by Buck et al. (2010) was to enhance preservice teachers’ preparation for teaching in terms of planning appropriate instruction and improving student learning. Buck et al. re-conceptualized an elementary science methods course with the intent to make formative assessment a reoccurring and interwoven theme throughout the entire course. This occurred through both explicit and implicit instruction. The re-conceptualization of the methods course was guided by two research questions: To what extent did course re-conceptualization efforts lead to a more informed understanding of formative assessment by preservice teachers? Did strategies enacted in the re-conceptualized methods course foster or hinder preservice teachers’ understanding of formative assessment?

Buck et al. (2010) conducted an action research study to determine if the re-conceptualization of their methods course enhanced preservice teachers’ planning skills and use of formative assessment. Buck et al. employed a self-study, arguing that a characteristic of self-study is the desire to help teachers learn more effective teaching practices. Change within the elementary science methods course was initiated because previous student evaluations of the course indicated that teacher candidates were entering the classroom unprepared to use formative assessment within their science instruction.
Buck et al. are therefore interested in looking at how science method instructional activities affect preservice teachers’ formative assessment knowledge. One science education faculty member and three science education doctoral students were part of the research team. The course was taught at a large Midwestern university. The faculty member was responsible for coordinating the elementary methods course. The course was taught by another faculty member disassociated with this study, however one of the doctoral students co-taught with this instructor. The other two doctoral students served as research assistants, transcribing audio recordings and analyzing data. There is no mention of type or extent of formative assessment experience or education the faculty member or doctoral students’ obtained. This is of particular interest because these researchers are in the position of judging preservice teachers’ understanding and implementation of formative assessment. Background information stating their qualifications is necessary.

Research took place in one section of the methods course, in which all 30 students participated. The instructor of record was not present when the students elected to participate in the study; as such the instructor was unaware of who was participating. This lessens the chance of teacher bias. The sample was chosen out of convenience and is non-random. This weakens the generalizability of the study. The results of the study are still of interest because the data can inform future work.

Buck et al. (2010) took both an implicit and explicit approach to assessment in the methods course under study. The researchers assessed the preservice teachers’ past experiences and current conceptualizations about instruction and assessment. This implicit approach was done through pre- and post-course questionnaires, exit cards, class
and group discussions, reflective journaling, course documents and case studies. Nothing was stated regarding what types of questions or discussions took place through these methods. Buck et al. simply stated that the responses gathered from the methods students were used to guide instructional activities for the course.

Buck et al. (2010) reported that although formative assessment strategies were explicitly used throughout the course, four days of instruction explicitly focused on assessment. Such instruction included distinguishing between formative and summative assessment, classroom assessment strategies, and processes for analyzing student assessment outcomes. The course instructor also included an inquiry lesson modeled for the students through the lens of formative assessment. The instructor used concept mapping, class discussions, journaling, sample activities for student practice, and think-aloud sessions with the preservice teachers. Results were used daily to help shape the four-day lesson. Little information is disseminated regarding the actual content of the formative assessment activities or the preservice teachers’ response to the stated activities.

The primary researcher in this study had coordinated the elementary methods course for several years and noticed that in-school teaching was unproductive in developing preservice teachers’ inquiry teaching and instructional revisions. Therefore, an after school teaching experience was created. All preservice teachers taking the elementary science methods course were required to conduct a case study involving elementary students in an after school science class. The purpose of this after school class was to provide the preservice teachers with an opportunity to practice their formative
assessment skills while planning, instructing, and interacting with elementary school children. The primary researcher for this study recruited 350 students from a local urban elementary school; 30% received free or reduced lunch, 91% were Caucasian, 4% were African American, 3% were Hispanic, 1% were Native American, and 1% were Asian American. This population of students was chosen because science instruction in this particular region was said to have been weak and sporadic. This after school teaching experience was not newly implemented for this study; however requiring the use of formative assessment during the preservice teachers’ experience was a new requirement.

The after school program required preservice teachers to instruct between three and eight students for a 90-minute session once a week for a total of five weeks. Preservice teachers were required to implement 5E (engagement, exploration, explanation, elaboration, and evaluation) instruction that included the following: (1) pre-assessment plan to gather students existing knowledge, (2) instructional plans to address students’ prior knowledge based on research, and (3) planned formative and summative assessments. Teaching adjustments were expected based on information gathered from students’ formative assessments. After each teaching session, the preservice teachers met to discuss and reflect on their experience. The preservice teachers were also asked to journal the outcomes of the discussion sessions as well as how the formative assessments led to changes in their instruction. The preservice teachers’ journal responses and field notes were collected by the instructor and used to make instructional changes for the methods course. These daily “checks for understanding” were a great way to model formative assessment for the preservice teachers.
Buck et al. (2010) collected data using several different methods: pre- and post-questionnaires, field notes from the methods course and from the preservice teachers’ teaching experience, preservice teacher focus group interviews, course documents, planning meeting transcripts, field experience and case studies. The open-ended questionnaire was an instrument used to gather preservice teachers options regarding the meaning formative assessment and how formative assessments can be used to impact teaching practice. The primary researcher observed both the methods course and the preservice teachers’ teaching experiences. Field notes were taken during the observations. Buck et al. state that general levels of student engagement and evidence of student learning were recorded in the field notes. It is unclear how the researcher measured these two factors. It is often difficult to judge engagement and evidence of learning as a passive observer. This issue was not addressed. Focus group interviews consisted of 16 preservice teacher volunteers. The interview questions consisted of asking the preservice teachers about their opinions regarding the role formative assessment plays in inquiry learning, how formative assessment in the methods course influences preservice teachers’ understanding of formative assessment in teaching, and what issues regarding formative assessment have not yet been addressed in the methods course. Responses were discussed among the research participants and used during the planning sessions for the methods course. During the meetings, the data was analyzed in light of the course goals set for the methods course students. This is an excellent example of formative assessment; connecting class activities back to pre-described goals.
Overall, the procedures for gathering data are appropriate for the stated research questions. Buck et al. (2010) wanted to use preservice teacher input to guide the re-conceptualization of the methods course and the authors were able to do so by collecting multiple types of data continually throughout the course. Data analysis was completed immediately following its collection. Buck et al. indicate that all researchers reviewed data from field notes, focus group interviews, course documents, and case studies. The researchers discussed emergent themes, similarities and differences in interpretations, and appropriate actions for improving the methods course. After data collection was completed, the researchers formulated four criteria for evaluating preservice teachers’ understanding of formative assessment: (1) understands the purpose of formative assessment; (2) relates formative assessment to students’ conceptual development; (3) links formative assessment outcomes to instructional planning; and (4) demonstrates an understanding of relational processes inherent to formative assessment (Buck et al., 2010). The researchers used these criteria to: evaluate the data for evidence of preservice teachers’ understanding of formative assessment, and evaluate the extent to which formative assessment was used in the 5E instructional planning, implementation, and adjustment of instruction due to student feedback.

From the data collected from the pre-course questionnaire, all 30 preservice teachers demonstrated a naïve or incomplete understanding of formative assessment. Only 1 of the 30 preservice teachers was able to make a connection between formative assessment and students’ conceptual development. Connections between formative assessment and instructional planning were briefly made by ten of the preservice
teachers. None of the preservice teachers had a good understanding of the role students played in formative assessments, although eight of the 30 preservice teachers briefly mentioned this relationship. Pre-course questionnaire responses indicted a confusion of the true meaning of formative assessment, with most preservice teachers mistaking formative assessment for summative assessments or other pedagogical strategies.

Buck et al. (2010) found the implicit approach to formative assessment instruction guided their own instructional plans for the course, but it did not aid in preservice teachers’ understanding of reflection through formative assessment. Using the information gathered from the students, the instructor was able to modify each class in response to the level of her students’ understanding. The underlying process of formative assessment that was taking place throughout the methods course was not made explicit to the preservice teachers. Buck et al. state that there was a lack of evidence to indicate that the preservice teachers realized the role formative assessment played in guiding the teaching and learning process in the methods course.

According the Buck et al. (2010), the explicit approach to formative assessment instruction led to changes in how preservice teachers understood formative assessment. Buck et al. state that classroom observations and student exit tickets were used to determine preservice teachers ability to: distinguish between formative assessment and other types of assessments given in class, and connect formative assessments to changes in instruction. The authors claim that a majority of the preservice teachers left the methods course with a more accurate understanding of formative assessment.
Although the field-based case study was not a new addition to the methods course, the researchers did implement a formative assessment focused theme throughout the preservice teachers field experience. This included strategies such as student questioning, whole class and small group discussions, journaling, graphic organizers, and observations. As such, Buck et al. (2010) claimed that the preservice teachers understanding of formative assessment was both aided and hindered as a result. Preservice teachers, in most cases, accessed their students’ knowledge through pre-assessments and used this knowledge inform initial instructional planning. Buck et al. claimed that most preservice teachers used journaling to elicit student conceptions, but few actually changed their instructional plans based on student responses. For many of the preservice teachers, time was cited as a factor for not providing written feedback. Instead of re-teaching in a more meaningful manner, it was stated that preservice teachers simply reiterated topics that were misunderstood by their students. If this is truly the case, what can we do as science educators to remediate this situation?

Buck et al. (2010) pointed out some possible limitations of the field experience that may have prevented most preservice teachers from fully working through the challenges of formative assessment implementation. Preservice teachers met with students once a week for five weeks for a 90-minute session. Not only was this seen as an inadequate amount of time to plan, implement and revise formative assessment plans, the preservice teachers did not have enough time to create trusting relationships with the students. All preservice teachers acknowledged that trusting relationships are important if you expect students to share their difficulties in understanding. The authors are correct in
stating these two factors as limitations. The limiting time frame in which to implement and reflect on the formative assessment practices used in the classroom could have greatly altered the preservice teachers’ learning experience.

In summary, Buck et al. (2010) state that their findings indicate substantial difference in preservice teachers’ pre and post course understanding of formative assessment. Although the number of preservice teachers who were described as having a thorough and complete understanding of formative assessment was relatively low from the post-course results, the overall shift of preservice teachers ranking of inaccurate to thorough understanding increased from pre- to post-course. For all four criteria, 97% of the preservice teachers ranked in the totally inaccurate to naïve understanding categories according to the pre-course data. Post-course data shows a shift towards a better understanding, with 52% of the preservice teachers ranking in the totally inaccurate to naïve understanding categories according to the post-course data. Roughly 3% of the preservice teachers ranked in the good or thorough categories according to the pre-course data, while 48% preservice teachers ranked in the good or thorough categories from post-course data.

Buck et al. (2010) addressed their two research questions. The goal of their first question was to determine the extent to which the re-conceptualized methods course lead to greater understanding of formative assessment. The authors claim that the re-conceptualization indeed allowed preservice teachers to gain a more complex understanding of formative assessment as well as an understanding of how formative assessment could impact teaching and learning. The authors, however, go on to state that
most preservice teachers did not include their students in the formative assessment process nor did they adjust their teaching to suit their students needs. When confronted with student misconceptions or lack of understanding, most preservice teachers did not enhance or revise their instruction. Preservice teachers also did not provide written feedback that engaged students in active participation. A serious question arises: is this due to a lack of formative assessment knowledge or a lack of pedagogical knowledge? Are the students in this methods course taught how to adjust their instruction for differentiated learning? Are the students taught how to provide adequate feedback that engages students to have a more active role in their own learning? The preservice teachers may have a very concrete understanding of formative assessment, but lack the skills to implement such changes into their planning and teaching. How do we teach preservice teachers these skills? What type of experience do preservice teachers need to feel confident that they can handle such tasks in their own classroom?

The second research question focused on the efficacy of specific activities within the methods course in regards to preservice teachers’ understanding of formative assessment. Buck et al. (2010) state that the implicit approach to teaching and modeling formative assessment was not efficacious to preservice teachers understanding of formative assessment. The explicit approach, according the authors, would support preservice teachers’ understanding of formative assessment as it would allow the preservice teachers to see how such assessment can affect the planning, teaching and learning in a course. Buck et al. contend that the field-based experience allowed preservice teachers to practice implementing formative assessment, by creating more
opportunities for increased learning. Leuhmann (2007) stated that field based experiences are beneficial, but alone are not sufficient for improving practice. Buck et al. suggest an increased use of case based experiences in preservice teacher education. This type of activity can increase discussion and reflection within teacher education programs and is a useful tool to explore formative assessment within a supported environment.

Case-based pedagogy can also play an important role in introducing formative assessment into classroom discussion, possibly promoting the use of such strategies in the classroom setting. When a preservice teacher continually reflects on how formative assessment might be incorporated into his or her teaching routine, it seems that preservice teachers would be more apt to use such strategies when teaching in their own classrooms.

2.3.3.1 Summary

Buck et al. (2010) suggest that there is a gap in the literature regarding how continuous exposure to formative assessment throughout preservice teachers’ educational program can affect the preservice teachers’ ability to utilize formative assessment in their own teaching. Buck et al. argue that formative assessment should be taught and modeled throughout the teacher education program. Such a learning experience, however, should not stop here. Buck et al. stress the importance of practice; preservice teachers’ need to observe, practice, and reflect on what they learn in the university classroom and field-based experiences help them achieve this. Luehmann (2007) indicated that one of the biggest challenges for preservice teachers was the difficulty in connecting and integrating theory taught at the university into their own teaching practices. Luehmann goes on to
state that teaching experience offers preservice teachers the means for displaying competence. With the proper mentorship, Buck et al. demonstrate that preservice teachers can practice implementing formative assessment in their planning, instruction, and interaction with their students. Such studies as Black and Wiliam (1998) demonstrate the effectiveness of formative assessment on student learning, but there is a clear gap in educational research for formative assessments role in improving and directing preservice teacher education. Maclellan (2004) argues that preservice teachers commonly exhibit limited knowledge regarding assessment principles and this hinders their ability to utilize formative assessments as they are intended to be used; that is, to interpret assessment outcomes and adjust planning and instruction accordingly. Buck et al. make a clear argument for the need to further investigate the teaching and practice of formative assessment during preservice teacher education.

The concluding remarks by Wiliam et al. (2004) address the perceived issues many in the educational field hold regarding the implementation of formative assessment; that teachers have to choose between quality formative assessment and adequately preparing their students for summative high-stakes testing. In deed, incorporating any new materials or strategies into a teaching regime takes extra time: a scarce resource for many teachers. In addition, implementation of formative assessment often requires additional professional development for teachers. Buck and Trauth-Nare (2009), however, claim that their findings support the idea that preservice teachers gain assessment experiences when they are explicitly taught how to use formative assessment and when teacher educators model this process in the education courses. Buck and
Truath-Nare’s findings suggest that teacher educators should provide preservice teachers with a chance to think about the efficacy of classroom assessments.

The findings from the research studies described in this section share a common theme in that implementing formative assessment can be challenging, especially for teachers who have never had extensive assessment instruction during their preservice education, or for preservice teachers trying to implement formative assessment strategies for the first time. As the in-service and preservice teachers faced these challenges, each group, through different methods, found substantial benefits for implementing formative assessment in their classrooms.

Research in the field of formative assessment is difficult because it deals with a unique population, often leading to problems with generalizability. The research on formative assessment thus far, however, indicates overwhelming evidence for student gains in learning when formative assessment is part of the classroom-learning environment. The fact remains that little formative assessment instruction occurs during preservice education. As a result, we try to educate in-service teachers about formative assessment through professional development and hope that they implement these new strategies into their pre-existing pedagogy. This is challenging because change is almost always viewed as an uncomfortable adjustment, requiring additional time and energy into lessons that teachers already spent time carefully crafting. If we use our resources and incorporate formative assessment education in our teacher preparation courses, perhaps such strategies would then become a natural process for preservice teachers when planning lessons for their own classrooms. It makes more sense to start in the beginning
rather than try to educate a smattering of teachers along the way. As Sato et al. (2008) remarked, teachers participating in their study cited certain features as having an impact on their teaching practices: a framework for what good teaching looks like, grounding the framework into practical classroom life, collaboration, and accountability thought criteria. This sounds remarkably similar to features that could be covered in preservice teacher methods courses. Cowan (2009) reported that most preservice teachers who are exposed to formative assessment during their teacher education courses and internships, and are offered professional guidance from teachers and college educators, have a higher level of confidence in implementing formative assessment strategies during their internships. Implementing formative assessment instruction in preservice education seems to be a worthwhile endeavor not only for the preservice teachers, but more importantly for the students they will teach. So the question remains, how can teacher educators explicitly implement formative assessment into their education coursework in the most effective and efficient manner?

2.4 Preservice Teacher Education and Case Method

All professional schools face the same difficult challenge: how to prepare students for the world of practice. Time in the classroom must somehow translate directly into real-world activity: how to diagnose, decide, and act. A surprisingly wide range of professional schools, including Harvard’s law, business, and medical schools, have concluded that the best way to teach these skills is by the case method (Garvin, 2003, p. 56).

In this chapter I will focus on the use of case method as a teaching approach in preservice teacher education. I will first begin with an overview of the case method; defining the
associated terms, providing a brief overview of the history of case method pedagogy, and the use of case method specifically in the field of education. I will then summarize the prominent literature on case method pedagogy, focusing on how using the case method as a learning tool encourages preservice teachers to reflect on teaching and learning (Abell, Bryan, & Anderson, 1998), improves reasoned decision-making, and enhances cognitive growth in teaching and learning through discussion.

2.4.1 Case method: meaning, history, and review

2.4.1.1 Distinguishing and defining the associated terms

Upon reading the literature related to case use in education, one quickly realizes the research is filled with numerous case-related terms, many with varied meanings depending on the authors’ use of cases in research and teaching. The more commonly used terms include: *case study, case methods, case-based instruction, scenarios, vignettes, and simply cases*. In order to critically analyze the research, it is first necessary to identify these differences in meaning and determine the most appropriate use for each of the terms so that their descriptions in this literature review are consistent. Throughout the literature, the term case study seems to take on a dual meaning. Case study is often used in the law, business, medical, and preservice teacher classroom. In these classrooms, the case study is most often a shortened story or *description* in which the characters, settings, and events of the story are emphasized (Silverman, et al., 1992) for the purpose of facilitating student learning. Perhaps more commonly known, the case study also has been referred to as a type of qualitative *research* (Crewell, 2009; Merriam, 1998).
Merriam (1998) dedicated an entire chapter to distinguishing the “case study” from other forms of research, claiming there is little consensus by educational researchers on what constitutes a case study. Merriam states, “Part of the confusion surrounding case studies is that the *process* of conducting a case study is conflated with both the unit of study (the case) and the product of this type of investigation” (1998, p. 27). The case study is not describing a methodological choice (Simons, 2009; Stake, 2005); rather it refers to “a form of qualitative research that results in an intensive and holistic description and analysis of an event or social unit” (Stivers, 1991, p. 8). They are an analysis of “persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more *methods*” (Thomas, 2011, p. 513). Such common methods include interviews, observations, examinations of records, and documents (Stivers, 1991).

Where as a case study is a type of research, case method describes a type of teaching approach that provides students with descriptive “real life” stories and puts the students in the role of the decision maker. Therefore, instead of *researching* people or phenomenon in an attempt to understand and describe the inner working of that particular situation, as in a case study, the case method is providing the reader with a *description* of one particular event in history (fictional or not) in which the reader must judge the outcome or decide how he or she would handle the described situation. Case method is the practice of using cases as a pedagogical tool (Levin, 1995). Before one can have a full understanding of what case method represents, however, the term case needs to be clarified. The term case is used to describe a particular happening in the context of something larger. Shulman (1992b) comments,
To call something a case is to make a theoretical claim. It argues that the story, event, or text is an instance of a larger class, an example of a broader category...To call something a case, therefore, is to treat it as a member of a class of events and to call our attention to its value in helping us appreciate more than the particularities of the case narrative itself (p. 17).

To put it simply, Shulman (2000) stated, “a case is a singular species of narrative, a story with a point” (p. 2).

Although the educational message lies within the case, the way in which the case is presented is equally as important (Welty, 1989). Teaching, discussing, and guiding students through the educational content of cases using class discussion is referred to as case-based instruction. This is done through the social context of instruction, in which realistic problems or cases are presented, providing the students with an opportunity to appreciate the value of the contextual knowledge, as well as understand the conditions for the use of this knowledge (Williams, 1992). Through case-based instruction, Smith and Benavides (1988) note that both the facilitator and students play an important role: both raising questions and posing solutions in a cooperative yet challenging learning environment. Smith and Benavides also stress the importance of group follow-up in order to examine and debate alternative solutions, perhaps altering opinions based on ‘better’ ideas. Likewise, Merseth (1991a) noted that the case material is just as important as how the case is prepared and presented for discussion. She stated, “Clearly, the purpose and content of a case bear a significant influence on its use and ultimate impact. Similarly, the method by which the case is discussed shapes the learning that results from it” (Merseth, 1991a, p. 6). In other words, the case and the method of instruction are wedded. “Just as curriculum and instruction must not be treated disjunctively, so must cases and case
discussion be considered as one. Process and content are inseparable in the case method” (Merseth, 1991a, p. 5).

Within the educational research literature, the terms case study, case method, case-based instruction and cases are all closely interconnected. Based on the case method literature, I offer a brief summary of how these terms are related to each other and how I will be utilizing each term’s meaning throughout this literature review. Case method describes a teaching approach in which descriptive stories (e.g. cases) are used to promote student learning. This is the umbrella term used to describe the entire methodological teaching approach. Case-based instruction describes the activities involved in this type of teaching approach; these can include guided class discussion, student reflection and decision-making, peer discussion, and teacher and peer feedback.

Merriam (1998) pointed out the confusion surrounding case studies; that is, conflating the process (case study) with the product (case). However, within the case method literature, the term case study is often describing the use of cases as a teaching and learning tool; students study cases to gain insight into situations they may not encounter until they become practicing professionals.

Lastly, the terms scenarios and vignette are occasionally referenced in lieu of the term case. Both scenarios and vignettes are often used to describe shortened cases, and are often used interchangeably. There is a lack of consensus on the definition or format for each; however, differences do exist within the literature. Scenarios have been defined as having a similar format to vignettes; however, according to some, vignettes differ from scenarios in that scenarios are future-based stories (Jeffries & Maeder, 2004 & 2005).
The term vignette has been defined as a shortened story or case, in which only one particular event, experience, or relationship is being addressed (Shulman & Colbert, 1988). Adding to that definition, vignettes have been described as short stories that move the reader from abstract ideas to more context-specific (Finch, 1987). Jeffries and Maeder (2004 & 2005) define a vignette as “incomplete short stories that are written to reflect, in a less complex way, real-life situations in order to encourage discussion and potential solutions to problems where multiple solutions are possible” (p. 20). Shulman and Colbert (1988), on the other hand, define a vignette as more of a complete narrative, having a beginning, middle and an end. They continue by saying that a vignette is a story that describes what occurred before and the consequences that followed the event, as well as a description of the possible emotions the protagonist felt during the event (Shulman & Colbert, 1988). Although vignettes can be employed for different purposes, Barter and Renold (1999) describe how vignettes generally satisfy three main purposes:

1. Interpretation of actions and occurrences that allows situational context to be explored and influential variables to be elucidated
2. Clarification of individual judgments, often in relation to moral dilemmas
3. Discussion of sensitive experiences in comparison with the ‘normality’ of the vignette (p. 2)

I would consider Barter and Renold’s list to be an accurate description of how vignettes, or cases, can aid in case method pedagogy; however, I would add, through the interpretation of cases, students become more aware of the principles or concepts described in the case; that is, they are exposed to teaching pedagogy and classroom experiences that they may not have been otherwise. In addition, through the discussion of cases, students have an opportunity to not only develop professional strategies and
practices, but the students also formulate ideas of what is possible through teaching and learning (Shulman, 1992b).

Regardless of the nuances in meaning between cases, vignettes, and scenarios, I would argue that, irrespective of their format, they all address the same function: to tell a story. This story is used within case-based instruction to provide students with an opportunity to participate in an active learning process. Regardless of their length or specific content, cases, vignettes, and scenarios are tools that help prepare students for the world of teaching. In a professional field where students are rarely afforded an opportunity to practice their craft until the end of the degree program, cases can provide a learning tool that helps bridge the gap between the educational theory learned in the university classroom and the practical experiences the preservice teachers acquire in the primary or secondary classroom (Lundeberg & Fawver, 1994; Lundeberg & Scheurman, 1997; Shulman, 1986).

2.4.1.2 History of case method

There has been a long history of using real-world cases as teaching tools to provide learners with the opportunity to engage in challenging decision making situations (Kim, et al., 2006). Legal, business, and medical disciplines have used such teaching tools to provide students with practical resources in which to learn; real-world situations and experiences the students relate with and learn from. In order to understand the rationale for teaching with the case method, as well as the student gains from this method of instruction, it is important to briefly look at the history of case method use in law,
business, and medical school. Most importantly, from this information we can determine how student gains from the use of case method could be visible in teacher education.

In 1870 Christopher Langdell, dean of Harvard Law School, was credited with the creation of the case method teaching. Langdell wanted to move away from the didactic lecture format so he introduced the Socratic method of instruction based on actual cases; in this case, appellate court decisions (Garvin, 2003). These cases included an introduction, description of the case, and the case outcome. The purpose of the case method in law education is to understand the principles of law by studying court decisions (Merseth, 1991b). In other words, to study the theory and principles behind the law. Case method first began as an informal apprenticeship, then in the late 19th century became institutionalized, and is now the predominant method of legal education in the United States (Williams, 1992). Upon seeing the benefits of case method in the Law School, Harvard Business School started using case method in 1902. In business school, cases describe real problems in which business students discuss appropriate action plans. The business school’s case method curriculum emphasized a problem-centered approach to teaching business (Merseth, 1991b). Unlike the law model of case method, the business cases require students to make their own decisions based on the information presented. The main role of the case is to help students develop diagnostic and persuasive skills, as well as unique ways of thinking about management solutions (Garvin, 2003). Despite a long history of repeated requests for change in the didactic nature of medical education, it wasn’t until 1985 that the Harvard Medical School began piloting the use of cases to support medical students’ education. By 1992 it was the sole method used in
medical instruction. This type of case method instruction is *problem-based* and student directed; students cooperatively work in groups, studying the information they are provided, deciding what questions need to be addressed, and based on this information, determine a diagnosis (Williams, 1992). It is a self-directed process in which the medical students are taught to be life-long learners through the building of self-assessment skills needed to monitor their own understanding (Williams, 1992). The argument for focusing on self-directed learning is that the medical field is continually changing; therefore, doctors must identify and address the gaps in their knowledge (Garvin, 2003) in order to effectively meet the needs of patients in an ever-changing field. The goal of the medical program is to teach and promote inquiry (Garvin, 2003). Case method has been used in three distinct disciplines, each using cases for distinct purposes, which foster different student outcomes. The field of law uses case method to help students apply the theory and principles of law. The field of business uses case method to help students develop the diagnostic and persuasive skills needed to be effective managers. The field of medicine uses case method to prepare students to be self-directive problem solvers. These three disciplines are unique in their use of case method pedagogy; however, they all provide students with “real-world” situations that encourage students to connect with the curricular material. Could this also be the case with preservice teacher education?

2.4.1.3 **Case method in the field of education**

Compared to other fields, the literature on case methods in teaching is scarce. Although the idea of using case material in teacher education existed as early as the
1920s, this approach to teaching was not well organized and did not become a more common occurrence until the 1960s and 1970s (Merseth, 1991a). Almost a century after its introduction into the law school curriculum, the Carnegie Forum on Education and the Economy (1986) and the Holmes Group (1986) both recognized the benefits of case method in teacher education. The Carnegie Forum (1986) stated, “teaching cases illustrating a great variety of teaching problems should be developed as a major focus of instruction” (p. 76). In fact, cases have been used in teacher education to help preservice teachers begin to wrestle with the inescapable uncertainties of such topics as classroom management, grading, diversity, instructional practices, and student learning (Silverman, et al., 1992). The real value in case-based instruction, however, does not come from the minute contextual details introduced through the cases but from the opportunity for preservice teachers’ to internalize, discuss, and reflect upon the case. Merseth (1999) states that case-based instruction “can help students of teaching develop skills of analysis and problem-solving, gain broader repertoires of pedagogical technique, capitalize on the power of reflection, and experience a positive learning community” (p. xi).

Cases in teacher education are unique because they don’t have a well documented set of solutions (Boudry, 1990); however, data supports the belief that teacher candidates can benefit from the same skills developed in the business, medical, and law case method models: applying theory to practice, developing diagnostic and persuasive skills, and learning to be self-directive in solving problems (Lundeberg & Fawver, 1994; Merseth, 1991a; Silverman, et al., 1992). Schön (1987) argues that these skills can be developed through case reflection; that is, cases offer strategic examples and possible consequences,
providing students with an opportunity to personally reframe problems, just as a professional practitioner would in the field. Through such use, cases can help preservice teachers to: develop critical analysis and problem solving skills; encourage reflective practice; gain familiarity with complex situations; expose students to teaching settings and context that they have not yet experienced; and create an active learning environment (Merseth, 1991a). Through such skill building exercises, cases stimulate reflection on teaching and pedagogy, as well as encourage discourse among case participants (Shulman, 1992a). Furthermore, preservice teachers benefit from the opportunity to discuss their opinion and make decisions in a safe environment; one in which their opinions and suggestions are heard and feedback is provided (Smith & Benavides, 1988). All of these opportunities can help promote the preservice teachers professional growth; helping them feel more comfortable and confident in making the teaching decisions necessary to guide student learning.

Many researchers and educators would argue that the goal of teacher education is to create reflective teaching professionals (Gideonse, 1984; Schön, 1983; Shulman, 1992b). As with case method in business school, through identification of the case problem or situation, students are placed in the role of decision maker; reflecting on and analyzing the causes of the problem or situation, and coming up with recommended solutions (Harvard Business School, 2012) Among all other ideas about the role of a teacher, Gideonse (1984) and Bolster (1983) describe the teacher as a decision maker. Bolster states that

the most important influence on teachers' knowledge of their craft is that it is formulated and determined in a classroom that demands specific categories of
knowledge derived from the uses it must serve. The structure of the teaching environment—typically one instructor with twenty-five to thirty-five young people in a classroom—requires that teachers function consistently as *situational decisionmakers*; the knowledge that they deem most important will be derived from that process (p. 296).

If a major goal of teacher education is to create reflective teaching professionals, we must ask ourselves what the actual process of reflection entails. I would argue that for teachers to reflect on teaching and learning, they must have the ability to adequately assess their teaching and the students’ learning. From the assessment results, teachers must then have the ability to analyze the data to determine the areas that need adjustment. Using prior experiential and pedagogical knowledge, the teacher then makes subsequent decisions based on the evidence provided from the assessments. Abell, Bryan, and Anderson (1998) state, “The ultimate intent of reflection in teacher education is for teachers to gain a deeper understanding of their practice in order to improve it” (p. 492). The authors go on to state that veteran teachers can use their collective experiences and professional knowledge to make sense of new situations; preservice and novice teachers do not have such a repertoire. Naturally, a question arises of how teacher educators can help preservice teachers build this repertoire, and then practice using such learned skills. Is this even possible prior to the preservice teachers entering the classroom? If teachers are “situational decision makers,” how do we prepare preservice teachers to adequately and effectively employ such skills? What skills or experiences must preservice teachers’ experience in order to prepare them for making the often abrupt teaching and learning decisions they will surly face in the classroom environment? Harrington (1995) stated, “Because teaching and learning in increasingly diverse contexts are complex, prospective
teachers cannot come to understand the dilemmas of teaching only through the presentation of techniques and methods” (p.203). Preservice teachers must be presented with additional tools within their coursework that allow them to engage in reflective decision making (Wildman, Niles, Magliaro, & McLaughlin, 1990); case method has been recommended as one such tool (Shulman & Colbert, 1989; Volkmann, 2000).

Doyle (1990) suggests three frameworks for using cases in preservice teacher education. Similarly, Grimmett (1988) characterizes three purposes of reflective teaching. These frameworks are important to mention because they emphasize the different ways in which cases can be used in teacher education, as well as how the use of such cases denotes the type of learning (e.g. introduction of a specific practice, building reflection and decision making skills, connecting teacher action to specific theory). Doyle’s first framework identifies a typical approach in which preservice teachers are given information that is seen as having practical application. This includes the practical tips for teaching in the field. In such a framework, cases are often rhetorical; an example is placed within the case to make a specific point. Grimmett would define the purpose of this type of reflective thinking as a means to direct or control practice. In this situation, there is little class discussion because the case is intended to highlight a principle or practice, rather than encourage problem solving.

Doyle’s (1990) second framework describes teachers as problem solvers and decision makers. Under Grimmett’s (1988) categorization, such cases inform practice by allowing preservice teacher to choose among multiple versions of “good teaching.” In such a framework, cases are used to tell a story in which the preservice teachers take an
active role in analyzing the situation. Doyle states, “Within a decision framework, then, cases have an essential role in teacher education as pedagogical tools for helping teachers practice the basic professional processes of analysis, problem solving, and decision making” (p.10). Doyle goes on to state that these cases represent the complexities of teaching rather than merely a story to demonstrate a single point; therefore, reflective thinking is intricately tied to the processes of analysis, problem solving and decision making.

Doyle’s (1990) third framework represents the view that teachers have propositional knowledge about the classroom system and this enables the teacher to recognize, interpret, and make subsequent decisions based on these events. Teachers’ actions are a reflection of how they understand the classroom; cases can represent this situational knowledge. Doyle argues that such cases are invaluable to preservice teachers because they exemplify the complexity of teaching. Similarly, Grimmett (1988) describes the process of reflective thinking as reconstructing experience and developing new possibilities for action. Within this framework, cases serve as proto-types in which preservice teachers do not look for “right” answers; rather they interpret the situation in terms of the theoretical issues involved.

From which of these three frameworks should preservice teachers be exposed? In referencing the Harvard Business School model, Schoen and Sprague (1956) state that there is no one correct way to instruct with the case method; instead, techniques of case method instruction change based on “(1) variations in course objectives, (2) difference in personalities and abilities of individual teachers, and (3) differences in the data with
which courses must be concerned” (p. 78). Schoen and Sprague do provide three
similarities common to all case method instruction: a focus on experiences within the
field, emphasizing decision-making skills through case practice, and focusing on the
emotional and intellectual experiences of the student. Since each of the three parts of
Doyle’s (1990) framework accommodates a unique purpose, all three can be used to help
preservice teachers learn from a virtual world of teaching experiences. In the teacher
education field, cases can be used to: demonstrate effective teaching and learning
strategies, present opportunities for preservice teachers to analyze situations and practice
professional decision making, and perhaps most importantly, provide an opportunity to
link educational theory to classroom practice. Abell et al. added,

We need to find ways to get beyond the smooth, slick surface of their buzz words
and textbook phrasing and begin to untangle the underlying web of implicit, and
often inconsistent, beliefs about teaching and learning…Cases present
problematic situations that help methods student begin to question and challenge
the origins and legitimacy of their theories about science teaching and learning (p.
507).

Formerly, Dunn (1956) proposed that case method instruction affords the student an
opportunity to learn the semantics, but “not as definitions by rote but as the sense and
feeling for shades of varied meaning among terms commonly in use. No amount of
textbook application can give him this knowledge so thoroughly as does the case
method” (Dunn, 1956, p. 96).

In the following section, I will be highlighting several research studies that
demonstrate the use of case methods in preservice teacher education. The studies
specifically look at how the case method encourage preservice teachers’ reflection on
teaching and learning (Abell, et al., 1998), reasoned decision-making (Harrington, 1995),
and cognitive growth in teaching and learning using discussion (Levin, 1995). These studies all share Schoen and Sprague’s (1956) collective characteristics of case method instruction; presenting preservice teachers with an opportunity to use both their emotional and intellectual experiences in order to practice reflecting, analyzing, and interpreting new teaching and learning experiences.

2.4.2 Case method in teaching: The literature

2.4.2.1 Promoting reflective thinking through case method.

If a major goal of teacher education is to create reflective teaching professionals, then it is important to determine how preservice teachers’ use the reflection process to assess teaching and learning cases. Abell, Bryan, and Anderson (1998) conducted a study to investigate preservice teachers’ reflective thinking regarding teaching and learning. Abell and colleagues (Abell, Cennamo, Bryan, Campbell, & Hug, 1996) created integrated media cases in which teachers could practice reflection in a virtual setting. Elementary education majors watched seven cases (i.e. real classroom conceptual change lessons about seeds and eggs) within one first grade science unit. Abell et al. (1998) studied the preservice teachers reflections over the course of the unit. Data was collected through written assignments, as well as small and large group discussions. The researchers were interested in how prospective elementary teachers construct images of themselves as teachers of science, what their reflections revealed about their personal theories of science teaching and learning, how they framed problems and responses, and how the cases influenced their thinking about science teaching and learning.
Abell et al. (1998) used an action research framework to investigate students’ reflective tendencies towards teaching and learning science. The authors then used this data to reform their science methods instruction. This choice in methodology was noteworthy because the authors were practicing the same reflection process they were teaching their students. By facilitating reflective case method strategies in the classroom, the researchers not only assessed the preservice teachers ability to reflect, but also through the reflections, the researchers assessed the preservice teachers theories of teaching and learning. In turn, Abell et al. use the data to modify the methods course. From this research, the authors have demonstrated the formative assessment process.

Data was collected in two sections of an elementary science methods course in which 49 students participated; 46 were female and 3 were male, and all but one of the participants were between the ages of 20 and 23. Abell taught one section of the method course and Anderson taught the other section. Bryan observed both sections. Data was collected over a seven-week period during the first part of the semester. Abell et al. (1998) collected a total of 1,506 reflective responses. The authors organized the reflection activities around specific tasks.

The first task helped the methods students analyze their own beliefs, values, and knowledge about classroom learning. The preservice teachers were asked to watch a video case and then describe what they remembered most vividly about the lesson, why they thought the teacher taught the lesson in that particular manner, and what the teacher’s practices said about her assumptions, beliefs, and values about teaching and learning. The authors were asking the preservice teachers to analyze the case through the
perspective of the teacher; emphasizing the idea that the teacher’s beliefs, assumptions, and values plays a significant part in how the teacher organizes and teaching the lesson. After analyzing the data, Abell et al. (1998) stated that the preservice teachers’ lesson reflections varied greatly. Through the preservice teachers’ descriptions, the authors noted that the comments were often judgmental in nature with little evidence from the case to support the preservice teachers’ claim. For example, one student commented that the students were enjoying the teacher’s lesson, yet had no real evidence to conclude such a judgment. The preservice teachers also appeared to use buzzwords like “hands-on” and “discovery” without producing evidence for the use of such words. The authors state that this could have occurred because these terms are often used throughout educational coursework, but not often well defined. In addition, due to the lack of preservice teachers’ descriptions and use of these buzzwords, the authors claim the preservice teachers may have been using the terms because they sound educational and scientific.

The second task helped methods students reflect on their personal science histories and how they envisioned themselves as science teachers. After reflecting on both, they were asked to watch two video cases and then describe the connections between what they saw and their own science experiences. After analyzing the data, Abell et al. (1998) stated that the preservice teachers’ personal science experiences influenced how they viewed themselves as science teachers. Most indicated that their science experiences in school were inadequate; either they were didactic and textbook driven, or they were fun and memorable yet lacked science content. The preservice teachers voiced their lack of confidence with teaching science lessons due to both a lack of science content knowledge
and the prior science experiences they had as students. Multiple preservice teachers commented on how their own experiences as a student in a science classroom were very different from what they witnessed in the case videos. Abell et al. provided two examples of preservice teachers who reflected on how they would use the strategies displayed in the case video to help them plan their own science lessons, but then went on to state that this was not a common occurrence. The authors suggested that at the beginning of the semester, when case method was a new process, most of the preservice teachers were not ready to assume the teacher frame of mind when viewing the videodisc cases. This, however, began to shift as the preservice teachers watched the entire sequence of lessons.

The third task was developed to help preservice teachers understand that personal theories influence how the teacher will handle certain situations. After watching two more video cases, the preservice teachers discussed their reactions in small groups. The students were asked to reflect on issues related to science teaching as seen through the cases. After analyzing the data, Abell et al. (1998) stated that the preservice teachers indicated that they valued activity-based science because it motivated students, not because it allowed students to learn a particular science concept. The authors stated that because the preservice teachers lacked knowledge of science instruction and that the preservice teachers did not feel confident with the science content, the preservice teachers may have been more comfortable with an activity-centered classroom. In addition, the preservice teachers also believed that first grade students lacked the cognitive abilities to understand scientific concepts. Before viewing the case, many of the preservice teachers commented that the first grade science lessons would be purely activity based to keep the
students interested, rather than to teach them scientific concepts. These views were based mainly on the preservice teachers’ prior experiences in an elementary science classroom. The cases provided an opportunity for preservice teachers to view different ways of teaching science content to younger students, incorporating science content in ways that were meaningful and student-centered.

The final task was intended to help the preservice teachers question their personal ideas about teaching and learning. After watching the final video case lessons, the preservice teachers were asked to reflect on how their expectations of teaching this unit lesson had changed throughout watching the videos, and which lessons they felt comfortable using in their own classrooms. After analyzing the data, Abell et al. (1998) stated that many preservice teachers began to reflect on how they would handle planning the viewed lesson in their own classroom. The preservice teachers reflected on the differences between the lesson they observed and how they were taught science concepts in school. They also began to comment on how they would adopt the strategies they viewed in the case lessons to their own teaching. Lastly, Abell et al. described how preservice teacher reflections revealed shifts in understanding teaching and learning. For example, one preservice teacher initially place high importance on student open-discovery, yet after watching the series of video cases, the importance shifted more towards the teacher as an important guide for student learning. Other preservice students demonstrated inconsistencies in their thinking. For example, many preservice teachers reflected that they appreciated the teacher’s willingness to let the students voice their opinions without being told they were incorrect, yet they felt uncomfortable not telling
the students the correct answer at the end of the lesson.

Abell et al. (1998) stated that the case-based instruction provided preservice teachers with an opportunity to think about science teaching and learning, reflecting on and challenging their personal theories about teaching and learning. After watching the video cases, the students were asked to compare their initial expectations of the lessons with what they observed. Many students commented about how their views of a first graders social skills and cognition changed; many preservice teachers were surprised at what the first grade students could accomplish, and the types of teaching strategies that could be successfully used with first grade students. Abell et al.’s study has provided insight into how the case method can be used to foster preservice teachers’ ability to use case content and personal reflection to further their understanding of teaching and learning.

Real world teaching cases provide preservice teachers with an opportunity to reflect on experiences they may not yet personally experienced (Lundeberg & Fawver, 1994), as well as provides them an opportunity to examine and reflect on their own knowledge, assumptions, and beliefs (Abell, et al., 1996; Harrington, 1995). These are important aspects to consider when teaching; however, perhaps more important is how the preservice teacher uses this information to make well-informed teaching decisions. Does quality reflection necessarily lead to improved decision-making skills? In a study conducted by Lundeberg and Fawver (1994), preservice teachers became more flexible in their thinking and suggested alternative solutions to problems when cases were used as a teaching tool. Case discussions allowed preservice teachers an opportunity to share their
conceptions of the teaching and learning episode; this activity was shown to have an influence on how other preservice teachers thought about a case and what type of decisions they suggested as a solution for the case dilemma (Lundeberg & Fawver, 1994). Does the introduction of different pedagogical strategies, demonstrated through cases, really increase preservice teachers’ understanding of teaching and learning? Do these types of cases help preservice teachers learn how to use the evidence provided to them to make the necessary critical decisions?

2.4.2.2 Promoting reasoned decision making through case method

Similar to Abell et al. (1998) work on preservice teachers’ development of reflective thinking skills through case method and Lundeberg et al.’s (1994) work on preservice teachers’ use of reflection to improve decision making skills, Harrington’s (1995) research also focused on using case based pedagogy to promote reasoned decision making skills. Harrington argued that preservice teachers cannot fully understand the complex nature of teaching and learning if techniques are merely presented to them during their preservice teacher education. Case method should be included in the preservice program curriculum because it encourages students to evaluate alternative solutions to various perspectives; therefore fostering professional reasoning. Brookfield (1991) identified key components of critical thinking that Harrington states are necessary for reasoned decision making. These include being reflective and analytical about the assumptions, contexts, and alternative solutions to any situation. Harrington states

Providing teachers with a way to think about what they value, how they ground their arguments, the evidence they use to support them, and the contextual factors
influencing how they conduct their work should lead to more thoughtful, reflective action (p. 205).

Harrington’s (1995) research was conducted to investigate if dilemma-based cases could be used to gain insight into preservice teachers’ reasoning. Participants included 26 students enrolled in an undergraduate elementary school teaching course. This course was one of the first courses the students were required to take after being admitted into the School of Education. Of the 26 students, 23 were female, 21 were traditional juniors and seniors, and five were non-traditional students with the oldest being 24. The participants were enrolled in a highly competitive public university.

Students analyzed four written cases, each focusing on a different aspect of education: schools and society, teaching, curriculum, and ethics. The participants were given general guidelines for writing their analysis of each case and were asked to discuss: issues presented in the case, the type of case it represented, how they would prioritize these issues, how different perspectives might inform the interpretation of the case, a solution for the case, consequences for that solution, and a critique of their solution and analysis. The author analyzed the preservice teachers first and last case analyses, focusing on the preservice students’ reasoning used within their response to the general guidelines. Five general levels of coding were developed: identifying the issue in the case, alternative perspectives on the case, connections between the solution provided and how they identified the case issue, the consequences of the actions taken, and the critique of their solution. Harrington’s findings were categorized under these levels of codes.

The way in which a dilemma is resolved is intricately tied to how the problem solver views the dilemma (Schön, 1983). Harrington (1995) states,
How teachers identify the dilemmas they have to deal with will be influenced by the interpretive frames they draw from and the values that influence those interpretations. Problem identification—the framing of the case—includes a claim (what it is a case of) and ground to support that claim (the issues and facts that support that claim) (p. 207).

In resolving problems, Schön (1979) suggests that a person must first be able to identify how the dilemma is framed before a solution can be made. In other words, what is the problem and what rationale or reasoning is used to identify the problem as such? In working with cases throughout the semester, Harrington was interested in the preservice teachers’ growth in their ability to identify the case problem, as well as provide grounded support for such identification. Harrington noted that even thought the guidelines explicitly instructed the preservice teachers to do so, at the beginning of the semester, 65% of the preservice teachers did not or were not able to explicitly frame the problem within the case. Harrington claims that some students have difficulty with teaching cases because they represent ill-structured problems. With ill-structured problems,

Disputants may propose different solutions to the problem, each with particular strengths and weaknesses. In approaching an ill-structured problem, the thinker must attend to alternative points of view and create arguments justifying the proposed solution. One responds to a well-structured problem with a right answer but to an ill-structured problem with a claim and a justifying argument (Carleton College, 2010)

The author was looking for the preservice teachers’ ability to build a strong rationale for why the preservice teachers identified the case the way they did, as well as use evidence from the case to support their reasoning. Students who were able to adequately frame the case indicated what they saw as the relationship between the issues of the case and the facts, and how they used this information to help them prioritize the key issues. At the beginning of the semester, however, most of the preservice students had difficulty
reflecting on such ill-structured cases; few connections were made between the issues, perspectives, and the solutions. This represents a possible common connection to Abell et al.’s (1998) study in which the authors suggested that because preservice teachers were new to the idea of case method pedagogy as well as new to the experiences of classroom teaching, they were not accustomed to viewing the ill-structured problem through the frame of a teacher. Harrington claimed, however, that by the end of the semester, 13 students (50% of the participant population) demonstrated the ability to identify the case and provide evidence for their reasoning. Of the remaining 13 preservice teachers, ten were able to identify the case, but failed to provide their rationale. Would continued work with ill-structured cases increase the preservice teachers’ ability to identify the case and provide evidence for their reasoning?

Harrington (1995) suggests one way in which educators can help preservice teachers identify the significant features within a teaching dilemma is to encourage preservice teachers to view the dilemma from different perspectives (e.g. from the point of view of the teacher, student, administrator, parent). Harrington’s data suggested that a majority of the preservice teachers were able to consider various perspectives throughout the semester; however, most of the preservice teachers only referred to the perspective of the protagonist in the case and failed to consider other perspectives. At the beginning of the semester, five preservice teachers were able to provide multiple perspectives, using facts and events from the case. At the end of the semester, eight preservice teachers were able to accomplish this task. This does not represent a large gain in the preservice teacher population. Was there enough time for a substantial gain to occur? As different
perspectives are shared, can small group or whole class discussion help increase
preservice teachers’ ability to consider different perceptions in dilemma based cases?
When dealing with professional dilemmas in the classroom, will such skills transfer?

Harrington (1995) argued that by examining how students warrant their solutions to
case scenarios, teacher educators can better support the development of preservice
teachers reasoning skills. At the beginning of the semester 23% of the preservice students
provided multiple sources of support for their recommended solutions to the cases.
Towards the end of the semester, 50% of the preservice teachers were drawing a clear
connection between the issues presented in the case, the actions they would take in
response to the issues, and the reasons why they would undergo such actions. Harrington
claimed that case based pedagogy provides preservice teachers with an opportunity to
practice making connections between their solutions and the case evidence, ultimately
improving their critical decision making ability. Although, over the semester, there was
an increase in the number of students who were making such connections, the author
does not describe the case pedagogy process used with the study participants. Was this
increase due to merely reading and responding to multiple cases throughout the semester?
Did the instructor scaffold instruction to help the preservice students improve their
reasoning skills over time? Was discussion a key form of dissemination of student case
responses?

Providing evidence for the actions taken during a particular case scenario is
important; perhaps equally important is considering the consequences of the actions.
Harrington (1995) examined the preservice teachers written case analyses to find that a
majority of the students focused on immediate consequences, with little recognition to possible general educational concerns. Some students, however, were able to consider the consequences in a broader sense; how the actions might affect the greater community or the long-term social and moral development of the students. Again, Harrington did not indicate what processes occurred during this intervention to encourage a broader reflection on the consequences of the case actions; however, Harrington did claim that case-based pedagogy can help preservice teachers reflect on limitations in their own worldviews. Does this occur by merely reading and reflecting on multiple cases? Does the discussion of their peers’ perspective help play a role in recognizing how different perspectives may lead to different teaching and learning outcomes?

Harrington (1995) described how critical reflection can help a person become aware of his or her assumptions, the context of the issue, alternative solutions, and personal limitations. At the beginning of the semester, Harrington stated that over 50% of the preservice teachers failed to critique their own analysis, providing no insight into any possible assumptions, lack of understanding, or limitations in pedagogy or experience. By the end of the semester, the number of preservice students who were critiquing their analysis increased; however, most did not reflect on how their assumptions might influence the actions taken during the case. Building professional and critical reflection skills is not an easy endeavor. Although four cases is hardly enough for preservice teachers to master such skills, Harrington argues that case pedagogy can help foster reflective and reasoned decision making skills. Harrington’s argument is consistent with research done on case method pedagogy (Doyle, 1990; McAninch, 1993; Merseth, 1991a;

To educate is to teach in a way that includes an account of why you do as you do. While tacit knowledge may be characteristic of many things that teachers do, our obligation as teacher educators must be to make the tacit explicit (Shulman, 1988, p. 33)

Shulman goes on to state that a skilled teacher not only reflects on practice, but also reflects on theoretical understanding. By forging together the interaction between theory and practice, cases can be a powerful vehicle for education (Shulman, 1988).

The intent of Harrington’s (1995) study was in determining if dilemma based cases can provide insight into preservice teachers’ professional reasoning. Case-based pedagogy provides an opportunity for preservice teachers to read and discuss educational issues and ideas. Due to the lack of extensive personal teaching experience many preservice teacher have, the information presented in cases can act as a catalyst for thinking about and discussing the nature of teaching and learning. Harrington concluded that case-based pedagogy provides an opportunity for preservice teachers to read and discuss educational issues and ideas, but suggests that the success of case pedagogy is based on multiple contexts: the content within the case, how the case is presented, the type of reflection required, the extent of the class discussion, and how the information presented within the class discussion is utilized. What role does discussion play in the preservice teachers’ ability to use case information to better inform their own practice? Does discussion improve a preservice teachers’ ability to reflect on their own practice? Is it the case content or the discussion of the case content that really advances preservice teachers’ pedagogical understanding?
Using cases as a pedagogical tool for preservice teachers can be a powerful instrument. Some researchers claim the power is in the case’s content (Shulman, 1992b); however, other researchers argue that the power of instruction lies within the discussion of the case content (Lundeberg & Scheurman, 1997; Merseth, 1991b; Welty, 1989). Levin (1995) addressed this issue in her study, questioning the variable of case discussion with preservice and in-service teachers of various experience levels. Levin began her analysis by first looking at the research on cognitive, developmental, and social psychology. Shulman (1992b) stated that cases provide real life teaching and learning situations that can motivate preservice teachers who have not yet been exposed to such experiences. The learners must reflect upon teaching and learning principles, as well as morals and ethics, to come to a conclusion about the case. Shulman stated, “The beauty of cases is their potential for reinterpretation and multiple representation” (p. 17). Similar to Harrington (1995), Lundeberg and Scheurman (1997), and Shulman (1992b), Levin has also categorized teaching cases as ill-structured problems because they can be defined as problems in which there is no one correct way to solve the dilemma (Chin & Chia, 2006) or they are problems in which multiple theoretical perspectives are represented (Lundeberg & Scheurman, 1997). While preservice teachers can indeed benefit from reading and reflecting on ill-structured cases, Levin argues that, through such cognitive exercises, it is equally important to look at how individuals construct knowledge. For this, Levin turned to the work of Piaget (1932) and Vygotsky (1978).
Levin points to Piaget’s claim that peer interactions pose cognitive conflict, something that would not necessarily happened to an individual if peer reflection were absent. Such interactions can promote the discussion of different ideas, which in turn can trigger recognition that there are conflicts between discussed ideas and that the construction of new schemas may be necessary to account for the conflicts (Piaget, 1932). Learning through ill-structured problems requires multiple representations and explanations (Spiro & Jehng, 1990). Levin states, “The social interaction during the discussion of a case among a group of teachers has the potential for providing cognitive conflict, hence to trigger change” (p. 65). In addition, such classroom discussion allows the instructor to guide learners as they attempt to make sense of the complexities of the ill-structured problem (Driver, Asoko, Leach, Mortimer, & Scott, 1994). Likewise, Vygotsky stresses the importance of peer interaction in cognitive development. Levin points out that according to Vygotsky’s Zone of Proximal Development (Vygotsky, 1978), experienced teachers can have a strong influence on the thinking of less experienced teachers when both are engaged in discussion. Levin uses these theoretical perspectives as a basis for her study on the affect discussion has in learning.

Levin (1995) worked with 24 current and preservice teachers all associated with the University of California- Berkley’s 2-year post baccalaureate Developmental Teacher Education program. Of the participant population, 21 were female, 16 were Caucasian, and eight were from various ethnic backgrounds. Participants were divided into two groups, a control group in which participants were asked to individually read and write about two teaching cases, and an experimental group in which participants individually
read and wrote about the same two cases; however, the experimental participant group also discussed their case writings with their peers. Both groups contained four experienced teachers with more than six years teaching experience, four beginning teachers either in their first or second year of teaching, and four preservice teachers who were concurrently participating in their field placements.

The participants were all given two teaching cases, both focusing on a fourth grade lesson on writing. The cases represented the following issues: a misalignment between the teacher’s goals and what was being taught; the absence of modeling the concept; management issues; a lack of standardized student expectations; and inappropriate tasks for that grade level. Levin stated that experts in case writing validated the parallel topics between the two cases. Pilot data was also used to validate the parallelism, as well as the efficacy and face validity.

For the first case, both the experimental and control groups individually read and wrote an analysis of the case. The experimental group was then asked to discuss their analysis with their peers. The experimental group was divided into two equally sized groups for peer discussion; smaller group sizes were purposefully done to encourage all to participate. Each group contained two experienced teachers, two beginning teachers, and two preservice teachers. Case discussions were video and audio taped, and transcribed for further analysis. Within two days after the original analysis, both groups were asked to write a second follow-up analysis of the first case. This was done without referring back to their original analysis. One month later, both the experimental and control groups read and wrote an analysis of a second case; however, this time neither
group were asked to discuss their written analysis. The author analyzed the case analyses for any changes in thinking that were prompted by discussion, and if those changes appeared to be temporary or if they were retained over the month’s period of time between cases. Participants were asked to consider seven prompts while writing their analyses: summarize the important aspects of the case; identify the issues that come up in the case; why it is important to raise said issues, alternative strategies for teaching the same lesson; how the study participant would teach the class; how the study participant would answer the questions posed at the end of the case; and anything else that the study participants would need to know about the case.

A holistic rubric was created to analyze the quality, completeness, and depth of responses to the participants’ written case analyses. The purpose of the rubric was to quantify teachers’ thinking about the case. A 1 to 4 scoring range was employed, with the highest number indicating participant answers that demonstrated flexibility, multiple solutions, integration of new ideas, and evidence-based judgments. Rubric scores for each participant were averaged to create one score. The quantitative data was used to determine if experience level and discussion had an affect on the quality of the study participants’ written analyses. The ANOVA conducted on the written analyses indicated that teaching experience level was significant, $F(2, 24) = 6.18, p < .01$. Levin (1995) stated that post hoc contrasts showed that the experienced teachers scored higher than the beginning teachers ($t(7) = -2.45, p < .01$) and preservice teachers ($t(7) = -3.55, p < .005$) for the first written analysis of the first case. The quantitative data, however, does not indicate a significant difference between beginning and preservice teachers. Levin states
that the qualitative data suggests a difference; this will be discussed later. No difference was found between either the experimental or control groups’ analyses.

For the second written analysis of the first case, the ANOVA suggests a significant difference between the scores of the experimental and control group participants, $F(1, 23) = 7.42, p < .05$; however, Levin (1995) states that there was no significant increase for the scores of the experimental groups between the first and second case analysis. Again, Levin claims that this difference may not be evident in the qualitative data, but was apparent when analyzing the quantitative data.

Levin (1995) also conducted an ANOVA for the third written case analysis. The results were similar to the pattern found in the first case analysis; there was a significant difference between experience level ($F(2, 24) = 6.56, p < .01$). Post hoc comparisons indicated that the experienced teachers scored higher than the beginning teachers ($t(7) = -3.29, p < .01$) and preservice teachers ($t(7) = -3.08, p < .01$), but there was no significant difference between preservice and beginning teachers ($t(7) = -1.71, p < .1$).

Qualitative analysis was then conducted by examining the written case analyses of the participant teachers. The aim in this analysis was to discover the extent to which experience level and discussion affected the teachers’ thinking about the case content. Levin (1995) categorized the results of the analyses into five themes. These included the teachers’: quality of understanding of the issues presented, awareness of the elements within the case that might affect the teaching and learning process, interpretation of the issues within the case, focus of the analysis, and tone of the analysis. Levin’s data suggests that the teachers with more experience demonstrated more complex and multi-
dimensional understanding the issues presented in each case, as well as displayed written evidence of reflection on their own thinking. The more experienced teachers also took more than one perspective into consideration when justifying their solutions to the issues presented. The less experienced teachers tended to look at the issues in terms of being correct or incorrect. For the first case analysis, preservice teachers were critical and judgmental of the actions taken by the case teacher; they wrote about what the teacher should be doing. Beginning teachers were less critical, but demonstrated more egocentrism than more experienced teachers. Beginning teachers also focused more on the teachers’ actions and the teacher-student relationships, whereas the more experienced teachers were empathetic towards the case teacher and focused on what the students could do rather than what the teacher should have been doing. Interestingly, in the third case, the preservice teachers did not identify any major issues with the case lesson, whereas the more experienced teachers were able to identify problems with the content or presentation of the lesson. More experienced teachers were also able to tie together lesson delivery and classroom management. Beginning teachers provided reasoning for the statements they wrote. Preservice teachers did not provide reasoning; they simply made declarative statements about the case content. Levin suggests that this articulation of reasoning seems to be the bridge between less and more experience in teaching.

Perhaps not surprisingly, preservice teachers had adequate ideas for teaching lessons, but most were teacher-centered. In addition, many were unaware of suitable developmental learning activities for the level of students in the case. Beginning teachers often connected the case issues to their own personal classroom issues and provided ideas
that were less teacher-centered than the preservice teachers. The more experienced teachers demonstrated understanding of the classroom context and the multiple variables that might affect the lesson. Ideas for the lessons were mostly student-centered. Both the preservice and beginning teachers demonstrated little understanding for task appropriateness. The more experienced teachers explicitly used developmental terminology to explain why the lesson was inappropriate.

In regards to how the participants interpreted the issues within the cases, Levin (1995) states that the data suggests preservice teachers correlated the teacher’s problems with classroom management issues. The beginning teachers interpreted the origin of problems’ as poor relationships between the teacher and students. The more experienced teachers viewed the problem as a mismatch between the task and students’ needs.

Levin (1995) also analyzed the participants written case analysis in terms of their participation or lack of participation in discussion between the first and second case analyses. Levin’s data suggests that the preservice teachers benefited from talking about case issues with more experienced teachers. The preservice teachers demonstrated more explicit clarification and elaboration of their reasoning, the assimilation and accommodation of discussion topics were apparent in the second case analysis, and there were more reasons provided for the declarative statements given during the first analysis. The preservice teachers also displayed more flexibility and detail in describing the teaching of the case lesson. In addition, the preservice teachers were less critical of the overall case than prior to group discussion. The preservice teachers who did not participate in discussion demonstrated little change between the first and second analysis
of the case. These preservice teachers simply summarized their previous ideas. There were no new ideas shared for how to teach the lesson or handle classroom issues. The preservice teachers were, however, less critical of the case overall, but still wrote judgmental comments about the teacher and lesson.

The beginning teachers in the experimental group also demonstrated implemented changes to their analyses due to the discussions held after the first case analysis. Levin (1995) states that the beginning teachers began to display conditional thinking and that there was an increased level of reflection, as well as assimilation and accommodation of ideas into their thinking. Beginning teachers also demonstrated new perspectives on how to handle classroom management and a better understanding of the connection between teaching goals and lesson activities. Finally, after discussions, the beginning teachers were not critical of the case teacher; there was an appreciation for the fact that teachers make mistakes. The beginning teachers in the control group added little elaboration or new topics to their second analysis. Levin stated that their original thinking was reinforced. Similarly, the beginning teachers did not write about any new perspectives on how to handle students or the lesson. In addition, the beginning teachers were still somewhat critical of the case teacher.

The more experienced teachers in the experimental group seemed to validate their original ideas and continued to show metacognitive thinking about the topics in the case. Not surprisingly, the experienced teachers showed fewer effects on their thinking than other teachers within the experimental group. Levin (1995) contributes this to the fact that most of the experienced teachers demonstrated the ability to justify and elaborate on
their decisions regarding the case lesson. The experienced teachers did, however, ask more questions and developed some new ideas after group discussion took place. Although not as common with the experienced teachers, Levin (1995) describes how some of these teachers were influenced by the conversations they had with peers. The more experienced teachers continued to elaborate on their understanding of key issues presented in the case. In addition, the more experienced teachers remained focused on the students needs within the case story, being critical yet empathetic to the case teacher. The more experienced teachers in the control group focused their re-analysis on one or two main points and did not provide any new ideas, solutions, or questions. The teachers still demonstrated metacognitive thinking. In addition, these teachers still gave developmental explanations, but turned these into declarative statements. Interestingly all participants in the control group, regardless of experience level, reduced their case analysis from 5 or 6 pages to 2 pages or less. While length is not necessarily an indicator of quality, it is interesting to note that these teachers reduced their descriptions and examples during this second reflection exercise. The more experienced teachers in the control group continued to view the case through multiple perspectives and display explicit, multi-dimensional understanding of the issues presented in the case.

In conclusion, Levin (1995) states that participating in case discussion affected the participants thinking regarding the case. For the experienced teachers, the discussion served as a catalyst for reflection. For the less experienced and preservice teachers, the discussions added in the teachers’ clarification of their thinking about particular issues presented in the case. Levin states that conflicting ideas shared during discussion acted as
a catalyst for many teachers to reexamine their thinking. On the other hand, those participants who did not engage in case discussion did not demonstrate any type of elaboration of their understanding or introduction to new ideas or strategies. Participants in the control group simply reiterated their original thinking about the case. Levin stated that these teachers merely solidified and reinforced their own perspectives, rather than gaining any new perspective on learning or teaching within the case. These conclusions are in line with the research on using ill-structured cases as a basis for discussion to stimulate cognitive growth (Colbert, 1996; Harrington, 1995; McAninch, 1993; Silverman, et al., 1992). Levin argues for the use of case discussion in preservice teacher education because of the preservice teachers’ lack of teaching experience and the lack of multiple perspectives on teaching and learning. In addition, case discussion appears to encourage alternative ways of thinking, promoting a better understanding of the complexities of teaching and learning in the classroom.

2.4.3.1 Summary

A teacher must understand the content they are teaching and understand how to teach that content to their students, while securing a safe and effective learning environment for their students. There are multiple variables influencing how a lesson is taught by the teacher and received by the students. When one variable changes, the lesson may require adjustment. How does a new and inexperienced teacher deal with such ill-structured situations?

In the course of their work, competent teachers make an amazing number of decisions based on predictions about the probable effect of their actions on
students' task accomplishment. When teachers are planning, these predictions are anticipatory and based largely on beliefs acquired from previous experience. In classroom sessions, the predictions are made more existentially through a process of giving and receiving cues (Bolster, 1983, p. 296).

The ability to make effective decisions can be a difficult skill to teach preservice teachers who often have limited prior teaching experiences to reflect upon. How can teacher educators help preservice teachers develop and practice the skills of reflection and decision making prior to the preservice teachers’ internship?

The research conducted by Abell et al. (1998), Harrington (1995), and Levin (1995) all suggest that case based pedagogy can play an important role in enhancing preservice teachers’ ability to reflect on teaching and learning by encouraging alternative ways of thinking about case situations. This is an important concept to achieve when working with teaching cases because the cases represent the sort of ill-structured problems a teacher will face in the classroom; these are often experiences the preservice teachers’ may not yet have personally experienced. Abell et al. and Harrington both suggested that case reflection allowed preservice teachers to examine and reflect on their own assumptions and beliefs of teaching and learning. Through case readings and discussion, the preservice teachers were able to analyze the similarities and differences between their own assumptions as well as the teaching and learning occurring within the case stories. Reflecting on their personal theories and those represented in the cases, the preservice teachers demonstrated the ability to make better connections between the evidence provided by the case and their “solutions” to the teaching and learning problems. This research supports Schön’s (1987) argument that cases offer strategic examples and possible consequences that in turn provide students with an opportunity to personally
reframe problems, just as a professional practitioner would in the field.

Abell et al. (1998) claimed that at the beginning of the course, when case method was first introduced as a reflective teaching tool, most of the preservice teachers were not ready to assume the “teacher frame of mind” when viewing the video cases. Towards the end of the video cases, however, most of the preservice teachers were able to reflect on their personal science learning experience, as prompted by the cases, to inform their ideas for future teaching. The preservice teachers also reflected on the success of strategies and techniques used within the cases, especially those used with younger students. Abell et al.’s study provided insight into how case-based instruction provided preservice teachers with an opportunity to think about science teaching and learning, challenging the preservice teachers’ personal theories, as well as fostering preservice teachers’ ability to use reflection to further their understanding of teaching and learning. Abell et al.’s study aligns with Merseth’s (1991a) description of how cases have helped preservice teachers to: develop critical analysis, reflection, and problem solving skills; gain an awareness of the complex situations that encompass a teaching episode; expose students to unfamiliar teaching settings and contextual experiences; and create an active learning environment. Abell et al.’s study has promoted an interest in determining the relationship between the act of reflection and how this knowledge is then used to inform educational decisions. Harrington’s (1995) study helped address this issue.

Harrington (1995) claimed that case based pedagogy provided preservice teachers with an opportunity to practice making connections between case evidence and the proposed case solutions; which then ultimately improved the preservice teachers’ ability
to make evidenced based decisions. Through her research, Harrington described how critical reflection helped preservice teachers become aware of their assumptions, the context of the issue, alternative solutions, and personal limitations. Case-based pedagogy provided an opportunity for preservice teachers to read and discuss educational issues and ideas. Due to the lack of extensive personal teaching experience many preservice teacher have, the information presented in cases can act as a catalyst for thinking about the nature of teaching and learning before entering the classroom. This raises the question of how important the input from other peers and instructors can be in reflecting on the case and proposing new solutions. Harrington concluded that case-based pedagogy provides an opportunity for preservice teachers to discuss educational issues and ideas, promoting evidence based decisions, but how important is the act of discussion in improving preservice teachers’ reflective and decision making skills? Shulman spoke to this point when he stated,

   A case in not merely a well-written anecdote; cases extend opportunities for reflection precisely because they take the learner beyond the limit of individual experience and permit opportunities for reflecting on the experiences of others. This is a particularly powerful experience when working with a group (Shulman, 1988, p. 36).

Cases can be used to promote discussions between peers and instructors. Such discussions help students develop skill in evaluating problems and creating solutions; both linking theory with practice (Stivers, 1991). In addition, with repeated use over the semester, teacher educators can see their students shift from seeking the instructor’s solution to collaborating with peers to develop a deeper understanding of the case (Stivers, 1991). Levin (1995) speaks to this issue in her research.
Levin’s (1995) research highlighted the relationship between preservice teachers’ cognitive thinking and case discussion. Levin studied preservice and in-service teachers with varying degrees of experience and found that all benefited from group discussion of case content. For the more experienced teachers the discussion helped to catalyze reflection. For the less experienced teachers, the discussion helped clarify, focus, and elaborate their thinking regarding specific concepts within the case. Group discussion afforded the teachers an opportunity to share and discuss differing views of teaching and learning. These conflicting ideas between more and less experienced teachers helped beginning teachers reflect and modify their preexisting ideas. On the other hand, those participants who did not engage in case discussion simply reiterated their original thinking about the case; merely reinforcing their own perspectives, rather than gaining any new perspective on learning or teaching within the case. Due to the lack of teaching experience of preservice teachers, Levin argued for the use of case discussion because it encouraged alternative ways of thinking, which in turn promoted a better understanding of the complexities of teaching and learning in the classroom.

A major goal of teacher education is to create reflective teaching professionals (Gideonse, 1984; Schön, 1983; Shulman, 1992b); Abell et al. (1998), Harrington (1995), and Levin (1995) have all demonstrated how case based pedagogy can be utilized to achieve this goal. In addition, these studies exemplify the skills obtained through the use of case method as demonstrated in: law, in which the focus is on the applying theory to practice; business, in which the focus is on the development of diagnostic skills; and
medicine, in which problem-based cases are used to prepare students for “real life”
professional situations.

Referring back to Doyle’s (1990) three frameworks for case pedagogy in the
preparation of teachers, as well as Grimmett’s (1988) three purposes of reflective
teaching, Abell et al. (1998), Harrington (1995), and Levin (1995) have, through their
research, established an argument that case-based pedagogy can be utilized to achieve
these outcomes. Doyle’s first framework identified an approach to preservice teacher
education in which direct and practical application of content was promoted. Grimmett
defined this type of reflective thinking as a means to direct or control practice. Abell et al.
demonstrated how preservice teachers benefited from the repeated use of case analysis in
which preservice teachers recognized how different perspectives influence the case
outcome. In addition, it was helpful for preservice teachers to learn educational language
in a way that fostered understanding through detailed examples. Doyle’s second
framework describes teachers as problem solvers and decision makers, which Grimmett
categorized as allowing preservice teacher to choose among multiple versions of “good
teaching.” Harrington (1995) demonstrated how presenting preservice teachers with ill-
structured case stories improved decision making abilities by allowing the preservice
teacher to take an active role in analyzing the case; forming a solution based on case
evidence. Doyle’s third framework represented the view that teachers use propositional
knowledge to recognize, interpret, and make subsequent decisions based on classroom
events. Grimmett described this process as reconstructing experiences and developing
new possibilities for action. Levin (1995) spoke to this point by demonstrating how peer
discussion allowed for teaching experiences to be shared, which in turn encouraged
preservice teachers to build new solutions based on prior experiences.

Abell et al. (1998), Harrington (1995), and Levin (1995) research has provided
support for using case method in teacher education. Preservice teachers’ ability to reflect
on teaching and learning can encourage alternative ways of thinking, as well as help
preservice teachers examine how their own assumptions and beliefs may affect their
decisions. Case method can promote reflection of personal theories as well as those
represented in the cases, providing opportunities to make better connections between the
evidence provided by the case and the preservice teachers’ recommendations to
the teaching and learning problems. Cases can also be used to promote discussions
between peers and instructors. Such discussion also encourages alternative ways of
thinking, which in turn promotes a better understanding of the complexities of teaching
and learning in the classroom.

2.5 Formative Assessment and Case Method

In Chapter 1, a review of the formative assessment literature, as it pertained to
teaching and learning in the field of education, was described. Within this literature, a
strong case was made for using formative assessment strategies to improve student
learning. The specific strategies used within the formative assessment process were not
described. Before an in-depth review, analysis, and synthesis of the research literature
connecting formative assessment strategies to case method instruction can occur, it is
necessary to first identify the specific characteristics of the formative assessment process.

125
2.5.1 Characteristics of formative assessment

2.5.1.1 The three questions

The Assessment Reform Group (2002) states, “Assessment for Learning is the process of seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go and how best to get there” (p. 2). A logical follow up question might be: what exactly does such assessment look like in the classroom? It is important to emphasize that assessment for learning is a continuous and formative process with the goal of promoting learning throughout the learning episode. What role does the student take in this process? What role does the teacher take? In order to successfully facilitate classroom formative assessment, teachers must initially identify and communicate the student learning goals, then use the assessment process to inform instruction while using a variety of formative methods to communicate student progress (Stiggins, 1999). The line of communication between teacher and student is often referred to as a feedback cycle. This cycle should involve gathering student information, using this information to provide scaffolded guidance for student improvement, and then offering opportunities for students to use this guided feedback to improve their learning (Black, et al., 2004). The feedback cycle is a fundamental part of the formative assessment process.

Few physical, intellectual or social skills can be acquired satisfactorily simply through being told about them. Most require practice in a supportive environment which incorporates feedback loops. This usually includes a teacher who knows which skills are to be learned, and who can recognize and describe a fine performance, demonstrate a fine performance, and indicate how a poor performance can be improved (Sadler, 1989, p. 120).
2.5.1.2 Five key strategies

For the feedback cycle between teacher and student to function effectively, the students must have an understanding of: what is expected of them, what skills and processes they will need to utilize as well as demonstrate to achieve the stated learning expectations, and what successful completion of the learning task looks like. In such a feedback cycle, both the teacher and the student are involved in the process of assessment; that is, identifying strengths and weaknesses within the students’ work and how to use this information to advance learning. Wiliam (2010) summed these points into five key strategies of formative assessment. These included:

1. providing understandable learning targets and success criteria;
2. eliciting evidence of learning through tasks, questioning, and discussions;
3. incorporating feedback cycles between students and teachers;
4. encouraging and facilitating peer-assessment as an instructional resource; and
5. teaching students to take ownership of their own learning.

Similar to Wiliam’s key strategies, Sheppard (2000) addressed the acts of providing feedback, encouraging students’ to transfer knowledge to new experiences, making learning criteria explicit, and allowing students to self-assess their work. Sheppard states,

How might the culture of classrooms be shifted so that students no longer feign competence or work to perform well on the test as an end separate from real learning? Could we create a learning culture where students and teachers would have a shared expectation that finding out what makes sense and what doesn’t is a joint and worthwhile project, essential to taking the next steps in learning? (p. 10)

Most likely there is no one correct answer to these questions. Both Sheppard and Wiliam acknowledged the need for classroom practices to reflect formative assessment as an
integral and explicit part of the learning process. By doing so, the act of learning can be viewed as a process rather than an end goal. In this mindset, learning is transparent; both the teacher and student play a leading role and share the responsibilities of learning.

Drawing from the Ramaprasad’s (1983) work on evaluative feedback, Wiliam and Thompson (2007) formulated three key questions to ask regarding student learning when focusing on formative assessment: where is the learner now?; where are they going?; and how are they going to get there? Wiliam and Thompson then organized these three questions around the three main “agents” or individuals directly involved in the instructional process: the teacher, the student, and the peer. Lastly, Wiliam and Thompson defined the roles the agents (i.e. teacher, peer, and student) undertake with respect to the five key strategies of formative assessment. Wiliam and Thompson emphasize how each agent has a specific role to play within the formative assessment process. It is important to note that while these roles are prescribed, they are not independent from one another. Students are dependent on the teacher to inform, guide, and scaffold learning towards the lesson objective; however, students also rely on one another to inform the learning process. In doing so, students must be aware of the learning intentions in order to provide peer feedback that is an accurate reflection of the defined learning goals and success criteria. Students then use teacher and peer feedback to improve their learning. Arguably, there are many ways to incorporate these formative assessment strategies into classroom teaching and learning; however, it is important that teachers and students focus their teaching and learning activities around these aspects of
formative assessment if they wish to create a learning environment that emphasizes both continual feedback and continual growth.

In summary, formative assessment is a continuous process used by teachers and students to inform teaching and learning. Learning goals and success criteria are explicitly shared with students, and in turn learning activities are created specifically to gather evidence of learning. From this evidence, the teacher has collected information to help scaffold student feedback in order to enhance learning. Peers are also an important agent for feedback. Through peer discussion, knowledge of the learning outcomes and success criteria are needed; which helps students understand the expectations for their own learning, enhancing the students’ ability to self-assess their work. When confronted with opposing views, discussion also provides peers an opportunity to challenge, defend, or perhaps change, their current views. All these roles and activities play an important part in the process of learning. How can teachers instruct in a manner that attends to this continuous formative assessment process? How can preservice teachers learn this process in a meaningful way during their teacher education courses? Case method may be one such teaching tool that provides such opportunities. Case method is a unique tool because it not only provides relevant assessment information within the cases, but by engaging in the process of case method, the process of formative assessment is actually modeled for preservice teachers. In this chapter, I will provide a summary of the case method research that highlights the use of formative assessment strategies; specifically the five key strategies of formative assessment (Wiliam, 2010). I will also discuss how case method can accommodate a formative mode of teaching and learning.
2.5.2 Using case method to teach formative assessment strategies: The literature

Research on using case method to specifically promote the explicit use of formative assessment for preservice teachers is non-existent; however, there is research that incorporates the use of formative assessment strategies within cases. For example, the use of cases to introduce content with the purpose of promoting student reflection, peer and class discussion, and teacher and peer feedback. In this chapter, I will share examples of research that highlight case method use to promote an awareness of teaching and learning through the five key components of the formative assessment process: providing understandable learning targets and success criteria; eliciting evidence of learning through tasks, questioning, and discussions; incorporating feedback cycles between students and teachers; encouraging and facilitating peer-assessment as an instructional resource; and teaching students to take ownership of their own learning (Wiliam, 2010). It is important to note that the five key strategies of formative assessment are an intertwined set of approaches that are all utilized for the common goal of improving student learning. In the following section, research studies have been chosen because they demonstrate the impact each assessment strategy has on student learning; however, it is apparent within the research that although one strategy might be the primary focus, other formative strategies are also utilized.

2.5.2.1 Learning targets and success criteria

When looking over Wiliam’s (2010) list of strategies for best practices in formative assessment, the first strategy listed refers to providing understanding learning
goals followed by criteria used in judging success. If learning goals and success criteria are not explicitly formulated and shared, the other four formative assessment strategies are difficult, if not impossible, to perform accurately. Clear and understandable expectations are the foundation for effective formative assessment. Understanding the goals and criteria are not only imperative for students to assess their own success, but it is also a framework the teacher uses to accurately assess student understanding. Although classroom assessment should focus on how well the learning objectives have been met (Popham, 2003), it is not uncommon for faculty to neglect linking their classroom activities to student learning objectives (Nesbitt & Cliff, 2008). In their research study, Nesbitt and Cliff (2008) highlight the importance of understanding learning objectives when creating learning activities, such as cases, for students. The authors stated, “the best case studies are written to invite students to explore a multitude of intellectual pathways with learning objectives serving as trail markers for the educational journey ahead” (p. 279). Nesbitt and Cliff were interested to see if anatomy and physiology faculty members could create open-ended questions (questions with more than one possible solution) and closed-ended questions (well defined problem with only one answer) when given a real-life case describing an Olympic athlete who tested positive for blood doping. The authors were specifically interested in investigating how closely aligned the participants’ open- and closed-ended questions were with their stated learning objectives for the case.

Nesbitt and Cliff (2008) lead two workshops regarding the use of open- and closed-ended approaches to case studies at a national meeting of the Human Anatomy and Physiology Society. Participants included a total of 50 anatomy and physiology
educators from both workshops interested in using case method in their own teaching. During this workshop, the authors provided the participants with an introduction to using cases as a learning tool, as well as a description of the purpose and utility of using open- and closed-questions to help teach through the case. Participants were then divided into groups and provided a worksheet that included the case narrative, and a space to write the learning objectives and case questions. Groups were randomly assigned to creating either open- or closed-ended questions. Participants were provided with specific instructions for creating learning objectives and questions prior to the group’s development of the questions.

Nesbitt and Cliff (2008) collected the group-generated learning objectives and case questions at the end of both workshop sessions and evaluated how well the case questions aligned with the stated learning objectives. The authors independently rated the participants’ questions as either being open, closed, or ambiguous (having the possibility of being either open or closed due to inadequate wording); rater reliability was 89%. Of the questions the authors disagreed, six were categorized as ambiguous by one of the authors and four were classified as either open or closed.

From the collected worksheets, Nesbitt and Cliff received 72 learning objective and 91 case questions. The authors verified all learning objectives as being relevant to the case of blood doping and the questions were also appropriate for the case content. The authors stated that the participants demonstrated that they could successfully create exemplars of open- and closed-questions; however, when it came to alignment, the questions were not well aligned with the stated learning objective for that question.
Nesbitt and Cliff reported that workshop participants spend little time or effort thinking about and writing learning objectives. In fact, the participants all rushed through this process and spent a majority of their time establishing case questions. In addition, the authors stated that most lesson objectives were submitted as either brief topic statements or outlines of the content covered. Performance outcomes were not measured; the objectives did not summarize what the student should do to demonstrate understanding. Nesbitt and Cliff claim that this occurred despite the fact that examples provided for the participants were performance-based. Lastly, Nesbitt and Cliff state that the gap between the stated objectives and the case questions demonstrate a failure to mindfully connect the objectives to the questions. Again, this occurred despite specific directions to do so during the workshop. The authors state that this type of mismatch is not an uncommon phenomenon for faculty members. Wiggins and McTighe (1998) stated that “too many teachers focus on the teaching and not the learning” (p. 8). If questions are not structured to elicit the answers needed to identify whether students understand the learning goal, Nesbitt and Cliff claim that there is no valid measurable way to assess student achievement. Could the use of case method in preservice education help demonstrate the importance of identifying learning objectives prior to specifically creating questions to obtain student understanding?

Nesbitt and Cliff (2008) studied the participants’ questions and found a wide variety of useful questions that spanned the spectrum of Bloom’s taxonomy. The questions ranged in difficulty from foundational knowledge to analyses of specific scientific processes. As expected, by their nature, the open-ended questions tended to ask
students to use higher-level analysis skills, encouraging students to arrive at a novel solution. Closed-ended questions, on the other hand, addressed lower-level cognitive thinking skills such as knowledge or comprehension. Nesbitt and Cliff state that both open- and closed-ended questions are appropriate and useful in gathering information about student learning; the appropriate use of each is simply a matter of what information you are trying to obtain from the students. The participants demonstrated that they could write both types of questions well; however, participants were more successful in writing closed-ended questions. Of the questions identified by the participants as closed-ended, the authors judged 88% of them to actually be closed-ended. Of the open-ended questions, the authors judged 43% of them to actually be open-ended. Nesbitt and Cliff state that this is not surprising because it is more difficult to write higher-order thinking, open-ended questions that directs students along numerous lines of inquiry with multiple viable solutions. In addition, open-endedness is not a common phenomenon in science education; many teachers become accustomed to writing questions that elicit one correct answer. Is it easier for an educator to align closed-ended questions to a single learning outcome? Nesbitt and Cliff include a quote from McComas and Abraham (2008) who stated, “Study after study reveal that although educators know that higher-order divergent question held significantly more power to engage the learner and ensure transfer of knowledge, we consistently retreat to using lower-order, convergent style questions when teaching and testing students.” Effective questioning comes from a teacher’s ability to pay close attention to the desired learning outcomes, as well as the context of the questions and the kinds of responses the students will most likely provide. In conclusion,
Nesbitt and Cliff state that their findings indicate that both open- and closed-ended questions can be well crafted for case use. To serve as a valid measure of student understanding, learning objectives must be kept in the forefront of the teacher’s mind. Appropriately linking learning objectives to classroom activities is an essential piece of the formative assessment process.

Although the participants in Nesbitt and Cliff’s (2008) study were not preservice teachers, they were teachers who demonstrated how difficult it is to align daily formative assessments (i.e. case questions) to specific learning targets. Nesbitt and Cliff’s research methodology modeled formative assessment; they shared clear learning objectives and success criteria with the workshop participants, exemplars were shared, and peer feedback was provided. To close the feedback cycle, the authors could provide expert feedback to the participants and provide an opportunity for the participants to modify their work based on the feedback provided. If this feedback and modification process took place, would the participants have modified their questions to better match with the stated learning objectives? Could teacher educators the use of this type of case activity with preservice teachers to demonstrate the importance of having clearly stated learning objectives and success criteria for students?

2.5.2.2 Eliciting evidence of learning through tasks, questioning, and discussions

A teacher may be able to articulate clear learning objectives to her students, but as Nesbitt and Cliff (2008) demonstrated, if the types of classroom activities are not directly aligned, the teacher will not collect the data needed to accurately assess her students’
understanding. Rosen (2008) was interested in researching the use of case method as an instructional tool to elicit evidence of student learning. Rosen argues that preservice teachers must critically think about educational practices and theories that support student learning. According to Rosen, case-based instruction can provide an avenue for developing and shaping the preservice teacher’s critical reflection about facilitating learning. Rosen describes case-based instruction as a practice that involves vignettes, comprising stories or cases in which complex teaching and learning is contextualized. Case-based instruction also provides preservice teachers with several opportunities to reflect and discuss the complexities of teaching and learning. Hoachlander et al. (2001) argues that situated learning opportunities allow preservice teachers to develop and integrate their knowledge base with instructional decision making, all in real time. Case method is not a substitute for actual classroom teaching experiences; however, due to the fact that preservice teachers have limited experience in the classroom, cases can offer an opportunity for such situated learning experiences to occur. Case method can also be used in conjunction with preservice teachers’ internships. Cases can offer a simulated teaching experience, but when done in a teacher education classroom, is this process an effective tool for eliciting evidence of preservice teacher learning?

To determine the effectiveness of using case-based instruction to elicit teachers’ evidence of learning, Rosen (2008) focused her research on preservice teachers’ ability to reflect. Not only is reflection an important professional skill, Nicol and Macfarlane-Dick (2006) state that it is also a key aspect of good formative assessment. Reflecting on strengths and weaknesses, and the ability to listen to and incorporate peer and teacher
feedback, is key to quality formative assessment practice (Nicol & Macfarlane-Dick, 2006).

Rosen (2008) analyzed preservice teachers’ written reflections when asked to answer the following questions: How does case-based instruction compare to non-case-based instruction for developing preservice teachers’ reflective thinking? and Does the method of delivery (paper versus computer) effect preservice teacher’ reflective thinking? Rosen used the Reflective Thinking Scale, or RTS, (Sparks-Langer, Simmons, Pasch, Colton, & Starko, 1990) to determine differences in preservice teachers’ reflective narratives. The RTS uses seven different criteria for assessment of reflective thinking. The criteria range is described in detail, beginning with “level one” which is explained as having no descriptive language about learning and teaching and ending with “level seven” which is described as having an explanation with ethical/moral considerations.

Participants for Rosen’s (2008) study included 60 undergraduate teacher candidates enrolled in a three sections of the same methods course; of the 60 participants, 46 female and 14 male. The participants were all involved in a field experience at a local urban public school, in which they spent five days per week in the classroom with a cooperating teacher. An evening seminar at the university was required one day a week. The research took place for a six-week period during the seminar sessions.

In her quasi-experimental design, Rosen (2008) examined the impact of case-based instruction on preservice teachers’ reflective thinking. Rosen evaluated changes in the preservice teachers’ written reflections from pre- to post-test using the RTS. Two formats for case-based instruction were created; a paper version and a computer version.
The only difference between the two types of case-based instruction was the mode in which the preservice teachers’ received them; they covered the same topics, contained the same six cases, and had the same activities associated with each case. Of the six cases, Rosen created two and adapted the last four from Desberg, Colbert, and Trimble (1995). The cases were created to allow the preservice teachers a common base in which a discussion could occur. Each of the three sections received a different mode of instruction. Group A used the computer cases, Group B used the written cases, and Group C was the control group. The instructors of the three sections viewed and discussed each case. This measure helped keep each of the seminars as equivalent as possible. Each instructor was also informed about discussion strategies to use with their students.

The participants in all three sections took a pre-test that included watching a case video and writing a reflection about the case. Then, each of the three groups received the same standardized introduction before starting the course. Groups A and B received case based instruction; computer cases and written cases respectively. The students in Groups A watched the cases while sitting in groups, discussed the details of the case, noted any learning issues, compared observations and analyzed the expert analysis statements made by a variety of “expert” school-based professionals. As a final activity, the preservice teachers typed their reflections into the computer program. Group B’s instructions were identical, except they read the case and wrote their reflections on a piece of paper at the end of the activity. Group C did not receive case-based instruction. Alternative instructions were provided which related to the topics discussed in the six cases, focusing on an opportunity to discuss related personal teaching and learning experiences. When
the six case-based instructional programs were completed, all preservice teachers took a post-test; this was a written reflection.

Rosen (2008) analyzed the pre- and post-test using the RTS. The RTS coding system employs content analysis to code reflections, focusing on three areas to determine the quality of student reflections: quality of evidence, quality of discussion, and quality of impact. Two experienced teacher educators used content analysis methodology to code participants written reflections; this was done by looking at the participants’ data for key words, pedagogical principles, and patterns that aligned with the RTS framework. The raters were trained on using the RTS program and inter-rater reliability was 90%.

According to Rosen (2008), in order for the raters to determine RTS scores for each written reflection, the raters looked for key words and language patterns within the reflections that indicated specific RTS levels. This was done for 21 participants in Group A, 20 participants in Group B, and 19 participants in Group C. Group A, B, and C had mean pre-test scores of 2.95, 3.10, and 3.37 respectively. Mean post-test scores all increased to 5.14, 4.15, and 3.53 respectively; however, the increases were not uniform. Group A increased the most, reaching a level five position, indicating an advanced level of technical thinking. Group B increased to a level four position, indicating an intermediate level of technical thinking. Group C, as compared to the other two groups, only slightly increased, but remained at a level three. This level indicates the lowest level of technical thinking. An ANOVA and post hoc tests were conducted to determine whether the differences in means were statistically significant. There was no statistical significant pre- \((F = 1.703, p = .192)\) or post-test \((F = 2.076, p = .192)\) difference in terms
of quality of evidence across Groups A, B, and C. Likewise, there was no statistically significant difference between the application of education theory across the three groups in the pre-test ($F = 1.031, p = .364$). There was a statistically significant difference in the post-test, however ($F = 5.831, p = .005$). Rosen performed a Tukey post hoc test to conduct a pairwise comparison of the means. Rosen states that the results suggest the computer group outperformed the other two groups; with Group A having a mean of 2.29, Group B with a mean of 1.86, and Group C with a mean of 1.59. Lastly, written reflections were analyzed. Pre-test differences were not statistically significant across the three groups ($F = 1.780, p = .177$). Post-test differences, on the other hand, were statistically significant ($F = 5.470, p = .007$). Rosen performed a post hoc test and again found the computer group outperformed the other two groups.

As anticipated, Rosen (2008) found that reflective thinking scores improved more for students participating in student teaching, seminar, and the case-based instructional treatment as opposed to participants involved in student teaching and the traditional seminar without case-based instruction. Rosen inferred that case-based instruction was successful because it provided instructional stories in which everyone had a common starting point; everyone in the group had all of the same information. The non-case-based instruction relied on students recalling personal teaching experiences and sharing this information with their group. Some participants may have been at a disadvantage with this method of discussion if they could not relate to their classmate’s experience. Having a common situation, explained the same way to all group members enriches the discussion because each person has a common ground to start on and can bring in their
own interpretations; this can increase the richness and variety of group discussion. Rosen (2008) warns that collaborative discussion can be difficult when the discussion revolves around personal experiences because reflection is dependent on each group member’s ability to relate and share in the specifics of the situation. Indeed, an advantage to using case method instruction is that the case represents a real-life situation that helps to transform the traditional principles and theory from dull and difficult to a memorable and meaningful lesson; this lays the foundation for critical reflection and therefore promotes the transferability of principles into teacher instruction (Shulman & Colbert, 1988).

Through Rosen’s (2008) argument, it is logical to see why students using the case-based instruction were able to better reflect on the teaching and learning situations. What is unclear is why data from the computer-based case instruction group was higher than the data collected from the written case instruction group. Rosen claims that the difference may be related to cognitive load; students viewing the video cases expended less cognitive load on decoding the visual information and more cognitive load on thinking about teaching and learning. On the other hand, Rosen states that participants reading written cases expended greater cognitive load as they decoded the narrative, in turn affording less time for reflection on the teaching and learning that was represented in the case. These are interesting concepts in which to conduct further research. Do different modes of presenting cases change a person’s cognitive load? Does cognitive load affect a person’s quality of reflection?

The data from this study helps support that case-based instruction, in conjunction with field experience, can indeed increase preservice teachers’ reflective thinking skills.
In this study, cases provided teacher educators with “evidence of student learning” in the form of preservice teachers’ gains in reflective thinking. Cases are a unique tool because they are stories specifically generated to describe certain topics or address certain issues. Instructor questioning and discussion that surrounds the case experience allows the teacher in eliciting evidence of student learning. Eliciting such evidence provides the teacher with a framework for continued learning; student feedback from questions and discussion provide the instructor with an idea of what the student understands and what areas need further work. This process starts the feedback cycle. What the teacher does with student response information is crucial.

2.5.2.3 Incorporating feedback cycles between students and teachers

The theory of situated cognition calls for embedding instruction in an authentic context (Jonassen, 2000). Andrews (2002) highlights a major challenge with teacher education today; finding ways for preservice teachers to be exposed to and participate in authentic instruction. Connecting preservice teachers with experts in the field of authentic instruction is difficult due to monetary, time, and geographic constraints. According to Andrews, this connection is of great importance for transfer of learning to occur; situated learning in addition to expert feedback provides a stimulating and motivating learning environment for preservice teachers. Knowledge and the application of this knowledge must be closely tied for a preservice teacher to be able to generalize this knowledge beyond classroom learning (Cantrambone & Holyoak, 1989). Andrews acknowledges the difficulty for teacher educators to provide authentic classroom situations in which
preservice teachers can receive feedback from expert teachers; yet she devised a research study to demonstrate the importance of the novice/expert interaction in relationship to preservice teacher learning.

Case method is not routinely used in teacher education courses; however, teaching with cases has been shown to improve problem solving, critical thinking, and theory to practice transfer (Abell, et al., 1998; Andrews, 1996; Schön, 1987; Shulman & Colbert, 1989). Andrews (2002) conducted a descriptive study to examine the impact that expert feedback on case method reflections had on preservice teachers’ learning. Participants included 40 preservice teachers in three different sections of a required course that focused on teaching students with disabilities in a general education class. Preservice teachers used a Web-based platform to read and reflect on teaching cases. An expert teacher with 15 years experience provided feedback to the participants’ case responses.

Four instruments were created to collect data for this study: a case, lesson planning tool, lesson analysis guide, and a survey. The researchers and the collaborating expert teacher developed the case. A real-life classroom narrative was provided, including a description of two students with disabilities. At the end of the case, preservice teachers were asked to develop a lesson that would be appropriate, yet challenging for all the students in this class. The online lesson-planning tool consisted of a lesson plan outline that guided preservice teachers to develop, modify, and adapt the lesson. The lesson analysis guide clarified the necessary features for an adapted lesson plan for disabled students. The collaborating expert teacher used this guide to provide feedback to the preservice teachers. Lastly, a survey gathered preservice teachers’ perceptions of the
use of case method as a tool for learning in teacher education and to prepare teachers for diverse student populations. The survey also asked questions about preservice teachers’ perceived changes in thinking and skill as a result of expert feedback provided during instruction, and the ability to use feedback to modify their work.

Preservice teachers were placed in heterogeneous learning groups, ranging in age, ethnicity, gender, and teaching experience. The preservice teachers were asked to review the case on their own time, post comments online to fellow classmates, and come prepared to the next class period with ideas about how to address student needs. During this next class period, groups discussed the case, a whole class discussion occurred, and then groups met again to brainstorm effective and appropriate lesson ideas, as well as accommodations for highlighted case students. Using the online planning tool, groups then went to the computer lab to write and submit their lesson plan. The collaborating expert teacher provided detailed feedback for each groups’ lesson plan; this feedback included comments, questions, and suggestions for improvements. During the next class period, the preservice teachers were able to read through their feedback and address any questions, comments, or suggestions they felt needed their attention. This revised lesson plan was then submitted. The preservice teachers wrote reflections and completed a survey about their experiences working with the case.

Andrews (2002) analyzed the lesson plans. Prior to feedback, all groups submitted lesson plans that contained only “surface adaptations.” These types of modifications included changing the student’s seat relative to the teacher, allowing certain students to complete fewer problems, or having students do less complicated problems. Four of the
ten groups also included an “intense adaptation” which included pairing students for peer instruction and creating cooperative learning teams. After expert feedback was provided and the student teachers had an opportunity to discuss modifications, Andrews noted that all groups expanded their original lesson plans to include more detailed adaptations to meet the needs of all students in the case narrative.

The number and detail of surface adaptations remained the same between the pre- and post-feedback lesson plans. The total of intense adaptations, however, increased from 5 to 23 after feedback was provided. Andrews (2002) categorized adaptations into three main types: (1) changing instructional strategies to include appropriate pacing of the lesson, multi-sensory presentations, modeling, and asking multi-level questions; (2) actions going beyond the lesson such as pre-teaching, using peer support groups, personal meetings with the students to encourage self-regulated learning; and (3) multiple ways to demonstrate mastery of learning such as allowing students to participate in the creation of assignments, and building on student strengths rather than focusing on weaknesses.

Lastly, the survey results were analyzed. Andrews (2002) organized the results into two main categories: students’ perceptions of case method and students’ perceptions of case activities to promote learning. Survey responses were on a scale of one to five, with one being the lowest score. For the survey questions clustered under the use of case method, the preservice teachers’ averaged a response score of 4.0 ($SD = .68$). Of particular interest are two specific survey statements: case method increasing preservice teachers’ ability to adapt instruction (4.2, $SD = .83$), and real life cases helped preservice teachers’ apply knowledge and skills (4.8, $SD = .4$). For the survey questions clustered
under case activities to promote learning, the preservice teachers’ averaged a response
score of 4.3 ($SD = .38$). Of particular interest within this cluster are two specific survey
statements: feedback improved adaptation skills (4.0, $SD = .44$), and responding to cases
involved preservice teachers in their own learning (5.0, $SD = 0$).

Lastly, Andrews (2002) analyzed the preservice teachers’ reflection papers and
categorized the responses into three main themes: (1) an increase in preservice teachers’
confidence in teaching; (2) a positive effect of peer collaboration; and (3) a benefit to
using real case narratives versus hypothetical situations.

Andrews (2002) data suggests positive learning gains when using case method to
support preservice teachers’ learning. Andrews stated that after using case method some
preservice teachers claimed higher concern about their ability to adapt instruction for
students. Andrews states that this could be a factor explained by Hall and Hord (1987);
concern levels increase when first exposed to new experiences, however this is not
problematic unless the concerns are not addressed properly. Andrews goes on to state that
case method is advantageous because it can help structure instruction so that students
develop multidimensional, interconnected knowledge that can be transferred to new
situations. When collaboration, feedback, and modification based on expert feedback
were provided, preservice teachers demonstrated positive learning gains.

Authentic problems, as suggested by Andrew’s (2002) data, provide an opportunity
for students to learn in an environment that simulates the professional environment in
which these students will soon be employed. Expert feedback provides students with
guidance from an experienced teaching professional, allowing the student to better
understand the classroom environment. What about peer interactions? Can preservice teachers gain additional knowledge and skills from their less experienced peers?

2.5.2.4 Encouraging and facilitating peer-assessment as an instructional resource

As suggested by Andrews (2002) research, authentic learning encourages students to be lifelong and self-directed learners (Weiss, 2003). Weiss states,

When students solve a problem that is of real interest to them, they will probably find their own solutions to be inadequate. Therefore, they are more likely to become self-directed learners and pursue further analysis of and alternative solutions to the problem. Furthermore, as students work collaboratively, they likely will assimilate a variety of approaches toward solving problems. That is, students learn from each other how to solve problems. Because of this type of assimilation, each student will learn new and novel—at least to that student—approaches for acquiring knowledge and solving problems (Barrows, 1996; Gijselaers, 1996) (p. 28).

In tune with Weiss’s research, Hewitt, Pedretti, Bencze, Vaillancourt, and Yoon (2003) were interested to what extent peer interaction affects preservice teachers approaches to solving classroom problems.

Hewitt et al. (2003) stated that most teacher education programs teach abstract educational concepts that preservice teachers have difficulty relating to classroom teaching and learning. When in the classroom, teachers are constantly immersed with complex situations; in order to address pressing questions and problems, quick decisions are required. Hewitt et al. claim that these types of decisions are a product of emotion, needs, values, and habits. Schön (1987) proposed that teacher education programs should support preservice teachers’ deep reflection on classroom behaviors and reactions to certain teaching scenarios. Hewitt et al. developed an activity that addresses such a
proposal. In their study, Hewitt et al. provided preservice teachers with a case study describing an elementary science lesson. At four different points in the lesson, the video is stopped and the preservice teachers are asked to quickly decide how they would handle that particular situation. Self-reflection occurs, followed by peer discussion, and then a reconstruction of how they might now handle the situation. The authors argue that this activity helps teacher candidates develop reflection skills.

Three questions guided Hewitt et al.’s (2003) research: Do preservice teachers feel they have time to think and reflect on problems while teaching? After peer discussion, how do the preservice teachers modify their immediate response to the scenario? and Did the preservice teachers feel this was a useful activity? For the purposes of this literature review, I will be focusing on Hewitt et al.’s second and third research questions as it pertains directly to using case method to encourage and facilitate peer-assessment as an instructional resource.

Peer involvement is an important aspect of the learning process; it can influence students’ conceptions of teaching and learning. As a teachers’ behavior may be influenced by social, cultural, situational and psychological factors, Korthagen and Kessels (1999) suggest that teachers who reflect on their teaching might be able to assimilate new information into their existing schema. Hewitt et al. (2003) decided to investigate this concept by creating a video-based case study. The authors state that preservice teachers do not always have extensive opportunities to practice their teaching and reflection skills. The video case studies provide a simulated environment in which
the preservice teachers can reflect upon and discuss real-life teaching episodes with peers.

Hewitt et al. (2003) conducted their research at the University of Toronto. Two classes of preservice teachers were invited to participate; 40 students volunteered. The students were part of a one-year, post-baccalaureate teacher education program. Hewitt et al. administered the video cases between the first and second practicum teaching experience. The researchers described the video as consisting of multiple vignettes; one third-grade science lesson was recorded and stopped at four different locations. The lesson consisted of a ten-minute discussion, a 20-minute small group activity, and a five-minute summary of the lesson. The video discussion was shown in its entirety, but the rest of the video lesson was not. The video consisted of 26 segments ranging in time from 30 seconds to four minutes. The segments consisted of student discussions in their small groups and interactions between students and the teacher. Along with the video, the preservice teachers were given a copy of the teacher’s lesson plan, the student activity sheets, a rationale for the lesson, and photographs and videos depicting the classroom environment.

The preservice teachers viewed the video segments individually online. At four different occasions the video stopped. Each pause occurred at a point in the lesson where the teacher was faced with an unexpected decision. The situation represented one in which Hewitt et al. (2003) felt the preservice teachers would face during their own teaching experiences. The four different situations were briefly described. The first situation involved a student posing a question that seemed to be off topic. The second
situation involved a student who was frantically trying to grab the teacher’s attention. The teacher was in the middle of an explanation so she signaled that the student would have to wait a minute. Once the student had the opportunity to speak, the student made an “advanced” observation about the experiment being conducted. The third situation occurred during the group activity. One student remarked that she didn’t understand why they were doing this experiment. The fourth situation occurred during the wrap up session. One student asked a challenging question, relating what they had learned in class to a different situation.

Hewitt et al. (2003) used three separate sources for their data collection. Firstly, at each of the four points in the video, the preservice teachers were asked to write down their immediate reactions to how they might handle that particular situation. This reaction was written on a reflection sheet provided to each student.

Second, after the written reflection, the preservice teachers then shifted into groups of two or three people and asked to compare responses. During group discussions, three groups were randomly videotaped and the conversation was transcribed. After the discussion, the preservice teachers were given the opportunity to revise their responses based on their classmates differing viewpoints. These responses were recorded below the initial response. The preservice teachers were allowed to watch how the teacher handled the situation on the video, but it was prefaced by the fact that the teacher’s approach was not necessarily the correct or best response.

Lastly, all preservice teachers filled out a questionnaire at the end of the study. The questionnaire assessed the effectiveness of the video-case method as a teaching tool.
In addition, it was noted that the principle investigator’s observation and field notes were used.

Hewitt et al. (2003) analyzed the data using a naturalistic research paradigm; emerging patterns from the data were used by two of the researchers to establish categories and themes. The reflection sheets were analyzed to determine to what extent the preservice teachers modified their reactions after peer discussions. Three categories were established: no change, modification, and re-invention. Modification referred to a refinement of the preservice teacher’s original statement. Re-invention referred to a complete change in opinion. The authors indicated that 70% - 90% of the preservice teachers either made modifications to their immediate responses or reinvented their responses after peer discussion for each of the four responses. Conversely, after peer discussion, 10% - 30% of the preservice teachers made no modifications to their original reflection. Of interest is the skewed distribution of modified versus reinvented responses for the fourth scenario when compared to the other three. The first three scenarios have relatively split percentages (approximately 30% each) between the modified and reinvented categories. The fourth scenario, on the other hand, has only one student with a modification and 24 students with a reinvention.

Hewitt et al. (2003) further analyzed the reinvention category. A comparison was done between the preservice teachers’ immediate response and the reinvented response in order to better understand the transformational process that occurred during peer discussions. Four main categories emerged from this analysis: the creation of a new explanation (38.2%), redirection of the original query (34.2%), the pace of the lesson
(19.7%), and classroom management (6.6%). The percentages represent the preservice students who were grouped in the corresponding categories. The highest percentage of students, grouped in the category pertaining to the creation of a new explanation, was identified as teacher candidates that responded in their immediate reaction with an explanation. This occurred more commonly in the first, third, and fourth challenge. Many of the preservice teachers decided to replace their old explanation with a new one. New explanations offered more information, some containing metaphors to help with clarification. The second highest categorization, redirection of the original query, identified preservice teachers’ who typical reacted to a students question by responding directly with an explanation. After reflection, some preservice teachers redirected the question back to the student or the class in general, asking for their input instead of providing the answer. This occurred more frequently with the third and fourth scenarios, as these situations were more conducive to such behaviors. The third grouping, pace of the lesson, identified preservice teachers’ who made changes associated with the need to keep the lesson from being sidetracked. This occurred more frequently in the first two scenarios, as they were both concerning the teacher’s presentation of a lesson. The last category, changes related to classroom management, identified preservice teachers who felt classroom management was a more pressing issue than delivery of science content. After reflection, some preservice teachers commented that they would address the child’s frantic hand waving first, and then address his discovery. This surprised the authors, as they didn’t feel the child’s hand waving was a negative behavior. Hewitt et al. point out
that the lack of classroom experience and the pressing concerns classroom management for novice teachers may affect the way in which they respond to this scenario.

Hewitt et al. (2003) note that over 70% of the preservice teachers modified or reinvented their immediate responses after peer discussion. The authors point out that after the group discussions the preservice teachers paid more attention to timing issues, classroom management concerns, and re-directing student questions back to the students. For the most part, these new reflections seem to be advantageous for preservice teachers, but does a revised response necessarily mean a “better” response? One limitation to the use of scenarios as teaching tools is that they are a representation of a complex situation, possibly representing many different variables. One response may not be more advantageous than another. However, encouraging the reflection process early in a person’s teaching career may promote reflective practices that lead to improved teaching and learning in the future.

Questionnaires were analyzed to determine how useful the preservice teachers felt the scenarios were as a teaching tool. Hewitt et al. (2003) stated that almost all of the preservice teachers felt that the activity had professional value; as they felt awareness of their own reactions to teaching scenarios increased. It was also stated that some felt the reflection discussions were beneficial.

In conclusion, Hewitt et al. (2003) state that case study methodology represents a new type of case study; one in which common teaching situations were presented and used as a tool for reflection and discussion. The cases presented in this study are not ones in which exemplary teaching is the focus nor was it the goal to present a situation in
which the preservice teacher needed to solve or analyze an instructional dilemma. Hewitt et al. stated that the analyzed results suggest three benefits for using case study methodology. First, case studies encourage discussion about specific teaching decisions. Second, the reflection and revision of the preservice teachers’ reactions to a teaching scenario offered awareness that their immediate reactions to classroom situations might not always be the ideal reaction. Thirdly, some preservice teachers were surprised by the varying reactions of their fellow peers to the same teaching situation. Case studies promote the acknowledgment of differing views and highlight the advantages of discussing these views with other teachers.

The case studies do offer an opportunity for peer analysis and discussion of teaching situations, promoting different views regarding the same situations. There are some limitations to such an approach. The preservice teachers are not afforded the luxury of seeing how their own reactions might be played out, that is until it possibly happens to them in a real classroom setting. Hewitt et al. (2003) acknowledge case study limitations, such as the problem of replicating the dynamic nature of classroom interaction. However, the authors state that the case studies foster introspective analysis and discourse regarding teaching practice, as well as place the focus away from the teacher in the video and more on the preservice teacher themselves. These types of case tools cannot replace actual in-class experiences, but they can encourage habits of practice that preservice teachers can take with them into the classroom. Do these activities provide the types of experiences that encourage students to take ownership of their learning?
2.5.2.5 Teaching students to take ownership of their own learning

Griffin (2003) states that preservice teachers face a difficult task in learning how to critically reflect and examine their pedagogical practices. This is most likely due to the fact that they base their ideas about teaching on their own educational experiences as a student. Sitting in a classroom as a student, and instructing the class as a teacher, are very separate activities. As a student, the process and role a teacher takes in the classroom may not be apparent. On the other hand, the student may not have had quality teachers to demonstrate proper pedagogy. Griffin states that unless preservice teachers are firmly and confidently grounded in the art of effective pedagogical reflection, critical thinking, and decision-making, the preservice teacher may quickly lose sight of the importance these knowledge and skills have in effective teaching.

Griffin (2003) was interested in examining the effectiveness of The Critical Incident (Tripp, 1993) on preservice teachers’ ability to critically reflect on their teaching practices. The Critical Incident is a writing and reflection tool that asks preservice teachers to: describe and explain an incident that occurred during their teaching, to identify a general meaning for the incident, to take a position on the meaning, and to describe any the actions that will be taken to remediate the incident. The intent of this tool is not to focus on the experience itself, but the meaning behind the incident. Griffin argues that The Critical Incident activity provides an opportunity for preservice teachers to examine multiple possibilities before forming a conclusion.

Dewey (1933) stated that reflective teachers possess the attributes of open-mindedness, responsibility, and wholeheartedness. Later, Schön (1983, 1987) categorized
teachers’ action with reflection as reflection-on-action and reflection-in-action; the
former as reflecting after the teaching occurred and the latter as reflection during the
teaching event. Griffin’s use of The Critical Incident took on a reflection-on-action role;
preservice teachers were asked to choose reflect on an Incident after it had occurred in
the classroom. The Incident’s role was to help preservice teachers identify assumptions
governing their actions and to effectively deal with complex problems.

The Critical Incident format guided preservice teachers to: (a) use the language of
their profession; (b) connect theory to practice as they explain their practice; (c)
connect their practice to the standards of their profession; and (d) describe how
their reflection/analysis would affect their actions in the classroom and school
communities.

Griffin’s (2003) research was conducted during a co-requisite instructional
activities course at a Midwestern university in which the author was the instruction.
Participants included 28 undergraduate preservice teachers with 210 hours of structured
field experience. Griffin collected 135 Critical Incidents from the preservice teachers
during a six-week, half-day field experience. During this co-requisite course, the
preservice teachers were introduced to the format and purpose of The Critical Incident,
and were provided exemplars. To scaffold instruction, Griffin asked the preservice
teachers to complete the first half (identifying and describing an Incident) of the first two
Critical Incidents one their own. In groups, the preservice teachers completed the second
half (the meaning of the Incident). After completion, the Incident descriptions were
submitted to the author for detailed feedback. Class discussion then occurred in which the
author shared student work examples and lead a discussion about the strengths and
weaknesses within the Incident forms. Small group discussion followed in which students provided peer feedback and discussed their perceptions of the Incident.

The remaining Critical Incidents were completed individually and turned into Griffin (2003) during the six-week internship. A review panel, which consisted of the author and two other expert teacher educators, rated the Critical Incidents with a 75-85% agreement rating. The panel rated the Critical Incidents on four dimensions: (1) level of language (layperson versus pedagogical description); (2) level of thinking (personal preference, principle/theory, principle/theory with contextual factors); (3) degree of orientation towards growth and inquiry (concrete thinker, alert novice, pedagogical thinker); and (4) models of reflective thinking (technical, contextual, dialectical) (Griffin, 2003). Results from these four categories are discussed in the next paragraph.

Under the level of language dimension, the review panel found no pattern in the use of preservice teachers’ use of terms. Both layperson and pedagogical terms were used frequently; 71 incidents used only layperson and 61 incidents used pedagogical terms. Of the 28 preservice teachers submitting 135 incidents, there was no incident that contained only pedagogical terminology.

Under the level of thinking dimension, 87% of the incidents were written at the first two levels of thinking: 58 contained personal preference and 60 contained references to principle/theory. The next two higher levels of thinking contained significantly less incidents: 14 referenced principle/theory with contextual factors, and 2 incidents contained considerations of technical, moral, and political views.
Under the degrees of orientation toward growth and inquiry, the panel identified two-thirds, or 88, of the incidents as written at the concrete thinker level. Griffin (2003) describes this level of thinking as relying on personal experience in learning to teach and focusing on “how” rather than “why” questions. The panel identified 44 incidents as alter novices; exhibiting strong orientation towards inquiry teaching, value exploration, and are reflective in nature. Only one incident was categorized as containing pedagogical thinking; that is, being student-oriented, demonstrating tentative conclusions, and possessing a moral awareness of teaching.

Lastly, under the modes of reflective thinking dimension, the panel identified 88 of the incidents as technical (effective application of skills and technical knowledge), 49 as contextual (reflection regarding assumptions and consequences of classroom practice), and 3 as dialectical (concerned with moral, ethical, or socio-political issues) in reflection.

At the end of the semester, the preservice teachers were asked to share their perceptions regarding their ability to critically reflect on the Incidents that occurred during their teaching experience. Of the 28 preservice teachers involved in this process, 19 stated The Critical Incident provided an avenue to improve their ability to analyze and evaluate their practice, as well as take into account multiple perspectives. Overall, Griffin (2003) stated that more than one-third of the preservice teachers commented that this process helped foster self-assessment skills, allowed them to look deeper into classroom issues before taking action, and highlighted the importance of figuring out proper unbiased solutions instead of “blaming” others for what had occurred. Data indicated that preservice teachers increased their degree of orientation toward growth and inquiry, and
assisted in developing the skills to look at the Incidents in the larger picture rather than focusing on personal experiences.

Griffin (2003) concluded by drawing attention the preservice teachers’ shift from blaming others to taking ownership of learning and teaching. Griffin stated,

One-third of the preservice teachers discussed how initially they had blamed the situation, another person, or other factor for the dilemmas in their incidents instead of assuming some or all of the responsibility, signaling the beginning of a shift from self-orientation to student-orientation. They valued the need to look at all sides of an issue from multiple perspectives. They searched deeper and more broadly for the truth, and used coursework and research to support their teaching practice. Significantly, they overcame personal fears, evaluated themselves and their fieldwork experiences, and attempted to make changes.

Regardless of prior educational experiences, Griffin concluded that The Critical Incident process offered preservice teachers an explicit model to guide and improve critical thinking and reflection skills. The process of writing real incidents, receiving peer and instructor feedback based on interpretations of the meaning of the incidents, and using this feedback to inform continued work provides the scaffold needed to improve reflection of teaching and learning, and to increase ownership of learning.

2.5.3.1 Summary

Referring back to Sheppard’s (2000) quote, questions were posed regarding a shift in classroom culture from a teacher-directed environment to one in which both teachers and student share responsibility for learning. Can we create a learning culture where students and teachers would have a shared expectation of learning, and students are motivated to take control of their learning? From the literature presented in this chapter, I would argue that the answer to this question would be yes.
Resnick (1989) states that learning is recognized as a process of knowledge construction rather than knowledge reproduction. Since learning is not linear or decontextualized, assessment should follow; assessment tasks should reflect real world use of knowledge and skills. Learners are motivated by real-life problems that require real-life solutions (Kolb, 1984). One of the major problems within teacher education is the lack of situated learning experiences; student internships provide preservice teachers with real-life classroom teaching experiences, however these internships usually occur for a short period of time at the end of the preservice teachers’ program. The lack of real-world experience creates a problem for preservice teachers because the pedagogical theory they learn throughout their college courses cannot be assimilated into a meaningful context if one such schema does not exist. There are teaching methodologies that can help to overcome this obstacle. Case method is one such teaching tool. Case method introduces learners to real-life teaching situations they are likely to face in the classroom; situations involving problems they will be required to solve (Niemyer, 1995). Parcell and Blight (2001) describe using case scenarios as a teaching tool that helps the learner avoid making common mistakes prior to entering the professional field. Parcell and Blight noted several strategies for highly effective medical instruction. Interestingly, these strategies mirror assessment for learning strategies: setting clear expectations; providing specific feedback; encouraging self-assessment; teaching to the learners’ needs; and reflecting on the instructors teaching methods (Parcell & Blight, 2001).

Case method is a unique education tool because it not only uses the formative assessment process to collect evidence of student learning, but it also models the
formative assessment process for the students. Teacher educators can use case method to introduce relevant teaching concepts or issues, and through discussions and written reflections, teacher educators can gather evidence of preservice teachers’ understanding. This informs instruction, and guides teaching and learning. Most importantly, this type of teaching methodology models the process of formative assessment. Explicit modeling, scaffolding, and guidance are key to increasing preservice teachers understanding and use of formative assessment (Buck & Trauth-Nare, 2009; Buck, et al., 2010).

Within this chapter, the literature presented has demonstrated how formative assessment strategies could be successfully used within case method. Each of the five key strategies of formative assessment (Wiliam, 2000) was highlighted. Although each review emphasized a different formative assessment strategy, the process is very much intertwined; each of the five strategies reacts to and influences one another. Nesbitt and Cliff’s (2008) data supports the use of clearly stated learning objectives in order to elicit evidence of student learning. Rosen’s (2008) data suggests that case method can elicit evidence of student learning; however, when students were not given one standard case, they were asked to personally describe a situation that happened to them. These students did not have the same shared-story, and therefore, it was difficult for them to envision the same learning objectives for the case. Andrews (2002) demonstrated that expert teacher feedback promoted improvements in preservice teacher lesson plan adaptations. In this case, after the feedback was provided, the preservice teachers needed to self-assess their previous work, accommodate the feedback, and produce a new or modified product. Hewitt et al.’s (2003) study suggested a similar type of accommodation occurred, only
this time it was delivered through peer feedback. Lastly, Griffin’s (2003) work suggested that preservice teachers were able to increasingly, and in great detail, reflect on case incidents when the process of formative assessment was modeled for them; clear learning objective and exemplars were provided, instruction was scaffolded, work was done alone and in groups that offered peer feedback, the instructor provided feedback, and the preservice teachers used this feedback to modify their understanding. Through all of these formative processes, the preservice teachers stated that they began to take ownership of their learning.

Each study highlighted within this chapter had a different research agenda. Nesbitt and Cliff (2008) were interested in how well faculty, when given a case, could identify appropriate learning objectives and create open- and closed-ended questions that aligned with the objectives. Rosen (2008) was interested in studying the relationship between case-based instruction and improving preservice teachers’ reflective thinking skill. Andrews (2002) examined the impact that expert feedback on case method reflections had on preservice teachers’ learning. Hewitt et al. (2003) investigated the effect peer-assessment and interactions had on preservice teachers’ reflective responses. Lastly, Griffin (2003) was interested in examining the effectiveness of a case method tool on preservice teachers’ ability to critically reflect on their teaching practices.

Interestingly, all of the studies that involved preservice teacher education focused on improving the preservice teachers’ ability to reflect on teaching practices. Indeed, many educational researchers argue that the goal of teacher education is to create reflective teaching professionals (Gideonse, 1984; Schön, 1983; Shulman, 1992b).
Of greater interest is the fact that all of the studies described in this chapter demonstrate research and teaching in a formative manner. While the research revolves around using case method to improve reflective teachers, it also demonstrate how case method can be used to not only use formative assessment strategies through case examples, but also model formative assessment processes. Would using case method to specifically teach preservice teachers about the use of formative assessment strategies in teaching and learning increase their overall understanding of the formative process? Would explicitly modeling the formative assessment process during such case instruction affect how preservice teachers use formative assessment in their teaching?

2.6 A Synthesis of the Literature

2.6.1 Introduction

In the preceding chapters, literature was shared on the topics of teacher education, formative assessment, and case method. Now the real inquiry lies in combining all of these topics. How can preservice teachers benefit from using case method instruction to explicitly learn about formative assessment use in the classroom? One common link within the research presented in this literature review points to providing an ideal learning environment to support student learning. Two common themes can be identified across the literature. These themes include (1) working within situated learning environments (Abell, et al., 1998; Buck & Trauth-Nare, 2009; Buck, et al., 2010; Cowen, 2009; Griffin, 2003; Harrington, 1995; Levin, 1995; Wiliam, et al., 2004), and (2)
working with ill-structured problems within the context of (2a) formative assessment (Abell, et al., 1998; Andrews, 2002; Buck & Trauth-Nare, 2009; Buck, et al., 2010; Cowen, 2009; Griffen, 2003; Harrington, 1995; Hewitt, et al., 2003; Levin, 1995; Nesbitt & Cliff, 2008; Rosen, 2008; Wiliam, et al., 2004) and (2b) case method (Abell & Volkmann, 2006; Griffen, 2003; Harrington, 1995; Levin, 1995). These themes were represented within the theoretical framework discussed previously in Chapter 1 and in more detail within this chapter.

If there are certain characteristics that are ideal for learning, what are they? Collins, Brown, and Newman (1987) defined four dimensions used to describe the ideal learning environment: (1) content, (2) methods, (3) sequence, and (4) sociology. Each dimension is broken down into further sub-categories, which will be described in more detail in the following section. These ideal learning environments are of interest because all of the dimensions are closely linked to or intertwined with formative assessment strategies and case method teaching. There is also a close tie to situated learning environments.

2.6.1.1 Components of an ideal learning environment

Collins, Brown, and Newman (1987) point to the apprentice process as an effective method for teaching student within an ideal learning environment. Apprenticeship learning is a type of situated learning in which experts and novices interact in a professional environment. First, the authors make note to distinguish between the purposes of traditional apprenticeships and cognitive apprenticeships.
Cognitive apprenticeship as we envision it differs from traditional apprenticeship in that the tasks and problems are chosen to illustrate the power of certain techniques or methods, to give students practice in applying these methods in diverse settings, and to slowly increase the complexity of tasks so that component skills and models can be integrated. In short, tasks are sequenced to reflect the changing demands of learning. Letting the job demands select the tasks for students to practice is one of the great inefficiencies of traditional apprenticeship (Collins, et al., 1987, p. 4).

Cognitive apprenticeships represent a method of teaching in which students are guided through the process of learning techniques and methods that can be utilized in various educational settings; students are taught the flexibility of these techniques and methods in an attempt to adequately and effectively identify and solve educational problems.

Within the first dimension, content, the goal of instruction is for students to gain content knowledge. Collins et al. (1987) divided content in four main categories: (1) domain knowledge, (2) heuristic strategies, (3) control strategies, and (4) learning strategies. Domain knowledge is considered to be the concepts, fact, and procedures needed to solve problems. Interestingly, none of the studies presented in this literature review had the goal of highlighting a specific concept, fact, or procedure. Multiple studies did focus on specific skills, for example Levin’s (1995) study on how group discussion affects critical reflection; however, I would categorize this more heuristically. Heuristic strategies are common approaches by experts. As with the case method, these two types of content of instruction could be compared to Doyle’s (1990) framework, referred to in chapter 1 of this review, in which cases are often viewed as rhetorical; that is, cases are used to make a specific point. In addition, cases using such domain knowledge are doing so with the intent to direct or control reflective thinking practice (Grimmett, 1988). The category of control strategies best fits with Doyle’s second
framework, in which cases are used to tell a story in which the readers must employ metacognitive processes to solve the problem or generate alternative solutions. Rosen (2008) and Hewitt et al. (2003) demonstrated control strategies by asking participants to review real-life teaching cases, and then through discussion and reflection, the participants employed metacognitive processes to formulated solutions. Collins et al.’s (1987) last content category is learning strategies in which prior knowledge is adopted or modified to suit an unfamiliar problem. This type of content knowledge is similar to Doyle’s last framework in which teacher use their prior knowledge to recognize, interpret, and make subsequent decisions on new events. Grimmett describes this process as a reconstruction of past experiences in an attempt to develop new understandings. Nesbitt and Cliff’s (2008) research can be categorized under learning strategies. Participants were asked to apply their expert science content knowledge to the unfamiliar task of writing open- and closed-ended questions.

Within the second dimension, methods, Collins et al. (1987) state that the goal of instruction is to assist students in using, managing, and discovering knowledge. What does expert knowledge look like in practice? How can these cognitive and metacognitive processes be taught? Collins et al. argue for explicit formulation of strategies; however, understanding how to use these strategies is dependent on understanding contextual problem solving. For this reason, Collins et al. suggest six methods to provide students with an opportunity to first observe, then engage in, and lastly to discover expert strategies in context: modeling, coaching, scaffolding, articulation, reflection, and exploration. Modeling provides an opportunity for the student to observe an expert
performing a particular task. Buck et al. (2010) demonstrated this process as preservice teachers observed, through their own educational experience within a methods course, being taught explicit formative assessment strategies. Buck et al. modeled this process throughout the course. Coaching, on the other hand, consists of an expert observing the student and providing immediate feedback to help improve performance. The expert determines, through student modeling and feedback, what level the student is in their learning and provides specific scaffolding to help the student reach the desired goal. Eventually, the expert provides little to no scaffolding as the student demonstrates competency in the task. Coaching occurred often within the research presented in this review (Andrews, 2002; Buck & Trauth-Nare, 2009; Cowen, 2009; Levin, 1995; Nesbitt & Cliff, 2008; Sato, et al., 2008). This in not surprising; the process of formative assessment requires students to receive feedback in order to improve their understanding. Buck and Trauth-Nare (2009) demonstrate coaching in their study involving the work of one teacher’s goal of understanding and implementing formative assessment. The authors worked one-on-one with this teacher throughout the study and provided evidenced based feedback to help the teacher improve. Articulation simply refers to getting the student to share their knowledge or problem-solving process. Students must then reflect on these processes by comparing their ideas with that of the experts and peers. Again, following the nature of the formative assessment process, this method was also used extensively throughout the literature in this review (Andrews, 2002; Buck & Trauth-Nare, 2009; Cowen, 2009; Hewitt, et al., 2003; Sato, et al., 2008; Wiliam, et al., 2004). Lastly, exploration strategies need to be taught so that the student can productively explore
problem solving on their own. Given the nature of case method in teaching, exploration strategies are visible in a majority of the research presented in the review (Abell, et al., 1998; Andrews, 2002; Buck, et al., 2010; Cowen, 2009; Hewitt, et al., 2003; Levin, 1995; Nesbitt & Cliff, 2008; Rosen, 2008; Sato, et al., 2008; Wiliam, et al., 2004). In particular, Buck et al. (2010) demonstrated how preservice teachers were asked to create their own formative adaptations during an after school science educational program for inner-city students.

Within the third dimension, sequencing, Collins et al. (1987) state that the goal of instruction is to recognize the different stages of skill acquisition and to sequence instruction appropriately. As such, instructors need to sequence active learning in which complexity is gradually increased over time. Collins et al. go on to state that tasks should also be sequenced in such a manner that a wider and wider variety of strategies or skills are required. Lastly, students should have the opportunity to apply skills before they are asked to generate or remember those skills. Cowen (2009) employed sequencing by asking preservice teachers, over a three-year professional development, to learn about a variety of formative assessment strategies. Then over time, the preservice teachers implemented these strategies; feedback and modifications were requested, followed by additional requirements for the next implementation.

The final dimension, sociology, refers to the sociology of the learning environment, something that Collins et al. (1987) states is often ignored in curricular and pedagogical practices. Within an apprenticeship, learning is done in the professional environment; for example, a butcher learns in a butcher shop, not in a segregated learning
environment. Collins et al. state five critical characteristics that influence sociological learning: (1) situated learning, (2) culture of expert practice, (3) intrinsic motivation, (4) exploiting cooperation, and (5) exploiting competition. In situated learning, the student is offered an opportunity to better understand the purpose of the information they are learning by actively applying this knowledge. Students will also learn the nuances in which knowledge is applied so they can formulate their own understanding. By far, the inclusion of situated learning experiences is the most common theme throughout all of the literature in this review. Again, by the very nature of case method and formative assessment, participants are asked to apply their knowledge to novel experiences; most commonly experienced in descriptions of teaching cases (Andrews, 2002; Griffin, 2003; Harrington, 1995; Hewitt, et al., 2003; Levin, 1995; Nesbitt & Cliff, 2008; Rosen, 2008) or in the actual classroom (Buck & Trauth-Nare, 2009; Buck, et al., 2010; Cowen, 2009; Sato, et al., 2008; Wiliam, et al., 2004). Creating a culture of expert practice helps students to situate and support their learning by directly working with experts who guide students in completing professional tasks. Andrews (2002) research highlights the expert novice learning relationship; preservice teachers submitted adapted lesson plans to an expert teacher for critical comments and feedback. Creating a culture of expert practice promotes students’ intrinsic motivation because learning is situated in the environment in which it makes the most sense to students. In such a culture, tasks are performed because they directly relate to the goal of instruction; this is demonstrated in Cowen’s (2009) study in which expert practice increased preservice teachers’ confidence and motivation in implementing formative assessment strategies to their teaching. Exploiting cooperation
refers to the use of peer collaboration in an effort to foster cooperative problem solving. Peer collaboration affords students an opportunity to teach and learn from one another; to provide additional opportunities to practice conceptual understanding. As one of the five key strategies of formative assessment, peer collaboration was a common activity in the literature presented in this review. Of note is the research conducted by Hewitt et al. (2003), Rosen, (2008), and Levin (1995). In all three studies, the researchers gathered data on preservice teachers’ critical reflection skills prior to and after peer discussion. Lastly, Collins et al. refer to exploiting competition as a strategy for students to compare the process in which they have used to arrive at a particular solution; this is not a comparison of student products, but a comparison of path they used to come to the particular solution. The intent of competition is to provide students with focused attention on improving both strengths and weaknesses. This relates directly to the benefits of peer collaboration. Levin’s (1995) research highlighted the strengths of this type of peer competition; both expert and novice groups of teachers shared personal solutions, which enabled the participants to learn from one another, improving the quality of their solutions.

As demonstrated by the connections to the literature, the characteristics of an ideal learning environment relate directly to the goal of case method instruction and the strategies used to improve learning and teaching through formative assessment. When linking the characteristics of an ideal learning environment to the studies included in this review, several highly prevalent themes emerged. These themes include: a strong connection between student learning and expert/novice interactions, student’s applying
knowledge in an environment that supports their professional needs, and the use of ill-structured problem solving.

2.6.1.2 Ill-structured problem solving

Case method is a teaching technique in which ill-structured problems are presented and students are asked to respond to the problem with a justified argument. Ill-structured problems represent challenges students will typically face in professional practice (Jonassen, 2000). Higher order thinking skills are necessary to solve such ill-structure problems, but how do we go about teaching students to solve problems that may more than one correct answer?

The research conducted by Abell et al. (1998), Harrington (1995), and Levin (1995) all suggest that case method pedagogy can play an important role in enhancing preservice teachers’ ability to reflect on teaching and learning by encouraging alternative ways of thinking about teaching situations. Cases can be defined as ill-structured problems because they can represent authentic teaching problems in which there is no one correct solution (Chin & Chia, 2006). They can also describe problems in which multiple theoretical perspectives are represented (Lundeberg & Scheurman, 1997). These types of cases represent the sort of ill-structured problems a teacher will face in the classroom. Perhaps most importantly, these cases are often descriptive experiences that the preservice teachers’ may not have personally experienced. Using cases to reflect on teaching and learning allows preservice teachers to examine and assess on their own assumptions and beliefs of teaching and learning (Abell, et al., 1998; Harrington, 1995).
Schön (1987) argues that cases offer a model for teaching; students can use this model to personally reframe problems, similar to a professional practitioner would in the field. Choi and Lee (2009) add that one of the essential goals of higher education is to prepare students to make reasoned and reflective decisions; ill-structured problems can provide an avenue for such a goal to be accomplished.

2.6.2 Summary

An extensive base of literature supports the use of formative assessment in advancing student learning gains (e.g. Bangert-Drowns, et al., 1991; Black & Wiliam, 1998a; Brookhart, 2007; Crooks, 1988; Fuchs & Fuchs, 1986; Hattie, 2009; Kluger & DeNisi, 1996; Natriello, 1987). Similarly, an extensive base of literature supports the use of case method as a powerful tool for instruction (e.g. Garvin, 2003; Lundeberg & Fawver, 1994; Lundeberg & Scheurman, 1997; Merseth, 1991a, 1991b, 1999; Shulman & Colbert, 1989; Silverman, et al., 1992; Williams, 1992). The connection between case method and formative assessment instruction is, at best, sparse. Why is this the case? If formative assessment has been demonstrated to improve student learning, and case method has been shown to provide students with a meaningful, real-world educational learning tool, wouldn’t it make sense to use case method more fluently in teacher education to promote formative assessment knowledge and utilization?

Using the framework of situated learning and anchored instruction (Williams, 1992) with the characteristics of an ideal learning environment (Collins, et al., 1987), I would argue that case method could be an effective and appropriate method for
implementing formative assessment instruction in preservice teacher education. Collins et al. (1987) spoke about content as one of four main ideal learning characteristics. Domain knowledge, heuristic strategies, control strategies and learning strategies were all described. In Doyle’s (1990) framework, all four contents are utilized in case method instruction; for the purpose of transferring contextual knowledge from teacher to student, to student transferability of learned knowledge to the application of knowledge in novel situations.

In referencing ideal methods of instruction, Collins et al. (1987) described modeling, coaching, scaffolding, articulation, and exploration as being among the most effective for learning. Wiliam’s (2010) introduced these same methods as effective teaching strategies within the five key strategies of formative assessment; specifically, Wiliam spoke to modeling criteria to improve student understanding, coaching and scaffolding students through feedback cycles, providing students with opportunities to use peer- and self-assessment in conjunction with teacher feedback to modify learning, and taking ownership of learning through the exploration of independent problem solving. In addition, when describing anchored instruction, Williams (1992) provided focus on direct assessment strategies: teachers modeling expert problem solving, providing immediate feedback, scaffolding learning, and frequent self- and teacher-assessment.

Lastly, Collins et al. (1987) described the sociology of learning; situated learning experiences, creating a culture of expert practice, and exploiting peer resources. Wiliam (2010) describes the collaborative peer relationship as one of the five key strategies of
formative assessment; encouraging and facilitating peer-assessment as an instructional resource. Williams (1992) frames anchored instruction around specific requirements: authentic problems, realistically complex, presenting problems in a way that is complex yet manageable, and scaffolding problems to support students’ learning needs. Collins et al. described these sociological characteristics as often ignored in curricular and pedagogical practices; however, they are a prominent feature in both formative assessment and case method literature. Is there a disconnect between research and practice? Data supports the improvement of student learning based on these characteristics, yet in practice, these characteristics are largely ignored. Why is this? What limits or discourages educators’ use of these methods?

2.7 A Review of Methodologies

2.7.1 Introduction

The preceding chapters were organized into three main categories of research literature: formative assessment, preservice teacher education, and case method. The goal of this chapter is to identify the methodologies and research techniques used within the studies in this literature review and highlight their advantages and disadvantages. A general summary table is provided (Table 2.1). When standing alone, formative assessment, preservice teacher education, and case method each represent a field of study in which extensive research has been conducted and in which the methodologies used are also extensive. When relating these literature topics to one another within the context of
<table>
<thead>
<tr>
<th>Topic</th>
<th>Studies</th>
<th>Methodology (data source)</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA and PST</td>
<td>William, Lee, Harrison, and Black (2004)</td>
<td>Qualitative (observations, field notes, lesson plans)</td>
<td>Research mimics FA process; Ts implemented the assessment measures they felt were most needed</td>
<td>Few observations; Based on written activities with no clarification; weak curricular validity; different instructors for two classes</td>
</tr>
<tr>
<td>FA and PST</td>
<td>Buck and Trauth-Nare (2009)</td>
<td>Cooperative Inquiry (teaching transcripts, lesson plans, interviews, student work)</td>
<td>Reflective nature of research models FA; small scale; easy to implement</td>
<td>Lacks generalizability; single research subject</td>
</tr>
<tr>
<td>FA and PST</td>
<td>Maclellan (2001)</td>
<td>Quantitative (questionnaire)</td>
<td>Varied perspective taken into account</td>
<td>Lacks generalizability; risk of misinterpretation</td>
</tr>
<tr>
<td>FA and PST</td>
<td>Bailey and Gamer (2010)</td>
<td>Qualitative (semi-structured interviews)</td>
<td>Direct contact and clarification with participants</td>
<td>Self-report; professors perceptions of student ideas</td>
</tr>
<tr>
<td>FA and PST</td>
<td>Reig and Wilson (2009)</td>
<td>Descriptive Study (survey)</td>
<td>Anonymity increases honesty in response</td>
<td>Self-report; Survey did not capture how tools were utilized</td>
</tr>
<tr>
<td>FA and PST</td>
<td>Sato, Chung, and Darling-Hammond (2008)</td>
<td>Mixed-Method (written response, interviews, survey)</td>
<td>Mixed source of data; rubric used to score</td>
<td>Participants have interest in research; unclear level of effectiveness for PD factors</td>
</tr>
<tr>
<td>FA and PST</td>
<td>Cowan (2009)</td>
<td>Qualitative (interviews, surveys)</td>
<td>Models FA instruction</td>
<td>PST consistency/confidence could be a measure of maturity and experience rather than intervention</td>
</tr>
<tr>
<td>FA and PST</td>
<td>Buck, Trauth-Nare, and Kaflan (2010)</td>
<td>Action Research (pre/post questionnaire, discussion, journaling, interviews)</td>
<td>Models FA instruction (used class data to inform instruction)</td>
<td>Unclear if results are due to lack of FA knowledge or PCK</td>
</tr>
</tbody>
</table>
Table 2.1 – Continued

<table>
<thead>
<tr>
<th>PST and CM</th>
<th>Abell, Bryan, and Anderson (1998)</th>
<th>Qualitative (written reflections, discussion)</th>
<th>Models FA instruction (used class data to inform instruction; used reflection to teach reflection)</th>
<th>Self report; lacks case/discussion description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PST and CM</td>
<td>Harrington (1995)</td>
<td>Qualitative (written analysis of case)</td>
<td>Models CM instruction</td>
<td>Lacks description of how CM was instructed; different case topics may affect PST analysis; Low number of case reflections to substantiate real change.</td>
</tr>
<tr>
<td>PST and CM</td>
<td>Levin (1995)</td>
<td>Mixed-Method (rubric analysis of written documents)</td>
<td>Qualitative description enriched quantitative data</td>
<td>Risk of misinterpretation; no interviews to clarify</td>
</tr>
<tr>
<td>CM and FA</td>
<td>Nesbitt and Cliff (2008)</td>
<td>Qualitative (case questions)</td>
<td>Provided objectives and exemplars; peer collaboration; introduced new teaching methodology to participants</td>
<td>Cuts FA process short by not including feedback; unable to tell if CM process works because participants were not able to reflect and revise</td>
</tr>
<tr>
<td>CM and FA</td>
<td>Rosen (2008)</td>
<td>Quantitative (written reflections)</td>
<td>Validated RTS was used to measure reflective thinking skills</td>
<td>Qualitative difference not tracked so unable to describe variable that led to higher-rated reflections in computer cases; limited time to collect data- does not contribute to understanding long-term effects of CM on reflection</td>
</tr>
<tr>
<td>CM and FA</td>
<td>Andrews (2002)</td>
<td>Descriptive Study; Mixed Method (written case analysis, written reflections, survey)</td>
<td>Models FA instruction; provides authentic expert feedback</td>
<td>Online discussion may hinder in-class group discussion</td>
</tr>
<tr>
<td>CM and FA</td>
<td>Hewitt, Pedretti, Bence, Vaillancourt, and Yoon (2003)</td>
<td>Qualitative (written reflections)</td>
<td>Peer discussion provides new insight; reflection/revisions demonstrate that first reaction may not be the best reaction</td>
<td>PST do not see how their responses play out in the classroom</td>
</tr>
<tr>
<td>CM and FA</td>
<td>Griffin (2003)</td>
<td>Quantitative (written cases)</td>
<td>Models FA instruction; provides authentic reflection on instruction</td>
<td>Reflections may not reflect PSTs full capabilities; some subjectivities in rating</td>
</tr>
</tbody>
</table>

Note. Studies are grouped together by topics described in the literature review. FA = formative assessment; CM = case method; T = teacher; S = student; PD = professional development; PCK = pedagogical content knowledge; RTS = Reflective Thinking Scale.
the educational setting, the variety of methodologies narrows. Upon further analysis of the literature, and governed by the educational context of this review, four major sub-groups emerge: reflection, modeling the formative assessment process, perceptions of formative assessment, and using cases as teaching tools. Table 2.2 shows the studies that fall within each of these sub-divisions. Due to the fact that the three major topics of this literature are closely intertwined, a majority of these studies are included in more than one of these sub-categories. This will be addressed within the following chapter.

In this chapter, I will describe: how each study within this literature review fits into one or more of these sub-categories, the similarities and differences of methodologies used within these sub-categories, the advantages and disadvantages of using such methodologies, and the appropriateness of the methods to warrant the proposed claims.

2.7.2 Reflection

As mentioned, many researchers and educators would argue that the goal of teacher education is to create reflective teaching professionals (Gideonse, 1984; Schön, 1983; Shulman, 1992b). Perhaps not surprisingly, the process of reflection was the largest sub-category of all major themes found across the literature; however, the method and purpose of researching reflective thinking skills differed. Five different purposes for reflective study are identified: reflection on incorporating formative assessment strategies into teaching (Buck & Trauth-Nare, 2009; Sato, et al., 2008); reflection on themselves as
Table 2.2

*Summary of Sub-Groups Within Educational Studies*

<table>
<thead>
<tr>
<th>Studies</th>
<th>Reflection</th>
<th>Cases Used as a Teaching Tool</th>
<th>Modeling the FA Process</th>
<th>Perceptions of FA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiliam et al. (2004)</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Buck and Trauth-Nare (2009)</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Maclellan (2001)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Bailey and Garner (2010)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Reig and Wilson (2009)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Sato et al. (2008)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cowan (2009)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Buck et al. (2010)</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Abell et al. (1998)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Harrington (1995)</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Levin (1995)</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Nesbitt and Cliff (2008)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Rosen (2008)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andrews (2002)</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Hewitt et al. (2003)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Griffin (2003)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* FA = formative assessment
teachers (Abell, et al., 1998); reflection on responses to teaching scenarios (Harrington, 1995; Hewitt, et al., 2003); how level of teaching experience affects ability to reflect (Griffin, 2003; Levin, 1995); and how the learning activity (e.g. case method) affects reflective thinking (Rosen, 2008).

2.7.2.1 Reflection on incorporating formative assessment strategies into teaching

Buck and Trauth-Nare’s (2009) conducted a type of cooperative inquiry in which the authors helped one in-service teacher implement formative assessment strategies into her classroom teaching. Like most qualitative research studies, Buck and Trauth-Nare used a combination of methods to collect data; these included observations, interviews, and documents (i.e. lesson plans and student work samples). Sato et al. (2008) focused their research on 60 in-service teachers seeking national board certification, during which time, extensive professional development took place to help improve teachers’ formative assessment practices in the classroom. Sato et al. conducted mixed-method research in which teachers’ documents (i.e. written responses and surveys) were analyzed and interviews were conducted. Analyzing written responses and using interviews to help clarify and broaden participants’ views on using formative assessment can strengthen the analysis of data; using both qualitative and quantitative methods in tandem can improve the use of both approaches as opposed to when only one approach is utilized (Crewell & Plano Clark, 2007). Buck and Trauth-Nare’s research employed a single qualitative approach. This could be seen as an advantage because the authors only had one research participant; with such a small-scale study, the authors were able to focus their attention
directly on one participant. A single research participant, however, does raise concerns about the implications of the results. The lack of a larger sample size eliminates any form of generalization that might be produced from the data.

2.7.2.2 Participant reflections of themselves as teachers

Abell, Bryan, and Anderson (1998) used a case lesson to elicit preservice teachers’ views of themselves as science teachers, as well as how cases influence their science thinking. Similar to Buck and Truath-Nare (2009) and Sato et al. (2008), Abell et al. analyzed the participants’ written documents (e.g. written reflections). In such a case, written reflections are advantageous because they represent data that participants have given thoughtful attention in composing (Creswell, 2009). On the other hand, written reflections are self-reports of the participants understanding and may not reflect authentic or accurate information (Creswell, 2009). In Abell et al.’s study, the researchers’ also used peer and whole-class discussions to gather information, which provided an opportunity to cross-reference the data, strengthening the authors’ analysis.

2.7.2.3 Reflection on responses to teaching scenarios

Harrington (1995) and Hewitt et al. (2003) used teaching cases to a tool to elicit preservice teachers’ reflections about topics or issues described in the teaching cases. Qualitative analysis of written student work was collected and analyzed. Harrington was interested in how preservice teachers’ identified the issues within the case, and what evidence they used to prioritize the issues and form solutions. Similarly, Hewitt et al.
used a real teaching lesson case to elicit preservice teachers’ reflections, but the authors were interested in how the preservice teachers’ reflections changed in response to in-class discussion.

Both studies demonstrate the use of written reflections as an appropriate method to collect preservice teachers ideas about case happenings because written reflection allows preservice teachers to synthesis data before writing and offers an opportunity for self-assessment; however, there are some issues to point out. Harrington (1995) provided four different cases for the preservice teachers to analyze. Could the different case topic affect how the preservice teachers analyzed the case? In addition, the short duration of the research study- only four cases- may not have been enough time or practice for the preservice teachers to make any real sort of substantial change in their reflective skills.

2.7.2.4 Level of teaching experience and the ability to reflect

Levin (1995) and Griffin (2003) were both interested in investigating how a experience level affected a teachers’ ability to critically reflect on a teaching situation. Levin asked both preservice and in-service teachers to participate in case discussions and found that even the experienced teachers’ reflective descriptions were influenced by peer discussion. Levin’s research methodology is of great interest because it demonstrates how both qualitative and quantitative approaches, when used together, can improve the accuracy of the results. For example, Levin’s quantitative data suggested that there was no significant difference in preservice and beginning teachers’ critical reflections;
however, the qualitative data from the participants’ written descriptions suggested otherwise.

Griffin’s (2003) definition of experience was different than Levin’s (1995) expert/novice description. Griffin investigated how preservice teachers’ reflective thinking skill changed over the course of the semester, as the preservice students’ gained more experience not only in their field placements, but also in writing cases. Griffin’s research is also unique in that preservice teachers did not read about another person’s real-life teaching experience; they each wrote multiple cases based on their own experiences. Through guided instruction, the preservice teachers were able to demonstrate growth in their abilities to describe the meaning behind classroom situations based on evidence and then suggest a course of action to remediate the situation. The advantage to this type of research approach is that it provides preservice teachers with authentic reflection on instruction.

2.7.2.5 Case method and reflective thinking

Rosen’s (2008) research, like Hewitt et al. (2003) and Griffin (2003), utilized case method to investigate aspects of preservice teachers’ reflective thinking skills. Unlike, Hewitt et al. and Griffin, Rosen specifically investigated the affect of using case method had on the preservice teachers’ reflective thinking skills. The participants who received case method instruction performed better on a reflective thinking tool than the preservice students’ who did not receive case method instruction. As creating reflective teaching professionals is a critical aspect of teacher education programs, this study suggests case
method is an advantageous instruction tool to employ. There are, however, some disadvantages to the approach Rosen took in conducting this research. The limited time in which the data was collected is of concern and suggests that the results be viewed with caution, as they may not contribute to understanding the long-term effects of case method on preservice teacher reflection.

2.7.3 Cases used as a teaching tool

Merseth (1999) described case-based instruction as a process that can help preservice teachers develop critical thinking skills, have an opportunity to discuss a variety of pedagogical techniques, use reflection to improve teaching and learning, and experience the benefits of collaborating with the broader learning community. In other words, case method is a tool that teaches preservice teachers about a myriad of skills, processes, and knowledge needed to be effective professionals. Within this literature review, five of the critical reviews (Abell et al., 1998; Andrews, 2002; Griffin, 2003; Harrington, 1995; Hewitt et al., 2003) focus specifically on using cases as teaching tools to help prepared preservice teachers for the diverse experiences they are likely going to face when in the classroom.

Case-based instruction offers an opportunity for preservice teachers’ to internalize, discuss, and reflect upon the case. Abell et al. (1998) and Harrington’s (1995) data suggests that preservice teachers did just that. Abell et al. used a video case from an elementary science lesson. Abell et al. discovered through written reflections and class discussion that the preservice teachers did not feel prepared to teach science lessons and
that they were genuinely surprised at how the case teacher was able to actually teach young students about the science content. Interestingly, a majority of the preservice teachers stated that they would use the case as a model for effective teaching. Harrington (1995) used cases to demonstrate that the issues and solutions presented may be different based on perspective. The preservice teachers’ written analysis of the cases indicated a lack in ability to view the case through the eyes of a teacher. Many preservice teachers still viewed classroom issues through the lens of a student. Harrington’s data supports the idea that case method can improve preservice teachers’ ability to frame problems, but preservice teachers have difficulty viewing cases through multiple perspectives (e.g. parents, students, teachers, administrators). Although both Abell et al. and Harrington’s research suggests case method informs preservice teachers’ pedagogical practices, there was a methodological disadvantage; both studies lack detailed descriptions of how cases were discussed and how the case method process was executed.

The research conducted by Levin (1995) and Andrews (2002) highlights how the interaction of preservice and expert teachers can affect discussion, reflection, and analysis of teaching and learning. Levin’s work suggests collaborative group discussions regarding teaching cases influenced both in-service and preservice teachers’ case reflections. Andrews, on the other hand, had an expert teacher provide individual written feedback on preservice teachers’ lesson plans. The data supports preservice teachers’ accommodation of feedback into revised lesson plans. In addition, preservice teacher surveys indicate their strong agreement with using case method of help increase their ability to adapt instruction and apply knowledge and skills to real life cases.
These types of methodological approaches to collecting data provide rich descriptive data; however, there are disadvantages to both Levin (1995) and Andrew’s (2002) methods. Levin’s data suggests that heterogeneous group discussions enrich case reflections. It is difficult to conclude this type of causal relationship. Other factors, such as time between discussion and further reflections in which self-assessment of knowledge could occur, as well as the fact that many of the preservice teachers may be taking other pedagogical courses concurrently. These two factors are an example of additional variable that should be taken into account. Interviews with research participants could clarify why their reflections may have changed. Andrew’s data relies in part by self-reported survey results, and as stated before, may not reflect authentic or accurate information.

Lastly, Griffin (2003) asked participants to write their own cases, as a reflection of personal classroom experiences they have encountered. Over the course of the semester, the preservice teachers wrote a total of 135 incidents. Griffin’s data supports the conclusion that the process of creating, describing, and analyzing their own cases afforded preservice teachers an opportunity to improve their skills of using evidence to determine case problems and suggest appropriate courses of action to remediate problems. A disadvantage to this type of methodological approach centers around the subjectivity of rating “improvement” on such case exercises. It is important for learning objectives and success criteria to be stated at the beginning of the process. In Griffin’s case, this may have been put in place prior to the start of the study, but this was not included in the research literature.
2.7.4 Modeling the formative assessment process

Cases method offers a strategic instructional tool for teacher educators because cases provide: examples and possible consequences of teaching situations, students with an opportunity to personally reframe problems, an active learning environment, and encourage discourse among case participants (Shulman, 1992a). Preservice teachers benefit from the opportunity to discuss their opinions, make decisions in a safe environment, and receive peer and instructor feedback (Smith & Benavides, 1988). All of these experiences are part of the formative assessment process of learning; however, the process does not end there. How students assess their own understanding, based on these interactions and feedback, is a crucial step in the formative process.

Case method not only provides students with a more authentic learning experience, by its very nature case method also models formative assessment in the process. Seven of the research studies included in this literature review demonstrate this relationship (Abell et al., 1998; Andrews, 2002; Buck & Trauth-Nare, 2009; Buck et al., 2010; Cowan, 2009; Nesbitt & Cliff, 2008; Wiliam et al., 2004).

Wiliam (2010) outlined five crucial formative assessment strategies. The first strategy was described as having clear learning objective and success criteria, while providing exemplars to demonstrate quality work. Nesbitt and Cliff (2008) methodological approach was unique in that they asked participants to identify their own learning objectives. The participants were provided a case and asked to identify the learning objectives for this case. Keeping in mind their learning objectives, the participants were then asked to create questions that specially aligned to elicit evidence of
student learning. Nesbitt and Cliff then provided the participants with exemplars to help
guide their learning. Although the intent of this research was to determine the extent to
which the participants’ questions matched the specified learning objectives, it is
interesting to note that once this data was collected, the study concluded. In other words,
the formative assessment process was cut short; no feedback or opportunities for
participant reflection and modification were provided.

Unlike Nesbitt and Cliff (2008), Abell et al. (1998), Andrews (2002), Buck and
Trauth-Nare (2009), and Wiliam et al. (2004) were all interested in the extent to which
their participants’ learning changed due to receiving constructive feedback and then using
this feedback to modify their work. Abell et al., Andrews, and Buck-Trauth-Nare
provided expert feedback to their participants and examined the extent to which they used
this information to modify their teaching and learning. Wiliam et al.’s study was designed
to help teachers implement formative assessment strategies into their classrooms and
examined the extent to which this occurred. The methodological approach was novel in
that it mirrored the formative assessment process; in other words, the teachers were
learning how to implement formative assessment by being taught formatively. In Wiliam
et al.’s case, the teachers were guided through lesson development, but when it came to
implementation, the authors only observed the teachers twice during a six-month period.
A majority of data was collected through documents such as teacher lesson plans and
written reflections. Wiliam et al.’s findings are, to a great extent, based on teacher self-
report that the formative assessments were implemented successfully. This brings to
question the validity of the results reported in this study. Although the research methods
may not provide evidence to warrant such a claim, this doesn’t mean that the results of
the study are inaccurate. The results shared by Wiliam et al. are of great importance to the
educational community and as such, additional research on this topic should be
conducted. In true scientific style, we should base our decisions on multiple sources
evidence, while at the same time questioning the appropriateness and accuracy of the
evidence.

Cowen (2009) and Buck et al.’s (2010) research also used the formative
assessment process to model instruction; however, each study was conducted differently.
Cowen was interested in the extent to which formative assessment instruction, within a
three-year teacher education program, affected the participants’ consistency and
confidence in implementing formative assessment strategies into their own teaching. The
program provided scaffolded support throughout the three years and used interviews and
surveys to collect data. One concern regarding Cowan’s data relates to the stated causal
relationship between formative assessment instruction and the participants confidence in
implementing such instruction. Since this is a three-year teaching program, preservice
teacher maturation should be taken into account. How does Cowen know the increased
rate of confidence wasn’t due to the overall pedagogical learning process? Buck et al.’s
methodological approach also included explicit instruction of formative assessment;
however, it is interesting to note that after the preservice teachers implemented their
formative lessons, none of the preservice teachers used student feedback to inform their
instruction. In this particular study, it is unclear if these results are due to a lack of
formative assessment knowledge or pedagogical content knowledge. Either way, this area of research needs further study.

2.7.5 Perceptions of formative assessment

It is clear from the literature (e.g. Andrade, 2010; Black & Wiliam, 2003; Brookhart, 2007; Cizek, 2010; Heritage, Kim, Vendlinski, & Herman, 2009; Sadler, 1998; Wiliam, 2010) that formative assessment can have a significant impact on student learning; however, teachers’ perceptions of the formative assessment may hinder the accuracy and utilization of formative assessment in the classroom. Maclellan (2001), Bailey and Garner (2010), Reig and Wilson (2009), and Abell et al. (1998) address this concern in their research.

Bailey and Garner (2010) interviewed faculty members about their perceptions of assessment at the university level. In addition, faculty member were asked about student perceptions of assessment. Abell et al. (1998) used case method to determine preservice teachers perceptions of science teaching as well as how they view themselves as teachers. Maclellan (2001) and Reig and Wilson (2009) both used questionnaires to collect faculty and students’, and teacher educators’ perceptions of formative assessment. Maclellan’s intention was to collect data regarding why assessments were taking place, how useful the assessment process was, how and when judgments were made, who made the judgments, and what procedures were used for making such judgments. Reig and Wilson were interested in determining what assessment strategies teacher educators’ use in their
own classrooms and which assessment strategies teacher educators perceive to be most effective.

In the case of Maclellan (2001) and Reig and Wilson (2009), a questionnaire is a useful tool to gather this type of information; however, the usefulness and accuracy of the data are only as good as the questions used within the questionnaire and the honest reflections of the participants. For example, Reig and Wilson failed to ask for how assessments were being used in the classroom (i.e. formatively or summatively). In addition, content validity could be an issue. Do the items on the questionnaires measure the content they intended to measure?

### 2.7.6 Summary

The studies included in this literature review were prominently qualitative in nature. Creswell (2009) states,

Qualitative research is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The process of research involves emerging questions and procedures, data typically collected in the participants setting, data analysis inductively building from particulars to general themes, and the researcher making interpretations of the meaning of the data. The final written report has a flexible structure. Those who engage in the form of inquiry support a way of looking at research that honors an inductive style, a focus on individual meaning, and the important of rendering the complexity of a situation (adapted from Creswell, 2007) (p. 4).

Educational research in particular lends itself to such qualitative practices. Observations, interviews, and document analysis were common data collection types throughout this review. These types of collection methods provide an opportunity to observe and collect details that might otherwise be overlooked. Gathering participant information through
interviews can be particularly useful because it provides an opportunity for the participant or researcher to clarify other data collected (e.g. survey or questionnaire descriptions, classroom observations), as well as ask clarifying questions. Caution must be taken, however, that these details are not misinterpreted or taken out of the context in which they occurred. In addition, not all participants are equally comfortable or articulate, so observations, interviews or written documentation must also be interpreted carefully.

2.8 Final Thoughts and Questions for the Future

This document was composed of literature on (1) formative assessment in teaching and learning, (2) preservice teacher education, and (3) case method instruction. Within this review of literature, research was compiled to an effort to build an understanding of what we know about formative assessment and case method use in preservice teacher education, the advantages and weaknesses of these particular educational interventions, and what questions still remain. Through this review of literature, research was synthesized and common themes surfaced; as such, new questions emerged. These questions are classified within the following categories: teacher education, formative assessment, case method instruction, and research methodology.

Teacher Education:

- How do external pressures (e.g. curricular demands, time limitation, departmental approval/involvement) affect teacher educators use of case method?
- Preservice teachers often have minimal pedagogical experience, so how can teacher educators promote the skills needed for preservice teachers to accurately make such professional judgments in the classroom?

- How do teacher educators address the importance of professional judgment with their preservice teachers?

- What are teacher educators’ views on the importance of using formative assessment strategies in their own classrooms? How does this affect the way preservice teachers view the purpose and utility of formative assessment?

- How can teacher educators help preservice teachers develop and practice the skills of reflection and decision making prior to the preservice teachers’ internship?

- How does a new and inexperienced teacher deal with ill-structured situations in the classroom? Would case method help develop the skills to deal with such situations?

Formative Assessment:

- If cases have been used to demonstrate teaching and learning success, why couldn’t cases be used to teach and model the use of formative assessment in teaching and learning?

- Which pedagogical methodology would allow students to gain valuable instruction in formative assessment?

- What can be done to boost confidence and competence of pre- and in-service teachers using formative assessment?
- Will student-centered formative assessment strategies, one that diverge from the standard summative measures, foster and encourage appropriate student learning gains?

Case Method Instruction:
- How do preservice teachers compare with business, law, and medical students who learn by case method instruction?
- How does the typical amount of teacher education content coverage compare to the amount covered in business, law, and medical schools that use case method?

Research Methodology:
- Are the typical qualitative methods of collecting data (e.g. observations, interviews, collection of documents) an appropriate methodology for studying explicit use of formative assessment in case method instruction of preservice teacher education?

2.8 Research Questions

From the literature review, data suggests that one of the major problems within teacher education is the lack of continued formative assessment instruction. Another major problem within teacher education is the lack of situated learning experiences. The lack of real-world experiences creates a problem for preservice teachers because it is difficult for the preservice teacher to apply the pedagogical theory that they learn throughout their college courses into a meaningful context. An argument has been made for case method, which introduces learners to real-life teaching situations they are likely
to face in the classroom (Niemyer, 1995). Cases represent the sort of ill-structured
problems a teacher will face in the classroom and these are often experiences the
preservice teachers’ may not yet have personally experienced. In addition, case method is
a unique education tool because it not only uses the formative assessment process to
collect evidence of student learning, but it also models the formative assessment process
for the students. Teacher educators can use case method to introduce relevant teaching
concepts or issues, and through discussions and written reflections, teacher educators can
gather evidence of preservice teachers’ understanding. This informs instruction, and
guides teaching and learning. Most importantly, this type of teaching methodology
models the process of formative assessment. Explicit modeling, scaffolding, and
guidance are key to increasing preservice teachers understanding and use of formative
assessment (Buck & Trauth-Nare, 2009; Buck, et al., 2010). Based on this literature, I
have proposed the following overarching research question:

1. To what extent does the implementation of formative assessment cases in
methods instruction influence preservice elementary science teachers’
knowledge of formative assessment?

With this research, it is important to recognize how such an “improvement” will be
measured; therefore, further sub-research question emerged:

2. What descriptive characteristics change between the preservice teachers’ pre-
  case written reflection and post-case written reflection that would demonstrate
  learning had occurred?
CHAPTER 3

METHODOLOGY

3.1 Research Design

As the research literature reviewed in Chapter 2 suggests, case method has been used in many disciplines to improve students’ understanding of the disciplinary content and associated skills. Case method has been used: to help students apply the theory and principles learned in the classroom, to help students develop diagnostic and persuasive skills, and to prepare students to be self-directive problem solvers (Gavin, 2003). As noted, case method is used for different purposes within many disciplines; however, one common feature among all disciplines is that case method provides students with “real-world” situations that help make connections between what is learned in the classroom and what is expected of a professional in the field (Lundeberg & Fawver, 1994; Lundeberg & Scheurman, 1997; Shulman, 1986).

An argument for the use of case method in teacher education was also made in Chapter 2; more specifically, case method could be an instructional method used to increase preservice teachers’ awareness of formative assessment. Case method has two major benefits. First, cases used in case method provide students with realistic stories and puts the students in the role of the decision maker. Case method is providing the reader with a description of one particular event in history in which the reader must judge the outcome or decide how he or she would handle the described situation. With this background knowledge and the quest to understand how formative assessment instruction
could be better integrated into science teacher education, my first research question emerged: To what extent does the implementation of formative assessment cases in methods instruction influence preservice elementary science teachers’ knowledge of formative assessment?

It is imperative to keep in mind that case method is a method of teaching. Case method is not only about introducing students to realistic cases, but it is also about the discussion of the case and how that discussion adds to student understanding (Merseth, 1991a; Welty, 1989). How will students handle different perspectives about a case? Will discussion of these perspectives have an affect on student understanding of how formative assessment works in the classroom? This brings me to question, what exactly does this type of learning look like?

The second major benefit of case method is that it models the process of formative assessment. Instructors ask students to read and reflect on a particular case. The case is then either discussed in small groups or as a whole class. Through discussion, students share their personal experiences and thoughts; listening to other students’ describe their ideas about the case content provides additional perspectives on learning. Discussion also opens a line of communication between teachers and students, which can provide teachers with the evidence to offer more tailored instruction. In case method, both the instructor and students play an important role: both raising questions and posing solutions in a cooperative yet challenging learning environment. Asking students to examine and debate alternative solutions, perhaps altering opinions based on ‘better’ ideas, is a key aspect of case method (Smith & Benavides, 1988) and the basis of peer-
and self-assessment in formative assessment. Do preservice teachers indeed learn through discussion and how is this reflected in their personal case reflections? The idea of students learning from case discussion brings up questions about what formative assessment learning really looks like. This led me to ask my second research question:
What descriptive characteristics change between the preservice teachers’ pre-case written reflection and post-case written reflection that would demonstrate learning had occurred?

According to Creswell (2009), qualitative research is described as a process involving “emerging questions and procedures; collecting data in the participants’ setting; analyzing the data inductively, building from particulars to general themes; and making interpretations of the meaning of the data” (p. 232). I believe my proposed case method research addresses Creswell’s specific qualitative characteristics (Table 3.1).

Table 3.1

<table>
<thead>
<tr>
<th>Qualitative Characteristic:</th>
<th>Data Source from Proposed Research Design:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Collecting data in the participants setting</td>
<td>ED 4010: Secondary Methods Course</td>
</tr>
<tr>
<td>2. (a) The researcher collects data herself and (b) tends to develop the instrument(s) to collect data</td>
<td>(a) Case reflections, classroom observations (b) Cases</td>
</tr>
<tr>
<td>3. Multiple sources of data are gathered rather than using only one source</td>
<td>Cases, field notes, and observational video</td>
</tr>
<tr>
<td>4. Inductive analysis of the data</td>
<td>Building patterns and themes based on weekly and pre/post case reflection Formative assessment is a process in which teachers identify and clearly communicate the student learning goals data</td>
</tr>
<tr>
<td>5. Focusing on the participants view of the problem</td>
<td>How the preservice teacher interprets and reacts to the case content</td>
</tr>
<tr>
<td>6. The research is emerging based on the data and participants</td>
<td>Learning from the preservice teachers and using that information to address the research questions</td>
</tr>
</tbody>
</table>

When reviewing the methodologies of research studies highlighted in Chapter 2, qualitative research designs were predominant. Written reflection, written analysis, observations, discussions, interviews, questionnaires, surveys and field notes were common data collection methods. These types of collection methods provide an opportunity to observe and collect details that might otherwise be overlooked through more quantitative data collection methods.

Interestingly, most of the research within Chapter 2 can be categorized as case study research. According to Stake (1995), case studies are a type of research that explores people, groups, programs, or events in an attempt to better understand them. Stake goes on to describe that researchers conducting case studies collect data within a prescribed period of time and for a prescribed activity. From the literature described in Chapter 2, most of the research designs could be categorized as such; individual or groups of students, teachers, or faculty participating in a study in which the researchers were investigating themes, patterns, or interpretations that emerged from participants ideas or knowledge of formative assessment and case method use in science classrooms. This type of research design lends itself well to answering the research questions I proposed. The intent of my research was to explore the extent to which the case method process impacts preservice teachers’ understanding of formative assessment in the science classroom. In doing so, I: collected data from one specific group of students (e.g. ED 4010 preservice student) in the participants setting; introduced cases that I created specifically to address my research questions; and coded pre- and post-case reflections for emerging themes.
3.2 Participants and Sampling

The sample for this study consisted of preservice elementary teachers enrolled in “Teaching Elementary School Science” or ED 4010. This is an upper division elementary science methods course taught through Teaching, Learning, and Educational Studies at Western Michigan University. All students seeking an elementary teaching degree are required to take this course. ED 4010 is described as a “lecture/lab/discussion” course and runs concurrently with the elementary preservice teachers’ pre-intern experience. ED 4010 preservice teachers were the primary research target audience for this research because the case instruments that were employed for this study are all based on science teaching at the elementary level and are framed around the elementary national science education standards (National Research Council, 1999).

Three sections were taught during the spring semester of 2013: one morning and one afternoon section that met twice a week, and one evening section that met once a week. One instructor taught the morning and afternoon sections and a second instructor taught the evening section. Students were only recruited from the morning and afternoon sections. This is due to a conscious effort to reduce the number of variables affecting the reliability of the data collected; different instructors may teach and lead discussions differently, which may affect participant understanding and responses.

The semester began with 21 students enrolled in the morning section and 20 students enrolled in the afternoon section. Since the instructor was using the case instruments as part of her classroom instruction, all students enrolled in ED 4010 were required to participate in the case reflections and case discussions; however students had
the option of opting out of participating in my research study. This meant that their reflections would not be viewed or used within my research. Refer to Appendix A for the Human Subjects Institutional Review Board (HSIRB) protocol. All 41 students consented to participate in my research. A demographic survey was given which inquired about the preservice teachers’ educational major and minors (Table 3.2) and their self-report regarding their familiarity with formative assessment (Table 3.3). During the course of the semester, two students dropped the course, one from each section. Two preservice teachers did not participate in the post-case reflection so they were dropped from the research project. This left a total of 37 preservice teachers’ case reflections as viable sources to be used in my research.

Table 3.2

*Preservice Teachers’ Educational Major and Minors*

<table>
<thead>
<tr>
<th>ED 4010 Major and Minor (s)</th>
<th>ED 4010 Section</th>
<th>Early Elementary Education</th>
<th>Elementary Education</th>
<th>Language Arts</th>
<th>Social Studies</th>
<th>Science</th>
<th>Math</th>
<th>History</th>
<th>Psychology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section</td>
<td>AM</td>
<td>10</td>
<td>11</td>
<td>18</td>
<td>12</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>12</td>
<td>8</td>
<td>18</td>
<td>14</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3.3

*Preservice Teachers’ Self-Report on Familiarity with Formative Assessment*

<table>
<thead>
<tr>
<th>ED 4010 Section</th>
<th>Preservice Teachers' Self-Report on Familiarity with Formative Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No knowledge</td>
</tr>
<tr>
<td>AM</td>
<td>1</td>
</tr>
<tr>
<td>PM</td>
<td>3</td>
</tr>
</tbody>
</table>
3.3 Instrumentation and Data Sources

Cases are used in the field of education, but the case topics are usually limited to topics such as classroom management, grading, diversity, instructional practices, and student learning issues (Silverman, et al., 1992). Cases highlighting formative assessment in teaching and learning are rare in teacher education curriculum. Due to this reason, I created cases to fit this need. There were five cases total: a pre/post case covering all of the formative assessment topics (Appendix C), and then four individual cases (Appendix D) each covering a different formative assessment characteristic: learning objectives, evidence of learning, feedback, and self/peer-assessment. The cases reflected age-appropriate elementary lessons, based on the national science education standards (National Research Council, 1996). The cases also reflected the five major characteristics of formative assessment (Wiliam, 2010), which were based on the ten principles of assessment for learning (Assessment Reform Group, 1999). The cases ranged in grade level appropriateness from first to seventh grade. Science subject matter included: sorting objects according to observable attributes; discussing how motion can be measured and represented on a graph; relating characteristics of observable parts in a variety of plants that allow them to live in their environment; and explaining the water cycle and describing what occurs within the cycle. Data sources included classroom observations during each of the four case discussions, video and field notes from the class discussion, and individual student case reflections for each case assigned.
3.3.1 Validation of the instrument

I created all cases that will be used in this research; therefore, measures were taken to insure proper validation of the instruments. To begin, I would like to address the work that went into creating these cases. The cases were a revision of a previous set of scenarios I created and piloted for my early research project through SCI 6170. The piloted scenarios were administered to the same participant population (e.g. ED 4010 students) in an attempt to gather data to better understand preservice teachers’ views of formative assessment practices in the classroom. The scenarios described teaching situations within the elementary classroom that focused on one characteristic of formative assessment (Wiliam, 2010). A group of 30 in-service elementary teachers validated the appropriateness of the science topic, as well as the ability of elementary students to perform given tasks within each scenario. The preservice teachers were asked to read the scenario and then respond to four different responses, each offering a different view of or conclusion to the scenario. Each response was associated with a four-point Likert scale and the preservice students were asked to rate how strongly they agreed or disagreed with the scenario responses. The scenario responses were set up to include one formative assessment response and three non-formative assessment response.

A sample of the research participants was later interviewed about their responses. From these interviews, several themes emerged which prompted me to change the scenarios into their current form. After interviewing participants, it became clear that the Likert scale ranking was not the best method for the preservice teachers to respond to
what was happening in the scenarios. Although the Likert responses were a true indication of how the students felt about the response, when asked why they ranked the response the way they did, the participants’ reasoning was often complex and did not always relate to the topic of formative assessment. For example, the participants would often describe how they would mix and match the teaching activities within the given responses. For some preservice teachers, they were more concerned with how the teacher presented the material or the types of student activities completed, rather than the aspect of formative assessment. Through interview discussions, I was able to better understand why the preservice teachers chose particular Likert responses, and some of the explanations were unexpected. This is one of the reasons I decided to make changes to the format of the scenarios. Another reason I changed the format was to be more inline with case method instruction, an instructional methodology I was not concerned with during my early research project.

Case method is not only the process of learning through real life contextual cases; it is also about the process of learning through class discussion (Merseth, 1991a; Welty, 1989). With this method in mind, I revised the scenarios to be more open-ended and discussion-friendly. The scenarios no longer have responses in which the preservice students are asked to choose. Instead, the scenarios are formatted more like a case in which the educational message is described within the case and case questions are posed to encourage participants to offer their reflections about the case content. This open-ended reflection is a prompt for the class discussion that follows. Although all aspects of the case were important, the case facilitator had the important job of keeping the
preservice teachers on topic. In this particular instance, concentrating on formative assessment issues was the main focus. The data collected from the piloted scenarios provided an opportunity for me to improve the instrument to better match the intent of my research.

In addition, I asked a panel of formative assessment experts (e.g. Assessment for Learning faculty and fellows at Western Michigan University, Dr. Katharine Cummings, Dr. Bill Cobern, and Dr. Steven Ziebarth) for further validation. After reading each case, I asked the experts to describe what type of formative assessment process/strategy was being addressed. I also asked the experts to provide a description of the strengths and weaknesses of each case, as well as ideas to improve the case. After discussing this feedback, I made the appropriate changes.

The ED 4010 instructor ran the case discussions. Prior to the start of the semester, I had a discussion with the instructor to determine the level of formative assessment that was usually taught in this course. Documenting the breadth and depth provided me with an idea of how familiar the instructor was with formative instruction and the formative assessment topics contained within the cases. Although case discussion is not a new practice for the ED 4010 instructor, discussing cases that solely focus on formative assessment was a new phenomenon. To combat this issue, I included a discussion summary for each case, which provided general guidelines for the type of material that should be covered in class discussion. In addition, I provided the instructor with an outline for how best to facilitate case discussion (Appendix C). These guidelines were based on expert case method facilitator recommendations (Miller & Kantrov, 1998).
attended all class discussions as a silent observer. During the case discussion itself, I wrote field notes on student discussion, and used a checklist of essential points that should be addressed during each case. The checklist was used to help describe limitations in preservice teacher data due to possible facilitation issues.

3.4 Data Collection

Data collection occurred in the ED 4010 classroom at Western Michigan University, with student reflection assignments done as homework, on the students’ own time. Prior to starting the intervention, a case (i.e., pre-case instrument) was administered to the ED 4010 students. This occurred in class, during the second week of the semester. This case told a story in which the major aspects of formative assessment were included: identifying learning objectives, collecting evidence of learning, incorporating feedback cycles, and peer- and self-assessment. The students were asked to answer four reflection questions based on the case. Students were asked to independently read the case and respond to the reflection questions. The reflections were collected in class; no class discussion occurred. The pre-case offered a baseline in which to compare student growth over the intervention.

The next four weeks, weeks three through six of the semester, entailed the administration of one case per week. Each case focused on a different aspect of the major characteristics of formative assessment (i.e., identifying learning objectives, collecting evidence of learning, incorporating feedback cycles, and peer- and self-assessment). Each case was assigned during the first class meeting of the week and the students were
required to complete the case reading and the reflection questions as homework for the second-class meeting of the week. The students brought their responses to the second-class period of the week. By asking the students to read and reflect on the case prior to class, only a short review of the case was needed during class, prior to the discussion of the case. In addition, students spent as much time as they needed outside of class reading and reflecting on the case. During class, the students had an opportunity to discuss their reflections as a whole class. After class discussion, students had an opportunity to reflect on the discussion, writing any additional comments or changes regarding their previous reflections. These reflections were collected at the end of the discussion period.

During week seven, after the conclusion of the treatment cases, students were asked to read the post-case. This case was the same as the pre-case administered at the beginning of the intervention. Students were asked to answer the same reflection questions as they did during the pre-case. Table 3.4 provides a short summary of data collected and the timeframe within the semester.

**Table 3.4**

*Summary of Data Collection for Spring 2013*

<table>
<thead>
<tr>
<th>Spring 2013</th>
<th>Activity</th>
<th>Data Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 2</td>
<td>Pre-instructional Case 1</td>
<td>• Reflection questions (no class discussion)</td>
</tr>
<tr>
<td>Week 3</td>
<td>Case 2 (Learning objectives and success criteria)</td>
<td>• Independent reflection questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• In-class discussion (field notes and videotaped)</td>
</tr>
<tr>
<td>Week 4</td>
<td>Case 3 (Evidence of learning)</td>
<td>• Post-discussion reflection/revision</td>
</tr>
<tr>
<td>Week 5</td>
<td>Case 4 (Feedback)</td>
<td></td>
</tr>
<tr>
<td>Week 6</td>
<td>Case 5 (Peer- and self-assessment)</td>
<td></td>
</tr>
<tr>
<td>Week 7</td>
<td>Post-instructional Case 1</td>
<td>• Reflection questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Compare with pre-case</td>
</tr>
</tbody>
</table>
3.5 Data Analysis

Three main data sources have been discussed in this proposal. These include preservice teachers’ pre- and post-case reflections, field notes and video from class discussion, and preservice teachers’ individual case reflections. In answering both research questions, the pre- and post-case reflections are the primary data source. I compared the preservice teachers’ pre- and post-case reflections and analyzed the differences between each. The field notes and video from class discussion, as well as the preservice teachers’ individual case reflections were secondary data sources, accessed for reference purposes when preservice teachers’ ideas in the pre- and post-case reflections needed clarification. The intent of the data analysis was not to track each of the 37 preservice teachers’ reflections and discussions each week throughout the six-week instructional period. Rather, I was primarily concerned with how their reflections changed between the first week (pre-case) and the sixth-week (post-case); analyzing the extent to which the preservice teachers’ reflections changed, as well as the characteristics of that change, helped me answer the research questions. This research project was very rich with data. Future analysis will be informed by this data, with the ultimate goal of additional publications.

Preparation for data analysis began as soon as the preservice teachers completed the pre-case. The ED 4010 instructor preferred that her students write their reflections and turn in a paper copy in class, rather than submit them electronically; therefore, I needed to convert the written text into electronic text. To do this, I used the voice recognition software, Dragon Naturally Speaking. After checking the transcripts for
accuracy, I upload the electronic transcripts into the qualitative analysis software, HyperResearch, for coding.

3.5.1 Inter-coder agreement

After the pre/post cases were collected, I began to code the data. A preliminary list of codes was established (Appendix E) prior to the start of the coding process. These codes represented the fundamental basics of formative assessment and a general description of the preservice teachers’ type of change in response from pre- to post-case in terms of formative assessment knowledge or acknowledgement. During the coding process, themes emerge from the reflections, and additional codes were created (Appendix F). When coding of the pre/post-cases was complete, I asked my fellow Assessment for Learning scholars (e.g. two faculty members and three graduate students) to code a random sample of cases for inter-coder agreement. Prior to their coding, I spend two hours walking through one case example. This walk-through included a description of what the codes were, how I used the codes, and my rationale for using the codes as demonstrated through one case example. After this example was provided, and questions were answered, I asked the scholars to code a random sample of cases on their own time. I arranged for each case to have two coders.

The coders had one week to read through the sample of cases and code them. During the following coding discussion, some concerns for obtaining inter-coder agreement arose. One concern related to the type of data collected. For a data set that compiles codes based on very specific and perhaps predetermined sets of possible
answers, inter-coder agreement is fairly straight-forward; you either agree or disagree that the answer the research participant provided fits a particular code. The responses provided by my research participants were based on their reflections to case questions. These responses were not standardized and did not fit into a specific predetermined set of answers (i.e. asking the preservice teachers to choose from a pre-established set of responses); therefore, consistency in coding could be an issue and the inter-coder agreement score could be a misrepresentation of what was actually occurring. For example, under the “General Codes” section (Appendix E), there are 18 different codes that were established that could be applied to any case reflection for any of the eight questions asked in the pre/post case. If the combination of codes I selected for a particular case did not exactly match the combination of codes selected by each of my coders, my inter-coder agreement would be affected; however, this may not be an accurate representation of how everyone actually views the preservice teachers’ responses in terms of understanding formative assessment. We may all agree that the data represents a particular view of formative assessment, but if each coder does not select the same exact combination of codes, the inter-coder agreement percentage would be affected. There was, however, one set of codes that could be applied to every reflection response. These codes described the preservice teachers’ overall shift, if any, in formative assessment knowledge or acknowledgement from pre- to post-case. Three codes were applicable in describing this shift: views remained the same from pre- to post-case reflection (VRS); views shifted towards formative assessment from pre- to post-case reflection (VSTFA); and views shifted away from formative assessment from pre- to post-case reflection.
(VSAFA). For each question within each case, one of these codes was applied. For this reason, it was possible, and appropriate, to calculate an inter-coder agreement score. This agreement was beneficial because this shift in thinking provides the “big picture” to help answer my first research question: To what extent does the implementation of formative assessment cases in methods instruction influence preservice elementary science teachers’ knowledge of formative assessment? In turn, a discussion of our justification for why each of us felt it was appropriate to code the responses in this manner led to a discussion of what descriptive characteristics are needed to claim formative assessment learning has occurred. This directly related to my second research question: What descriptive characteristics change between the preservice teachers’ pre-case written reflection and post-case written reflection that would demonstrate learning had occurred? This discussion not only helped to answer my research questions, but it can inform future research within the field of formative assessment and preservice teacher education.

In addition to coding for a shift in formative assessment knowledge, we felt it was appropriate to have a discussion about each case example that was coded. This was not done to calculate inter-coder agreement. Rather, it was done to further the conversation regarding what formative assessment learning looks like in this type of case method research; an area that has very little prior research. Since a majority of the codes were not standardized across each case, it was imperative that the coders could agree on the overall message each preservice teacher was providing within their reflections. This is precisely what occurred.
After coding the preservice teachers’ shift in formative assessment views from pre- to post-case, inter-coder agreement was 78%. When initially discussing the discrepancy in codes, it was quickly recognized that the coders were not actually disagreeing with each other’s reasoning behind choosing a particular code or with their understanding of formative assessment. When each coder described his or her reasoning for why he or she coded a response in a particular manner, it was soon recognized that the discrepancy was actually associated with how each coder interpreted the preservice teachers’ descriptions within both the pre- and the post-case. From this discussion, I was able to classify the coders’ discrepancies into two main categories: the difference in the amount of detail provided between pre- and post-case responses and the type of vocabulary used within the pre- and post-case responses. The next subsection describes and provides specific examples for each of these types of discrepancies.

### 3.5.2 Level of detail in pre- and post-case responses

In several of the instances, this discrepancy occurred because the amount of detail that was provided in either the pre- or post-case response that was not provided in the other. For example, one preservice teacher provided a generic pre-case description, but was very detailed in her post-case description. In her pre-case description, the preservice teacher stated

*I do not believe this lesson used activities that provided a clear assessment of student learning based on the lesson objectives. The activities were dominated by Ms. Miller explaining content, leading a discussion, telling the students certain things…Although the data collection activity on day three included a great amount of time spent on discussing environments where fossils are found and what differences in depth indicate, the lesson did not relate this information back*
to the objective involving how any of this information helps scientists understand past environments, plants, and animals.

In this example, the preservice teacher highlights the lack of connectedness between the lesson objectives and the lesson activities, as well as the fact the lesson was mainly teacher-driven. In her post-case description, the preservice teacher voiced the same concerns; however, she not only described specific examples from the case to support her answer, but more importantly, her descriptions specifically addressed a formative assessment characteristic and how it was used (or not used) within the lesson. The preservice teacher stated,

I do not think the activities provide true assessment of student learning based on the objectives. The exit slips Ms. Miller has them complete are a good way to evaluate what the students have learned in the first two days. However, here she asked her students to reflect on the objectives for the day without ever actually clearly stating the objectives. Therefore, this method of assessment is not at true measure of what the students may know if they don't have specific things they need to focus on relating their knowledge to. The journal activity is also not another effective way to gather information about student learning because the students may not have understood the questions or known how to articulate their thoughts. The teacher has no information as to why some students did not put responses and there was no feedback provided. If the objectives were for students to learn about what a fossil is and how they help scientists know about past environments, plants and animals, then the wrap up activity is not a good assessment of student learning in regards to the objectives. She made this wrap up to measure their learning in regards to the misconception (which she hadn't mentioned since the first day), not the lesson objectives.

Initially, one coder coded this pre/post response as staying the same, while two coders agreed that the response was moving towards a more formative-focused response. The following was discussed in regards to the post-case response. This post-case described the same dislike for the case teacher’s lesson; however, the preservice teacher specifically mentions the case teacher’s need to explicitly state the learning objectives for
her students. The preservice teacher points out that the two ‘formative assessment’ activities were not used to their full potential because the learning objectives were never stated, nor was there appropriate feedback provided. In addition, the preservice teacher recognized that the case teacher was asking her students to complete assignments that where not even part of the lesson objectives. In the end, all coders agreed that this particular preservice teacher’s views do indeed move more towards the acknowledgement of formative assessment.

Being more or less detailed in a case description does not, however, necessarily represent a shift in formative assessment knowledge. This can be exemplified in the following pre/post case response. In the pre-case, one preservice teacher stated,

Ms. Miller *did not incorporate much feedback* into her lesson. The only clear feedback she gave the students was a star or "x" on the journal entries. This is a very poor form of feedback since the students see that they either did great or failed with *little reflection on what was good or what still needed work*. Since there was very little feedback, *I do not believe Ms. Miller encourages student learning* through feedback.

The preservice teacher points out that the feedback is not adequate; therefore, the case teacher is providing little encouragement of student learning. In the post-case, the preservice teacher states,

Ms. Miller *did not incorporate any feedback* into her lesson that would help the students in any way. For the journals, she only put marks if the student gave a response or not; she did not give any feedback as to the responses being correct or incorrect or other ways to think about things. I think the feedback in this case did not encourage student learning at all. If anything it only hindered student learning. For those who provided answers, they don't know if what they said makes sense or not and they are just left to assume they were correct since they received a star. For those who did not have answers, an 'x' basically tells them they are wrong and gives no prompting or incentive for them to improve. Especially when they began small group discussions with their journals, this would be an embarrassing situation for the students who did put anything since they would not be able to
share or contribute. Since there was no appropriate or effective feedback there was no way for it to encourage improvements in learning. The students were given no prompts, probing questions, or comments to help them.

Although the post-case response is much more lengthy, the preservice teacher is saying the same thing in both responses. In the more detailed post-case, however, the preservice teacher is simply using more description in answering the question. For this particular coding exercise, one coder coded that the preservice teacher was shifting towards a more formative-focused response; two of the coders coded that the preservice teacher’s response remained the same. After a discussion in which the aforementioned points were highlighted, all three coders agreed that the preservice teacher did not demonstrate any additional acknowledgment of formative assessment.

3.5.3 Vocabulary usage within the pre- and post-case reflections

In several of the instances, the coding discrepancy occurred because the vocabulary used in either the pre- or post-case response that was not necessarily the same used in the other. For example, one preservice teacher used terms such as “addressing the objective” in the pre-case description, but used more generic vocabulary such as “laying out an agenda or plan” in the post-case description. In her pre-case description, the preservice teacher stated

Although the teacher identified a misconception that students have about all fossils being created at the same time in history, I think beginning with the picture of tracks is too abstract of a concept for the students to grasp without first having learned about how fossils are created. The lesson explained how Ms. Miller stated a concept, summarized the point of the lesson, or told the student something. This exemplified that the teacher did most of the talking with little time for inquiry by asking the students to pose questions, draw conclusions, or state any thoughts. This would help them understand the topic much better than the teacher doing all
of the talking. On the third day, Ms. Miller did talk in detail about how fossils change over time, different environments fossils come from, how deep a fossil is buried explains important information, etc. However, as her lesson concluded she did not address her objective of students understanding how fossils help scientists understand past environments, plants, and animals. She simply stated the facts listed above with little reference to what they mean and how scientists interpret the information to understand history in natural science.

The post-case reflection stated,

I think all of the activities were very good, but I don't know if the lesson was coherent enough for the students to come to a good conclusion at the end that they understand why all of the things they learned help scientists to understand past environments, etc. Ms. Miller jumped right into the lesson without laying out any agenda or plan for the students so they didn't have any information that would help them to organize what they would be learning.

In this particular case, one coder initially coded this preservice teacher as shifting away from formative assessment, while two coders coded this these responses as staying the same. To the more experienced teacher, there is a major difference between an objective and an agenda or plan; however, to a novice teacher, these two words may have a similar meaning. The coders discussed this issue and, as the research subjects for this project were indeed novice teachers, the conclusion was made that we should look less at the specific vocabulary used and more at the overall message. All coders agreed that the preservice teacher was saying the same thing in the pre- and post-case reflection; therefore, all coders agreed to code this as the preservice teachers views on formative assessment remained the same. At the end of our coding discussion, all coders agreed on the same codes for each case and for each question, pushing inter-coder agreement to 100%.
3.6 Validity and Reliability Measures

Creswell (2009) states that reliability and validity do not hold the same meaning for both qualitative and quantitative research. Gibbs (2007) argues that quantitative researchers have used such things as experimental design, double blind testing, and random sampling to ensure valid, reliable, and generalizable results; these types of designs are rarely used, and often inappropriate to use, in qualitative research. Gibbs states, “there is no simple reality against which to check the analysis, only multiple views or interpretations” (p. 91). So how does the qualitative researcher handle validity and reliability issues? What does valid and reliable qualitative results look like?

3.6.1. Validity

According to Gibbs, results are “valid if the explanations are really true or accurate and correctly capture what is actually happening” (p. 91). Creswell states that validity is actually one of the strengths of qualitative research because there are multiple strategies a researcher can employ to enhance the accuracy of her findings. These strategies include: triangulation, member checking, rich description, clarifying bias, presenting negative or discrepant information, prolonged time in the field, peer debriefing, and external auditing (Creswell, 2009). Of Creswell’s eight strategies, I used four strategies to enhance the accuracy of my findings:

1. Rich, thick description: Detailed description of student case reflections and student discussion were shared.
2. Clarification of researcher bias: Identification of researcher bias was described in section 3.6: The Researcher. In addition, bias was discussed with peer examiners.

3. Presentation of negative or discrepant information: Student perceptions may conflict with themes associated with the research. These conflicts were discussed in the Results and Discussion section.

4. Peer examination: Three Committee members and the PI of the Assessment for Learning (AfL) grant, as well as three AfL fellows served as expert peer examiners.

3.6.2. Reliability

Gibbs (2007) explains that qualitative results are “reliable if the results are consistent across repeated investigations in different circumstances with different investigators” (p. 91). Due to the fact that my research has not been repeated with different investigators, it was difficult to achieve reliability as Gibbs describes. In such a situation, Gibbs does suggest several reliability procedures to enhance self-consistency. These procedures include: checking the accuracy of transcripts, checking for a drift in coding, coordinating communication with multiple coders, and crosschecking codes. Of the four procedures described by Gibbs, I did three of them. These included:

1. Checking the accuracy of transcripts: Case reflections were hand-written and typed. I transcribed the reflections. After the transcription was complete, I checked for accuracy.
2. Checking for a drift in coding: I alleviated this problem by writing specific descriptions for each code and their definition. I also continually compared data with the codes.

3. Crosschecking codes: I recruited several colleagues to cross-check my coding throughout the analysis process.

3.6.3 Generalizability

I feel it is important to briefly discuss generalization in research. In quantitative research, generalized results are sought after. If random samples are part of the research design, it makes sense that the treatment or intervention will suggest results that would be appropriate for anyone within that range of criteria set for the research participants. Qualitative researchers, on the other hand, are not necessarily interested in generalized results. Creswell (2009) states, “In fact, the value of qualitative research lies in the particular description and themes developed in context of a specific site” (p. 193). With that said, Yin (2003) argues that some qualitative researcher can be broadly generalized. Yin offers the example of case study research, in which some of the case findings can be generalized to new cases with similar design. At this point, I am not concerned with producing generalizable results.
3.7 The Researcher

3.7.1 The researcher’s background

I have a Master’s degree in secondary science education, during which I also earned my secondary teaching certificate. During this degree program, I took a science methods course similar to the ED 4010 course at Western Michigan University. This course, however, neither focused on elementary school curriculum, nor did it extensively cover the topic of formative assessment. Other than a few classroom management cases discussed in class, case method was not part of my educational experience. I have five years teaching experience at the high school level, teaching earth science, physical science, and environmental science.

I also have experience teaching at the college level. I was a lecturer at Eastern Michigan University for ESSC 202: Earth Science for Elementary Teachers. This was a science content focused course for elementary preservice teachers. During this course, I implicitly modeled formative assessment strategies, but I did not employ the case method. Arriving at Western Michigan University, I taught two courses. The first course was BIOS 1700: Life Science for Elementary Educators I. This was a biology content course for elementary preservice teachers. During this course, I explicitly taught formative assessment strategies, but did not teach using the case method. The second course I taught was ED 4060: Secondary General Methods. This was a methods course for all secondary preservice teachers. The topic of formative assessment was a central theme in this course. I both modeled formative assessment strategies for the students and
asked the students to incorporate formative assessment throughout their practice teaching and unit planning. Cases were discussed; some relating to formative assessment in the classroom, but most of the cases dealt with classroom management issues.

My prior experiences bring certain biases to this study; however, every attempt was made to remain objective during data collection and analysis. I recognize that each group of students is unique; the knowledge and experiences each student brings can offer a new and different perceptive to the research.

3.7.2 Role of the researcher during this study

The ED 4010 instructor assigned students each case to be read and reflection questions to be answered outside of class. During the predetermined class period, the instructor led a class discussion based on the case the students were assigned. Student reflections were an important part of the data collection and were collected after the discussion, and reflection of the discussion, occurred. Of greater interest, however, was the discussion of the case held in class. I took an active role in both data collection and data analysis. During the data collection phase, I was a silent observer in the classroom. My role was to take comprehensive field notes on student responses to the discussion. After the discussion has occurred, students were asked to reflect on what was discussed and how this process affected the way in which they understood the case content. Once all of the cases were discussed, the students completed the post-case. This was followed by a self-reflection on how their responses may have changed from the beginning of the intervention. All reflections were collected.
I was the sole researcher conducting data analysis. I continually worked between the pre- and post-case data set, coding for pre-existing themes, as well as developing codes as themes emerge from the data. Colleagues help conduct inter-coder agreement. After coding was complete, I analyzed the data and wrote the results.
CHAPTER 4

RESULTS AND DISCUSSION

The pre/post-case includes four major characteristics of formative assessment. After the pre-case was administered, four case discussions occurred in class, each case focusing on one of the formative assessment characteristics. After the four case discussions, the post-case was administered and discussed. This took a total of six weeks, one case per week. The pre- and post-case were identical; however, before the post-case reflections were written, the preservice students had completed the four individual case discussions held in class. These detailed discussions covered each of the four formative assessment characteristics. These characteristics were represented in the eight pre/post-case questions (Table 4.1). It is important to note that although each of the four individual cases were discussed in class, the pre-case was not discussed and the post-case was discussed after the preservice teachers reflected on the case. In other words, the preservice teachers never discussed the pre- or post-case prior to writing their reflections. Instead, they were asked to think about what they discussed and learned from the four individual cases, which represented different teaching scenarios, and apply this to the post-case reflection. The post-case discussion did not have an impact on their post-case reflections.

Results from all eight of these questions are reported and discussed in this section. The subsections below are organized around each of the four formative assessment characteristics. A discussion section follows each of these subsections. Within this discussion section, I interpret the results based on connections within and between
Table 4.1

*Formative Assessment Characteristics Associated With Each Case Questions*

<table>
<thead>
<tr>
<th>Pre/Post Question</th>
<th>Formative Assessment Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are these appropriate lesson objectives for this lesson? Explain your answer.</td>
<td>Providing clear learning objectives</td>
</tr>
<tr>
<td>2. Do you think this lesson provided students with a good understanding of what the teacher expected them to learn from the lesson? Explain your answer.</td>
<td>Providing clear learning objectives</td>
</tr>
<tr>
<td>3. What did Ms. Miller do to help students understand the lesson objectives? What could she do to improve student understanding of the lesson objectives?</td>
<td>Providing clear learning objectives</td>
</tr>
<tr>
<td>4. Over the four-day period, do you think Ms. Miller collected enough evidence that her students understood the learning objectives for this lesson? Explain your answer.</td>
<td>Collecting appropriate evidence of learning</td>
</tr>
<tr>
<td>5. In what ways do the lesson activities provide an assessment of student learning based on the lesson objectives?</td>
<td>Collecting appropriate evidence of learning</td>
</tr>
<tr>
<td>6. How does Ms. Miller incorporate feedback in the lesson? In what ways do you think the feedback encouraged student learning? In what ways do you think the feedback encouraged improvements in teaching?</td>
<td>Providing guided and scaffolded feedback</td>
</tr>
<tr>
<td>7. When thinking about student learning throughout this lesson, what purpose did both group and individual work serve? Did these activities provide an opportunity for students to peer- and self-assess their work? Explain your answer.</td>
<td>Offering opportunities for self- and peer-assessment</td>
</tr>
<tr>
<td>8. How would you incorporate more (or perhaps better) self- and peer-assessment opportunities?</td>
<td>Offering opportunities for self- and peer-assessment</td>
</tr>
</tbody>
</table>

Preservice teachers’ responses, as well as in light of the case discussions that occurred around each of the cases. This, in turn, will be connected to my two research questions.

Before reporting and discussing the results under each section, it is necessary to provide a brief description of how the formative assessment characteristics were represented in the pre/post case. This description will be tailored to each of the eight
pre/post case questions, as they specifically refer back to a particular formative assessment characteristic. This description will occur in the beginning of each subsection below.

In addition, it is also important to reiterate the three major coding themes that occurred for each of the pre- and post-case responses. From pre-case to post-case, the preservice teachers’ views were coded in one of three ways: 1. Shifting towards the inclusion or acknowledgment of formative assessment, 2. Remaining the same, or 3. Shifting away from the inclusion or acknowledgment of formative assessment. This is a critical factor to report and discuss because it helps answer my first research question: To what extent does the implementation of formative assessment cases in methods instruction influence preservice elementary science teachers’ knowledge of formative assessment? Subsequently, the details of why the preservice teachers’ answers shifted or remained the same helps to answer my second research question: What descriptive characteristics change between the preservice teachers’ pre-case written reflection and post-case written reflection that would demonstrate learning had occurred? The reports of data in each sub-section are framed around these three codes.

4.1 Providing Clear Learning Objectives: Pre/Post Questions One, Two, and Three

Before reporting and discussing the results under this section, it is necessary to provide a brief description of how learning objectives were represented in pre/post case. Ms. Miller, the teacher in the pre/post case, did not adequately provide clear learning objectives for her students. At the beginning of the case it states that Ms. Miller planed to
cover two “objectives;” however, nowhere in the case did it indicate that Ms. Miller
shared these objectives with her students or shared her overall learning intentions for the
unit. In addition, the “objectives” stated in the case are not actually objectives; they are
more like general topics. From the “objectives” stated (i.e. to introduce the idea of fossils,
and how fossils help scientists understand past environments, plants, and animals), it
would be difficult for a teacher to measure student understanding because it is unclear
what the teacher is specifically asking the students to know or how students should
demonstrate their understanding. For an objective to be measureable, it should contain a
verb (e.g. analyze, recognize, compare, etc.) that describes the skill or procedure the
student must demonstrate in order to show improved content knowledge. In addition, the
verb must be used to describe the actual product, process, or outcome the teacher wishes
to see.

4.1.1 Pre/post question one: Are these appropriate learning objectives for this
lesson?

Of the 37 preservice teachers who participated in this study, 19 answered that the
learning objectives were appropriate for the lesson and 18 answered that the learning
objective were not appropriate. Table 4.2 provides a summary that briefly describes
preservice teachers’ reasoning for their agreement or disagreement to this question. I will
first report on preservice teacher agreement with the appropriateness of the learning
objectives, followed by how, if at all, these preservice teachers’ responses shifted from
pre- to post-case. I will then report on preservice teacher disagreement with the
appropriateness of the learning objectives, again followed by a report of any shift in reflection between pre- and post-case.

Table 4.2

*Summary of Preservice Teachers’ Responses to Pre/Post Case Question One*

<table>
<thead>
<tr>
<th>Yes…</th>
<th>No…</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preservice Teachers’ Description to Support Claim</strong></td>
<td><strong>Preservice Teachers’ Description to Support Claim</strong></td>
</tr>
<tr>
<td># of PST</td>
<td># of PST</td>
</tr>
<tr>
<td>Students completed lesson activities</td>
<td>13 (9S, 4A)</td>
</tr>
<tr>
<td>This was an &quot;introductory&quot; lesson</td>
<td>2 (1S, 1A)</td>
</tr>
<tr>
<td>LO are specific/direct</td>
<td>2 (S)</td>
</tr>
<tr>
<td>Teacher stated the LO</td>
<td>1 (S)</td>
</tr>
<tr>
<td>Does not directly relate to LO</td>
<td>1 (T)</td>
</tr>
</tbody>
</table>

*Note.* Preservice teachers’ views from pre to post-case: remained the same (S), shifted towards (T) the acknowledgement or inclusion of formative assessment, or shifted away (A) from the acknowledgement or inclusion of formative assessment. LO = Learning objectives is abbreviated.

4.1.1.1.1 **Question one: Agreement**

4.1.1.1.1 **Students completed lesson activities.**

The largest grouping of preservice students (13 students) agreed that the learning objectives were appropriate because the students completed lesson activities that were of a similar topic to the learning objective. One preservice teacher wrote, “I think that they are appropriate because through the activities involved in this lesson the students will have an introduction to fossils and how fossils convey information to scientists. Through the activities the students will achieve the objectives planned.”
Of these 13 preservice teachers, nine had views that were similar between their pre- and post-case reflections. In other words, there was no significant change in the content of their reflection after a classroom discussion of the case occurred. This can be represented by one preservice teacher’s pre-case description,

I believe that these lesson objectives are *appropriate for this lesson*. The lesson objectives are to introduce the idea of fossils and how fossils help scientists understand past environments, plants, and animals. The lesson that the teacher has created *addresses these objectives*. Students are *working with multiple forms* of fossils and are working with the idea that fossils could have formed at different times which conveys the idea that they may have formed in different environments.

The same preservice teachers wrote a post-case response, stating

I believe that the lesson objectives are *appropriate for the lesson*. Ms. Miller wants the class to understand that different fossils have formed at different times in history, and not all at the same time. The lesson *provides activities* for the students in order to best help them understand this information. The *activities fit the objectives* in my opinion.

Although not in the same exact words, this particular preservice teacher has answered the question in a similar manner for both the pre- and post-case reflection.

Interestingly, four of these nine preservice teachers describe lesson appropriateness by describing how the teacher was involved in telling or summarizing the objectives during or after the classroom activity. One preservice teacher wrote,

I feel that Mr. Miller did a great job *explaining* the misconception in a four-day lesson. I like how she gave the students a map that shows different tracts of animals in the same spot. This was a great learning objective for the day, and gave students a chance to create stories and learn that fossils are not created at the same time in history.

Of these 13 preservice teachers, five had views that actually shifted away from the acknowledgement or inclusion of formative assessment. In other words, the preservice
teacher’s pre-case included a certain measure of formative assessment that was absent in their post-case.

For the pre-case, all five preservice teachers reflected on the how the lesson activities did not focus on the teacher’s intended objectives. This is captured in the following preservice teacher’s reflection,

The lesson objectives for this lesson do not seem to be directly correlated with what the students were inquiring about. At the end of the lesson it says they were ultimately addressing the misconception that fossils are created at the same time. I think this is a better objective and that the students in addition learned about the environments, plants and animals.

However, on the post-case the preservice teachers’ response changed. Four of the preservice teachers’ responses described how the completion of lesson activities helped the students understand the teachers learning objectives. This is captured in the following statement,

I think that the lesson objectives for this lesson were appropriate. This was a great way to introduce the idea of fossils through many activities conducted by my students. The students were able to write down what they learned, and still have questions about. They also were able to journal about what they have learned about fossils. The 3-D data program on the computer helped them gain an understanding of how fossils help us understand the past environments, plants, and animals.

All five preservice teachers also shifted their views towards the idea that since the lesson was an “introduction” to fossils, the lesson objectives were appropriate. One preservice teacher stated,

Since this is just an introductory lesson into the whole unit on fossils, then I feel that these are good objectives to have. The teacher just wants to give students if few main ideas about what fossils are and why they are important.
4.1.1.1.2 An introductory lesson.

Of the remaining six preservice teachers who agreed that the learning objectives were appropriate believed so for four different reasons. First, two preservice teachers characterized the appropriateness of the objectives by categorizing the lesson as an introduction to fossils; a lesson that would be taught to students at the beginning of the unit for the sole purpose of simply introducing the students to the general idea of fossils. One preservice teacher’s views remained the same. She stated, “I do think that these are appropriate science lesson objectives for fourth grade because this is simply an introductory lesson on fossils. For that reason introducing the idea of fossils and how they help scientists are appropriate objectives.” The second preservice teacher’s views shifted away from the acknowledgement of formative assessment. His pre-case written reflection stated,

I feel that not all of the lessons/objectives go together. They also don't seem appropriate for what she is trying. To be honest, I have no idea what she is trying to teach. The first objective (the opening activity) didn’t seem to really go with the topic.

His post-case reflection stated,

Since this is just an introductory lesson into the whole unit on fossils, then I feel that these are good objectives to have. The teacher just wants to give students if few main ideas about what fossils are and why they are important. Also, she uses the lesson to prove a student misconception about fossils wrong.

4.1.1.1.3 Learning objectives were direct/specific.

The second grouping of preservice teachers used the same reasoning that the lesson was only an introduction; two preservice teachers further characterized the
appropriateness of the objectives by categorizing the objectives as being specific or direct. This can be represented by the following preservice teacher’s description,

I believe that these objectives are well suited for the lesson. I think that they are well stated and specific. It seems as though these objectives are very introductory and will be easily made as the foundation for the students' learning.

4.1.1.1.4 The teacher stated the learning objective.

Third, one preservice teacher characterized the appropriateness of the objectives by pointing out the teacher’s involvement. She stated, “I do think that Ms. Miller's teaching objectives are appropriate. She states her objective in the beginning of the lesson and throughout the four day lesson, goes over different activities that establish the objective goal.”

4.1.1.1.5 The teacher assessed student work.

Lastly, one preservice teacher initially characterized the objectives as appropriate because the teacher assessed her students, but then ultimately stated that the lesson and learning objective do not correlate well. Her views shifted towards the acknowledgment of formative assessment in that the preservice teacher recognizes a disconnect between the activities and the stated “objectives.” In her pre-case reflection, she wrote, “Yes [the learning objective are appropriate], because she [the teacher] discusses and checks for student understanding for each topic.” In her post-case reflection, she stated

I believe these are appropriate objectives for this lesson. However, in my opinion she could have done a better job of assessing her students' learning. She gave them questions to answer but this was graded as a pass/fail and she didn't look to see if her students had the correct ideas about fossils. Her other assessment
addressed the misconception mentioned earlier in the lesson but it does not directly address the objective of how fossils help scientists understand the past.

4.1.1.2 Question one: Disagreement

Of the 37 participants in the study, 18 of the preservice teachers did not believe the lesson objectives were appropriate. Five different themes emerged from the coding (see Table 4.2). Of the 18 preservice teachers, seven did not believe the learning objectives were represented in the lesson activities. Of the seven preservice teachers, three did not significantly change their views from pre- to post-case reflections, while four of the preservice teachers’ reflections incorporated a shift towards the inclusion of formative assessment.

4.1.1.2.1 Learning objectives are not represented in the lesson activities.

Of the preservice teachers whose views remained the same, all three highlighted the fact that the case teacher did not represent her “objectives” equally throughout the unit. The following response is representative of the preservice teachers pre- and post-case responses,

The objectives for the lesson were not as good as they could have been. The idea of fossils was introduced in many experiences, but how fossils help scientists understand past environments was not the focus. The teacher emphasizes other characteristics and ideas about fossils that could have been included as objectives.

Of the preservice teachers whose views shifted towards the inclusion of formative assessment, three of the preservice teachers stated the objectives were appropriate in their pre-case reflection, but then in the post-case reflection their views shifted to described
why the objectives were not appropriate. In the pre-case, one of the preservice teachers described the objectives as being age-appropriate. The other two preservice teachers began by stating that the objectives were appropriate, but then went on to state that all of the objectives were not addressed within the teacher’s unit. In the post-case reflections, however, all three preservice teachers described the learning objectives as inappropriate because they were not addressed in the unit. One preservice teacher wrote, “The study says that she talked about using fossils to learn about its environment, but none of the activities explore these aspects of the objective. I don't think that the objective is a good fit for the lesson.”

One of the preservice teachers stated that the lesson objectives were inappropriate in both her pre- and post-case reflections. In her pre-case the preservice teacher stated,

I do not think the objectives are appropriate for this lesson. Though the four-day lesson, it seemed like Miss Miller was introducing more topics that did not relate to her objective of how fossils help scientists understand past environments, plants, and animals.

In her post-case, this preservice teacher went on to state that the objectives needed to be stated explicitly in a way that students understood what was expected of them. This idea is also shared with the remaining 11 preservice teachers who believed the lesson objectives were ambiguous. More specifically, four preservice teachers stated the learning objectives needed to be more measurable, four preservice teachers stated they needed to be more explicit, two stated they needed to be student friendly, and one stated they needed to be more purposeful.
4.1.1.2.2 Learning objectives need to be measurable.

Although three of the four preservice teachers’ who stated that the learning objectives needed to more measurable had similar pre- and post-case reflections, the post-cases did offer more detail. For example, in the pre-case reflection, one preservice teacher indicated that the objectives needed to be more measurable and then gave an example of how the objective should be written. In the post-case reflection, the preservice teacher made similar claims and then continued by suggesting a way in which the case teacher could have followed through with measuring that particular objective. One preservice teacher’s views shifted towards the acknowledgement of formative assessment. In her pre-case reflection the preservice teacher stated that the lesson objectives were appropriate because they fit well with the lesson procedures. In the post-case reflection, the preservice teacher recognized the need to rewrite the objectives in a way that could measure student understanding. She stated,

I think that the objective, "to introduce the idea of the fossils" that Ms. Miller set could be said in more detail. I think the teacher should give an objective where it specifically said what you want the students to get out of when the teacher introduces the fossil. For example, when Ms. Miller introduced the fossils, she told the class what the fossil is and how the fossils are formed. So, Ms. Miller could change the objective too, "Students will be able to tell what a fossil is and how fossils are formed." This way it is more specific than just setting an objective, "to introduce the idea of fossils."

4.1.1.2.3 Learning objectives need to be explicit.

Following the same general opinion of objectives, four preservice teachers
indicated that the objectives needed to be more explicit. One preservice teacher, however, did not reflect this opinion in her pre-case reflection. She wrote,

I think her objectives were appropriate for this lesson. It gave the students the foundation of what fossils are and what they can mean. These are very important aspects to consider. For children they need to know what learning things mean and why they are important to those around them.

The preservice teacher’s view changed in her post-case. She stated,

Based off the activities and what students would have learned from them, I don't think her objectives were detailed enough for this lesson. I think her lesson objectives should have been "to educate the students on how an animal and plant can exist in the same area at different times and how the depth can tell you about type of fossils there are”… Half of the lesson was clearing up the student's misconception and the activity where they were digging taught them how scientist can use depth. I just think her objectives weren't specific. She just said, “to introduce the idea of fossils.”

4.1.1.2.4 Learning objectives need to be student friendly.

Although the preservice teacher acknowledged the need to modify the learning objectives, the alteration suggested is still teacher-focused; it is describing what the teacher will do rather than providing an objective the students reach. Two preservice teachers did, however, identify the need for learning objectives to be presented in a more student-friendly manner. For example, in her pre-case reflection, one preservice teacher stated, “They are too general of objectives. They need to state what the students will be learning from the unit, especially addressing how to identify how old the fossils were and where they were found.” In her post-case reflection, the same preservice teacher shifted her reasoning more towards aspects of formative assessment by stating,

Objectives are supposed to be what the students are going to be able to do once the lesson or unit is complete. Ms. Miller's objectives talk about what she is going
to do: introduce the idea of fossils and how fossils help scientists understand past environments, plants, and animals. Instead, Ms. Miller should state her objectives as something like "students (you) will be able to identify what a fossil is and explain how fossils help scientists understand past environments, plants, and animals". This clearly states what the students will be learning about in the unit and what they should be able to do once the unit is over.

In this particular case, the preservice teacher provided an example of an objective written to be more student-friendly; clearly stating what the student is expected to learn, while providing direction for what the teacher is looking for from the student. In other words, the objective clearly states what the teacher will be looking for when assessing the students’ understanding of the concept. The second preservice teacher in this category made similar remarks; however, she also stated that it might be beneficial for the students to come up with their own objectives.

4.1.1.2.5 Learning objectives need to be purposeful.

Lastly, one preservice teacher described the need for the learning objectives to be purposeful. The preservice teachers’ views shifted towards the acknowledgement of formative assessment. In her pre-case reflection, she stated,

The objectives given are appropriate for this lesson because it introduces what fossils are and what caused these fossils to form. It allows any misconception students may have to be addressed. These objectives started "small" and then worked up to be an interactive investigation.

Her post-case reflection changed to include a formative assessment strategy that was represented in the first case and discussed specifically during that case discussion in class, as well as subsequent class discussions. She stated,

They are a great start to showing what the teacher wants students to learn, but Ms. Miller needs to make sure that her objectives have a purposeful meaning that
children will remember. When thinking about lessons the teacher needs to think about the start of the objectives as "I can" statements. What do these lesson objectives say in "I can" statements?

This particular preservice teacher’s response is an example of several in which either the activities within the cases (e.g. the use of “I can” statements) or the ideas brought up in the case discussions (e.g. creating understandable and measurable learning objectives) surfaced in the preservice teachers’ reflections.

4.1.1.3 Discussion: Question one

To begin, I will discuss the major themes that emerged from the preservice teachers’ pre- to post-case reflections. I will then conclude by offering an interpretation of how this data helps to answer my research questions. In total, between their pre- and post-case responses for question one, ten preservice teachers’ views shifted towards acknowledging formative assessment, five shifted away, and 22 remained the same.

I will first discuss the preservice teachers who demonstrated a shift towards acknowledging formative assessment between their pre- to post-case reflections. Within this group of preservice teachers, there was an acknowledgement, which did not exist in their pre-case descriptions, regarding the specific attributes of appropriate learning objectives. More specifically, learning objectives must be explicit, measurable, and in student-friendly language. These ideas were illustrated in the first case and discussed in detail during the first case discussion. Within their post-case reflection, several preservice teachers also provided specific examples of classroom activities (e.g. “I can” statements), as illustrated in the first case. Several preservice teachers in this category began their pre-
case reflection by stating that the learning objectives were age-appropriate, focusing more on the content than how the teacher and students used the “objectives” to improve their teaching and learning. In their post-case reflection, however, this set of preservice teachers acknowledged the lack of connectivity between the stated “objective” and what was actually being taught and assessed within the classroom. Two preservice teachers went on to identify the ownership students have in their learning, a crucial, yet often absent factor in quality formative assessment practice. In this case, objectives were not only to be written in student-friendly language, but the preservice teachers also suggested the students be part of the objective-writing process; to decide with the teacher what the class is going to learn and how learning will be measured.

Of the 22 preservice teachers who were categorized as having the same views for both the pre- and post-case reflections, 12 demonstrated an inadequate understanding of formative assessment in both their pre- and post-case reflections. Of the ten preservice teachers demonstrated an adequate understanding of formative assessment in both pre- and post-case reflections, six preservice teachers provided additional details in their post-case description as to how the teacher could follow through with measuring the students’ understanding of the set learning objectives. These six preservice teachers demonstrated an adequate knowledge regarding learning objectives in both their pre- and post-case descriptions; therefore, they were categorized as having the same views throughout the research study. The additional detail they provided in their post-case description, however, suggests that learning did occur between the pre- and post-case reflections.
In addressing my first research question, the data suggests that the implementation of formative assessment cases did influence preservice teachers’ knowledge of formative assessment. In their post-case reflections, the preservice teachers either modified their idea of how a learning objective should be structured or used within a class, or modified their reflection to include specific ideas or examples for how the teacher could measure student learning based on appropriate learning objectives. The modifications were in some cases taken directly from the case studies (e.g. modifying learning objectives to describe how understanding would be measured) and other times from something that was stated during the case discussion (e.g. a necessary shift from the teacher-focused case to a more student-focused classroom). Creating measurable learning objectives and creating a student-centered classroom are both major themes within formative assessment.

In addressing my second research question, the data suggests that specific characteristics can be identified within the preservice teachers’ reflection that suggests learning has occurred. Data suggests that the preservice teachers’ applied formative assessment concepts and strategies within their post-case reflections. This includes: describing specific formative assessment strategies, such as “I can” statements; including students in the learning process by involving them in the creating of measurable learning objectives; and shifting to a more student-centered class in which learning objectives are rewritten to focus on what student should do to demonstrate learning. These are the types of formative assessment strategies and concepts discussed during the class case discussions. Application of these strategies and concepts to their post-case reflections
suggests that the preservice teachers have gained insight due to the cases and the case discussions.

Lastly, five preservice teachers were coded as shifting away from the acknowledgment of formative assessment between their pre- and post-case reflections. Four of the five preservice teachers commented on how completion of the lesson activities provided the students with an understanding of the objectives. The data suggests that these particular preservice teachers may not yet recognize the connection between providing clearly defined and measureable learning objectives for a lesson, and providing specific assignments that assess these exact objectives. Covering material that is merely related to a particular concept may not specifically address the objective the teacher is trying to teach. Interestingly, all of the five preservice teachers whose views shifted away from the acknowledgment of formative assessment also, in their post-case reflection, stated that the lesson activities were appropriate because this was only an introductory lesson. For these preservice teachers, their reflections may also point to a possible belief that assessing students’ understanding on introductory material may not necessary. The data may all suggest that because the “objective” described in the case was actually a vague description of the topic being addressed in the lesson, the general or “introductory” lesson was therefore suitable.

4.1.2 Pre/post case question two: Do you think this lesson provided students with a good understanding of what the teacher expected them to learn from the lesson?

Of the 37 preservice teachers who participated in this study, 17 responded that the case lesson provided students with a good understanding of what the teacher expected
them to learn from the lesson; 20 answered that the lesson did not provided students with a good understanding of what the teacher expected them to learn from the lesson. Table 4.3 provides an overall description of the preservice teachers’ agreement or disagreement to this question.

Table 4.3

**Summary of Preservice Teachers’ Responses to Pre/Post Case Question Two**

<table>
<thead>
<tr>
<th>Yes…</th>
<th>No…</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong># of PST</strong></td>
</tr>
<tr>
<td>Students completion of activities leads to understanding</td>
<td>10 (8S, 2A)</td>
</tr>
<tr>
<td>Activities were appropriate for the content being taught</td>
<td>3 (2S, 1T)</td>
</tr>
<tr>
<td>Different types of learning were represented throughout the unit</td>
<td>2 (1S, 1A)</td>
</tr>
<tr>
<td>Teacher explained or summarized the activities</td>
<td>2 (1S, 1A)</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

I will first report on the preservice teachers who found this case lesson to be appropriate, followed by how, if at all, these preservice teachers’ responses shifted from pre- to post-case. I will then report on preservice teacher disagreement with the appropriateness of the lesson, again followed by a report of any shift in reflection between pre- and post-case.
4.1.2.1 Question two: Agreement

4.1.2.1.1 Student completion of activities leads to understanding.

The largest grouping of preservice students (10 students) agreed that the lesson provided students with a good understanding of what the teacher expected them to learn because the students’ completed the classroom activities, which in turn provided evidence for the teacher to judge whether or not the students understood the concepts. This can be summarized by one particular preservice teacher’s response. “Students showed if they had good understanding by completing the tasks in each activity.” Of these ten preservice teachers, seven had similar views from pre- to post-case reflections. Although all seven of the preservice teachers agreed that the lesson provided students with a good understanding of what the teacher expected them to learn, the preservice teachers had two different explanations for why the activity was appropriate.

The first explanation was centered on the idea that the teacher was fully involved in the students’ learning process and helped shape the learning outcome through guided interactions. In a pre-post response, one preservice teacher stated,

During the lesson the teacher stayed involved. She guided them in the direction she wanted him to go. She asked questions based on what the students were doing. What it meant if the fossils were deeper or found in a certain area.

In the post-case response, this preservice teacher expanded her view to say,

At the end of each activity she discusses how that activity helps them see what they want to about fossils. The discussion helps clear up any confusion in the lesson or any ideas and objectives the students have. Maybe going into each
activity the students didn't understand what was expected of them, but when the activity ended they could see what they were supposed to learn.

The second explanation centered on the appropriateness of the activities provided during the case lesson. The preservice teachers described the lesson activities as being beneficial for the case students in learning the expected material. One preservice teacher focused heavily on the fact that the students were doing “hands-on” activities. In her pre-case, she stated,

I strongly feel that this lesson provided students with a good understanding of what the teacher expected them to learn. I believe that students learn with hands-on activities and memorable experiences, instead of just through lecture and taking notes. Each of the lessons gave the students an opportunity to have hands-on experiences and "to be paleontologists". I feel the lessons were well planned out and provides students with an understanding and opportunities to learn about fossils and the objectives.

In her post-case reflection, this same preservice teacher stated,

Yes, I do believe that the lesson provided students with a good understanding of what the teacher expected them to learn. I feel this because each day the students were doing an activity that explained why fossils were not created all the same time. The students then reflected on the activity, such as raising their hands to a multiple-choice answer, writing in their science journals or reflecting with her table mates. The students were given four days of learning the objective in a different way.

Another preservice teacher reiterated this idea; however, the preservice teacher then went on to state the importance of specific learning objectives. The preservice teacher stated, “I think the students had a good hands-on experience. I still think the objectives could have been more specific and the students still would have met it.”

Within this group of ten preservice teachers who agreed that the lesson provided students with a good understanding of what the teacher expected them to learn through completion of the classroom activities, two preservice teachers’ views shifted away from
formative assessment between the pre- and post-case reflections. For both of these preservice teachers, their pre-case reflection provided a generic, yet correct view of formative assessment as it was described within the particular case. This is exemplified in the following pre-case reflection from one of the preservice teachers,

*I do not think the lesson provided the students with a good understanding of what the teacher expected them to learn. I think this because the objectives are what the student is supposed to learn from the lesson. I do not think the students would be able to look at a fossil and explain what kind of environment it came from. I think they would be able to tell us how old, or the appropriate age of the fossil or even what the fossil is. According to the lesson, I don't think the students have a good understanding of what they're expected to learn.*

In the post-case reflection, however, the preservice teachers describe a completely different view, as represented by the following post-case response,

*The lesson provided students with a good understanding of what the teacher expected them to learn. The objectives of the lesson were to introduce the idea of fossils and help scientists understand past environments, animals, and plants. The lesson was to not fully explain every detail about fossils, it was to introduce the ideas of what a fossil is. The students completed activities, such as determining what fossils can tell them about their pretend fields past environment, in order to meet these objectives.*

4.1.2.1.2 Activities were appropriate.

The second grouping (three students) within the preservice students who agreed that the lesson provided students with a good understanding of what the teacher expected them to learn from the lesson agreed because the preservice teachers’ felt the activities were appropriate for the topic being discussed in class. One preservice teacher wrote, “I do think that the lesson provided students with a good understanding of what the teacher expected them to learn. *The activities suited the lesson objectives* in a way that the
students could understand.” This response was typical for the students whose views remained the same from their pre- to post-case reflections; however, one preservice teacher provided more description, in terms of writing about student engagement. She stated, “Yes, the students were engaged in the activities and seemed like they learned a great deal of what a fossil could tell them relating to location and environment. This was the teacher's objective…” This is of particular interest because the preservice teacher claims that the teacher’s lesson objective was to engage students in learning. Perhaps more noteworthy is the fact that the preservice teacher states that there is no evidence that the students are actually obtaining the lesson objective through engaging activities; it only appears or “seems” like they are.

One preservice teacher’s view shifted towards the acknowledgment of formative assessment. In her pre-case reflection, the preservice teacher makes a point that the activities are providing a means to understanding the learning objectives; however, in her post-case description, the preservice teacher describes what the students are learning from the activities but then states, “I'm not quite sure what she wants the students to learn about the plants and animals though.” The students may be learning something from the lesson activities, but is it the lesson’s objective? This seems to be a difficult question to answer because the case teacher never explicitly states the student learning objectives for the lesson.

The remaining two categories of preservice teachers also agreed that the lesson provided students with a good understanding of what the teacher expected. They did so
for two different reasons: the case lesson represented different types of learning and the teacher explained or summarized the activities for the students.

4.1.2.1.3 Different types of learning were represented.

In general, the preservice teachers who mentioned the use of different learning styles as a way of providing students with a good understanding of what the teacher expected, all did so in a similar manner. This can be represented by the following preservice teachers’ reflection.

Ms. Miller gave the students plenty of opportunities to work with the information and materials that she wanted the students to learn, meeting many of the different learning styles. They had an opportunity to look at and touch fossils. They had an opportunity to use writing to learn about fossils and what fossils tell us about the Earth. They had an opportunity to dig in the boxes of sand to pull up fossils and experience the work of being a paleontologist. There are also opportunities for group discussions and individual responses to questions. I think the students had several opportunities to learn what Ms. Miller planned for them to learn and in many different ways.

One preservice teacher in this category was coded as moving away from acknowledging formative assessment. In her pre-case description, she stated, “The students don't know the objectives ahead of time before the lesson the students eventually figure it out, but is important to state the objectives ahead of time.” Her post-case reflection indicates that she has changed her view; however, the preservice teacher is still acknowledging a need for students to be told what is expected of them during the learning episode. She states, “Yes it does because there are many different types of learning, but I think she should have given more examples so the students could see exactly what was expected of them.”
Finally, a pair of preservice teachers felt that students understood the lesson because the teacher explained or summarized the activities for the students. One preservice teacher’s views remained the same. He stated,

I think that the students would be able to absolutely address the first objective through defining the concept of a fossil. This is because it is explicitly stated in the lesson that the teacher will ‘describe what a fossil is.’

Following this same thought process, one preservice teacher’s views actually shifted away from the acknowledgment of formative assessment from her pre- to post-case reflections. In her pre-case, the preservice teacher stated,

The teacher was trying to correct a misconception that all fossils were created at the same time and I feel the lesson did help the students understand this. I do not, however, feel the lesson taught the students the objectives that Ms. Miller said she was trying to encompass.

In her post-case reflection, the preservice teacher’s view changed. She stated, “I think that because Ms. Miller stopped to summarize what she was trying to teach them, that she provided good explanations.”

4.1.2.2 Question two: Disagreement

I will now report on the preservice teachers who disagreed with the appropriateness of the lesson, followed by how, if at all, these preservice teachers’ responses shifted from pre- to post-case. The preservice teachers’ responses suggest that their disagreement can be classified into five main categories: 1. The learning objectives need to be more explicit; 2. The lesson activities do not address the learning objectives; 3.
Teacher feedback is needed to aid in student understanding of the lesson concepts; 4.
There was an overall lack of student understanding; and 5. The learning objectives should be stated prior to the start of the lesson.

4.1.2.2.1 Learning objective needs to be explicit.

The largest grouping of preservice students (10 students) disagreed that the lesson provided students with a good understanding of what the teacher expected them to learn from the lesson because the teacher needed to make the learning objectives more explicit for the students. Three of the ten preservice teachers’ views remained the same from their pre- to post-case reflections. In the pre-case reflections, all three preservice teachers mentioned that the case students were guided through several days of activities, but the overall goal or objectives were not made clear to the students. In addition, the pre-case reflections included a recognition that not all lesson activities directly related to the intended learning objective. This is represented by the following preservice teachers’ pre-case comment,

The teacher expects the students to have an understanding of what fossils are and how they help scientists, but the lesson focused mainly on the misconception that fossils were all created at the same time. While that is an idea that is crucial to fossils, it wasn't the focus of the lesson's objectives.

Post-case reflections were also similar, indicating that objectives need to be made more explicit in order for the students to fully understand what is expected of them. This is represented by one preservice teacher’s response,

Miss Miller never actually tells her class what is expected of them. They are not given any sort of objectives or general statements of what they will learn from this lesson. There is so much information given during the three days and so much to
remember I would think that the students would come up with a variety of answers for what is expected of them.

Seven of the preservice teachers’ views shifted towards the acknowledgement of formative assessment. The majority of pre-case reflections focus on the case teacher’s involvement as the driving force for student understanding, as stated in this preservice teacher’s written reflection,

Ms. Miller tells her students, summarizes, that different events happen over time, and used fossils to show the students that animals or plants lived at different time periods. The teacher also explained what the activities were and after, talked about their results/findings and what that meant.

Another preservice teacher focused on the reflective class exercises as a way for the case students to understand the unstated lesson objectives. In this particular instance, the preservice teacher is connecting the student’s understanding of the lesson objectives with the process of student reflection. She states,

I think by the end of this lesson, students had a good understanding of what Ms. Miller expected them to take from the lesson. I like how at the end of the second day, she asked students to write down three things they have learned, two things they still have questions about, and one thing that they would like to talk about during tomorrow's class. This exercise gives students a chance to reflect back on the objective for this lesson.

Another preservice teacher, however, did not agree in their pre-case reflection that this lesson provided students with a good understanding of what the teacher expected; however, the disagreement was not due to a lack of explicitly stated learning objectives, rather a dislike for the actual lesson.

I do not feel that this lesson provided students with a good understanding of what they were supposed to be learning. I feel that this lesson was all over the place and unorganized. I myself was slightly confused while reading about it.
In all of the post-case responses, the preservice teachers’ recognized the importance of stating objectives prior to the learning experience, as reflected in this post-case response,

I think Ms. Miller could have done a better job explaining. To me, each lesson seemed more like a "game" or fun activity for the students to do and I am not sure if they fully understood what they were supposed to take away from each lesson. I think Ms. Miller should reiterate at the beginning of each day what it is they are investigating.

In addition to making the learning objectives explicit, several preservice teachers also mentioned the importance of appropriate assessments to determine student understanding of the objectives. One preservice teacher stated,

One way to ensure that the students understand what they are supposed to be learning is by writing the objectives on the board or posting them in the classroom. Then in order to establish that they understand those objectives, you must give them a form of assessment, each day.

Another preservice teacher stated,

I do not think this lesson gave the students a good understanding of what the teacher is expecting them to learn. The teacher did not give appropriate assessments to the students and did not give them appropriate feedback that provided the students with what the teacher expected them to learn from the lesson. The teacher did not reflect or repeat the objectives of the lesson throughout the activities they performed and did not measure the students learning.

4.1.2.2 Activity does not address the learning objective.

The second largest grouping of preservice students (5 students) disagreed that the lesson provided students with a good understanding of what the teacher expected because the lesson activities did not specifically address the learning objectives. Four of the preservice teachers’ views of formative assessment remained the same between the pre-
and post-case reflections, and one preservice teacher’s shifted away from formative assessment.

Of the four preservice teachers’ views that remained the same, all of the preservice teachers pre-case views reflected the lack of continuity between the lesson activities and the teacher’s intended lesson objectives. This is represented by one preservice teacher’s pre-case response,

I think the lessons could have provided the students with a better understanding of what the teacher wanted them to learn from the lesson. One example: Ms. Miller did a lesson where she handed out a worksheet with animal tracks and then had the students create a story that matches what they see on the track picture. Ms. Miller’s purpose for the activity "was for students to understand that animals (and plants) can exist in the same area at different times." I don’t think this lesson provided the students with that objective.

These views did not change in the preservice teachers’ post-case reflections. The preservice teachers did acknowledge that portions of the case teacher’s objectives were covered in the lesson activities; however, the preservice teachers all recognized that some of the objectives were completely left out of the lessons. This is represented by the following preservice teacher’s post-case statement.

I think that the students were introduced to fossils, but I’m not sure if it provided them with a good understanding of how fossils help scientists to understand past environments, plants, and animals. This is because I feel that Miss Miller focus too much on the fossils being in boxes, and maybe the students understood that the deeper the fossil, the older, but I don’t think that Miss Miller connected these activities to how fossils help scientists understand the past.

One preservice teacher’s views shifted away from the acknowledgement of formative assessment. In her pre-case response, the preservice teacher stated, “I think the lessons didn’t really focus on how fossils help scientists understand the past. I think it focused more on where fossils were found, how they were different, and how you can
indicate the age.” This statement indicates that the preservice teacher recognizes that the lesson activities were not aligned with the teacher’s intended lesson objectives. In her post-case response, however, the preservice teacher changes her mind about the lesson, yet still offers a couple concerns.

*I do think that this lesson provided students with a good understanding of what Miss Miller expected them to learn; although, it's hard to tell whether or not each student understood the lesson because there wasn't much individualized assessment. Also I don't think there was enough taught on the introduction of fossils, which is part of the objective. I think if Miss Miller wanted her lesson to include this she should have spoke about what fossils were and where they are found. She could have simply seen if her students have prior knowledge about fossils to spark interest and introduce lesson.*

Of the 20 preservice teachers who disagreed that the lesson provided students with a good understanding of what the teacher expected, 15 fit into the two categories previously described. The remaining five preservice teachers have been categorized into three different groupings: teacher feedback was needed to aid in student understanding, there was a lack of student understanding, and the learning objectives should have been stated prior to the start of the lesson. The preservice teacher responses will be briefly reported in the following section.

4.1.2.2.3 Teacher feedback is needed to aid in understanding.

Two preservice teachers acknowledged feedback as an important aspect of obtaining student understanding, as represented by one preservice teacher’s response,

*I think that this lesson could be better, in that I don't think the students were always provided with good understanding of what the teacher expected from them. I thought the activities were put together well and that it helped the students understand more about fossils. I think the teacher should have given more feedback to the students, so they have a better understanding on exactly what they*
are supposed to know. When the teacher had the students write in their journals, she just put a star if it was correct and/or a "x" if it was incorrect. She never told the students why they were wrong, which would have helped the students know what they are expected to know. There was a lot of strategies during the lesson that let the teacher know where the students are in their learning of fossils, but there are not strategies that let students know what they are expected to learn.

4.1.2.2.4 Students are not understanding.

Two of the preservice teachers suggested there was a lack of student understanding throughout the case. One reflection was more generic in nature.

I think the lesson did not provide students with a good understanding of what they teacher expected them to learn during this lesson. I believe the students were probably a little confused with the different activities and not much clarification that was going on during these lessons. I feel like the students were not making the correct connections about the different activities and did not fully understand the concept of fossils.

The other preservice teacher offered more detail as to why this may have occurred and possible solutions to rectify the lack of student understanding.

I do not think this lesson provided the students with enough understanding of what Ms. Miller wanted them to learn. I think she needed to go into more depth with the students on the activities they completed and explain to them the importance of learning about the age of fossils, the specific location of fossils, and the depths at which the fossils are found. She uses some great hands-on and visually stimulating activities, but doesn't give the students feedback as to whether or not their thinking is on track. Simply putting stars at the top of their work to signify complete/incomplete work and not offering feedback causes the students to lose the opportunity to learn more. The activity where the students have to put an X through the fossils that are the oldest without any data or response on the activity seems almost pointless.
4.1.2.2.5 Learning objectives should be stated prior to the start of the lesson.

Lastly, one preservice teacher focused his response on the fact that learning objectives should be made explicitly clear to the students prior to the end of a lesson. His pre-case reflection succinctly states, “It could be better if the learning objectives are explained to the class before the lesson started.” In his post-case reflection, the preservice teacher provides more detail, stating,

*At no point did Ms. Miller explain the objectives* to her students or write them on the board. She does address the topics she wishes to cover and makes sure her students are on track but *it would be more powerful if the students knew the objectives ahead of time so they could keep track of their own progress towards these objectives.*

4.1.2.3. Discussion: Question two

In total, between their pre- and post-case responses for question two, 11 preservice teachers’ views shifted towards acknowledging formative assessment, five shifted away, and 21 remained the same. Again, I will begin by discussing the major themes that emerged from the preservice teachers’ pre- to post-case reflections. I will then conclude by offering an interpretation of how this data helps to answer my research questions.

The preservice teachers who were coded as having similar views between their pre- and post-case responses were placed in four major categories. The preservice teachers who disagreed that the lesson provided students with a good understanding of what the teacher expected them to learn were placed into two major categories. These particular preservice teachers either highlighted an absence of specific lesson objectives
within the case lesson description or reflected on the lack of continuity between the
lesson activities and the learning objectives. The responses from this group of preservice
teachers suggest that there was a fundamental understanding of the concept formative
assessment; however, it was interesting to note that the idea of making learning
objectives an explicit part of teaching and learning did not surface within the reflective
descriptions of the case. The importance of sharing explicit learning objectives with
students was also not highlighted in the preservice teachers’ reflection. Many of the
preservice teachers did, however, highlight a need for students to understand where they
were in the learning process. In other words, the data supports that these preservice
teachers were emphasizing the importance of providing feedback to students so that the
students could have an understanding of where they stood. Although this feedback may
be based on specific learning objectives, the preservice teachers did not exclusively make
this connection.

The preservice teachers who agreed that the lesson provided students with a good
understanding of what the teacher expected them to learn were also placed into two major
categories. These preservice teachers either commented on the importance of teacher
“guidance” during the lesson or referenced the type of activity students were asked to
complete during the lesson. First, through their written reflections, some of the preservice
teachers described the importance of teachers guiding students towards the “correct”
answer. The data supports several implications: learning was viewed as a straight path
towards a “correct” answer or fact; learning occurred when a teacher guided the students
towards the “correct” answer or fact; and explicit learning objectives were not a
necessary part of student learning as long as the teacher was guiding students towards this “correct” answer. Second, and more commonly, some preservice teachers identified the type of activities within the lesson as a measure of how well the students understood the lesson objectives. The preservice teachers stated that the variety of lesson activities addressed different learning styles and many of the activities were “hands-on.” Within the pre- and post-case reflections, however, there was no connection made between the types of activities completed and the appropriateness of the activities based on the intended learning objectives. If the activity focused on the same concept, it was an acceptable tool for evaluating a student’s understanding of the topic, regardless of the specific learning objective that were supposed to be addressed. The data supports that collecting evidence of learning was important; however, the evidence was merely collected by the teacher as an evaluation tool to judge student understanding. For this group of preservice teachers, their views between pre- and post-case remained the same. The case readings and case discussions did not produce a noticeable change in their acknowledgment of formative assessment.

Five students were coded as having views that shifted away from the acknowledgment of formative assessment between their pre- and post-case reflections. In their pre-case reflection, all five preservice teachers noted how the learning objectives were not appropriately addressed within the provided lesson activities. Many described this inappropriateness, however, not in terms of a mismatch between objectives and activities, but rather how the activities didn’t seem to cover all of the “objectives” indicated. Interestingly, in their post-case reflections, the five preservice teachers’ views
shifted to describe how the activities did indeed provide students with an opportunity to understand the lesson objectives. The completion of the activity either provided clarity on the learning objective, provided opportunities for different learning styles to be addressed, or provided motivation for students to learn the material. The data suggested that the preservice teachers held an insufficient understanding of the purpose that learning objectives serve. The preservice teachers’ reflections suggested that students, simply by navigating through an activity, could obtain an understanding of the learning objective. Moreover, the data suggests that the preservice teachers made little distinction between addressing an explicit learning objective and covering a general concept. As noted before, the preservice teachers provided no written reflection to suggest the acknowledgment that, for learning to be assessed adequately, learning objectives must be measurable. These five preservice teachers were coded as shifting away from the acknowledgment of formative assessment because of the shift from simply disagreeing to agreeing that the lesson provided students with a good understanding of what the teacher expected them to learn. The preservice teachers post-case reasoning however suggests that this shift was focused more on how the teacher was involved in summarizing the “important” concepts for the students rather than focused on making a connection between explicit learning objectives and activities that address the objectives appropriately.

Lastly, 11 preservice teachers views shifted towards the acknowledgment of formative assessment. In the pre-case reflections, the preservice teachers described how the teacher was the driving force in student understanding; the teacher told or summarized the lesson’s main ideas for the students. In the post-case reflections however,
the preservice teachers’ views shift towards acknowledging the importance of identifying and sharing learning objectives with the students. One preservice teacher questioned the purpose of the lesson, stating that it was unclear what the teacher expected the students to learn. Providing explicit learning objectives were also discussed. Preservice teachers suggested that the case teacher write the learning objectives on the board and assess student understanding of the objectives on a daily basis. It was also suggested that the case teacher reiterate the learning objectives at the beginning of each day. One preservice teacher stated that explicit learning objectives helped students take ownership of their learning. Providing clear and measurable learning objectives on a daily basis, and frequently assessing student understanding of these objectives are tenets of quality formative assessment practice.

In addressing my first research question, the data supports that the implementation of formative assessment cases did influence preservice teachers’ knowledge of formative assessment. In their post-case reflections, 11 of the preservice teachers modified their views to reflect less teacher-directed instruction by highlighting procedures or activities that assist students in taking ownership of their learning. The modifications were in some instances taken directly from the case studies (e.g. placing learning objectives in the classroom for students to see on a daily basis) and other times from something that was stated during the case discussion (e.g. learning objectives provide a target for students to “hit” during a lesson and, therefore, allow students to self-assess their understanding). Sharing measurable learning objectives and creating opportunities for students to take ownership of their learning are both major themes within formative assessment.
In addressing my second research question, the data suggests that specific characteristics can be identified within the preservice teachers’ reflection that suggests learning has occurred. Data suggests that after reading and discussing the first case in the preservice teachers’ methods course, the preservice teachers began to question the lack of formative assessment concepts and strategies within the case. At first, many preservice teachers were satisfied that students understood the concepts being taught because the teacher reiterated and summarized the main points at the conclusion of the case activity. After reading and discussing the first case, the preservice teachers acknowledged a lack of student involvement in the learning process. The case and case discussion focused on providing students with the tools to self-assess their conceptual understanding based on specific and explicit learning objectives, rather than assuming the students understood a concept because the teacher summarized the important points of the lesson. Self-assessment is a significant part of the formative assessment process, and one that was highlighted during the class case discussions. Questioning the quality of teaching practices within their post-case reflections suggests that the preservice teachers have gained insight due to the cases and the case discussions.

4.1.3 Pre/post case question three: What did Ms. Miller do to help students understand the lesson objectives? What could she do to improve student understanding of the lesson objectives?

The third case question is actually made up of two questions. Table 4.4 provides a list of general descriptions for how the preservice teachers’ answered both questions. I will begin by describing how the preservice teachers in this study believed the case
students were aided in understanding the learning objectives for the lessons. I will follow with a description of how the preservice teachers felt the case teacher could have improved student understanding of the learning objectives.

Table 4.4

Summary of Preservice Teachers’ Responses to Pre/Post Case Question Three

<table>
<thead>
<tr>
<th>How Were Students Aided in Understanding the LO?</th>
<th># of PST</th>
<th>What Could the Teacher do to Improve Student Understanding of the LO?</th>
<th># of PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student completion of activity</td>
<td>17 (9S, 6T, 2A)</td>
<td>LO needs to be explicit</td>
<td>18 (7S, 10T, 1A)</td>
</tr>
<tr>
<td>Students didn't understand LO</td>
<td>5 (2S, 3T)</td>
<td>More student-centered</td>
<td>8 (6S, 1T, 1A)</td>
</tr>
<tr>
<td>Teacher summarized activity</td>
<td>5 (S)</td>
<td>More/different assessments</td>
<td>5 (3S, 2T)</td>
</tr>
<tr>
<td>Type of activity (hands-on, mimic scientific work, etc.)</td>
<td>3 (1S, 2T)</td>
<td>Different/additional student activities</td>
<td>3 (2S, 1T)</td>
</tr>
<tr>
<td>Student self-assessment</td>
<td>3 (2S, 1T)</td>
<td>Acknowledging students prior knowledge</td>
<td>1 (S)</td>
</tr>
<tr>
<td>Students reflection occurs after the lesson</td>
<td>2 (S)</td>
<td>Provide feedback for student use</td>
<td>1 (T)</td>
</tr>
<tr>
<td>No answer</td>
<td>2</td>
<td>No answer</td>
<td>1</td>
</tr>
</tbody>
</table>

4.1.3.1 How were students aided in understanding the learning objectives?

4.1.3.1.1 Student completion of activity receiving.

Of the 37 preservice teachers who participated in this study, a majority (17 preservice teachers) described the act of completing an activity or assignment as a method to help aid students in understanding the lesson’s learning objective. This idea is summarized by one preservice teacher’s reflection,
To help students understand the learning objective Ms. Miller introduced the topic of fossils with a common misconception. She then had the students do the activities where they dug in their fossil boxes, like real scientists would do. From this activity the students learned about different ages of fossils and different types of fossils, which are things that are tied to the lesson objectives.

Of these 17 preservice teachers, nine of them did not change their views between the pre- and post-case reflections. These views fit within a wide spectrum of ideas about how the case students were aided in understanding the lesson’s learning objectives. Four of the nine preservice teachers provided responses that focused on having students complete lesson activities in order to gain an understanding of the objectives. The following is a representative example from one preservice teacher’s post-case response.

Ms. Miller tried to get the students to understand the lesson objective in a couple of different ways. She had them writing about a footprint. This would help with getting students to think about the history of the footprint. She then let students explore different fossils by feeling them and actually being able to touch them. Also she had them split up by different time periods and location where they would have been found. The last activity she had them do was look at a picture of different fossils and then put labels on them in the order they were discovered from the oldest to youngest.

Two of the responses focused more on the case teacher’s role in helping the students understanding the learning objective. These two responses are provided below.

Ms. Miller discussed the information that the activity was based on with her class. Without this discussion I do not think that the students would have learned the objectives on their own. I like how she included small discussion in with the activity and made side comments to assist the students in their learning.

Ms. Miller had students write in a journal as well as having a class discussion about their findings. I think hearing what other groups had to say and what the students wrote in their journals gave Ms. Miller an understanding of how her objective was being accomplished and what she could do to make sure the students are meeting the objective goal.

Another preservice teacher described the linkage between a fun or engaging activity and a student’s ability to better understand the learning objective. “To help
students understand the lesson objectives, Ms. Miller created fun activities the students can be doing (hands-on). By creating an adventure for them, they are most likely very engaged and interested in learning.”

Lastly, one preservice teacher described the classroom activities as a way to collect evidence of learning the objectives from the students; however, this preservice teacher commented on how the lack of teacher feedback hindered the students’ ability to improve their understanding. The preservice teacher also focused on how this lack of feedback affects the quality of instruction.

One way that Ms. Miller collected evidence occurred on the second day of the lesson. She asked her students a multiple-choice question that was answered the previous day. This was an informal assessment that required the students to put their heads down and raise their hand when she called out the appropriate answer. However, after seeing that the students though, she did not address the question in any way. Therefore, the students that may have answered incorrectly were not given any feedback or help. At the end of the lesson on the second day, Ms. Miller had her students write down three things they learned, two things they still have questions about, and one thing they would like to talk about during the lesson, the following day. This may have been an effective technique if she had given her students feedback about what they had written or addressed their questions, the following day. She can see that students have questions about what they are learning, but makes no effort to address them.

Of these 19 preservice teachers who described the act of students completing an activity or assignment as a method to help aid in student understanding the lesson’s learning objective, 7 preservice teachers’ views shifted towards acknowledging formative assessment between their pre- and post-case reflections. Initially the preservice teachers’ description solely focused on the completion of the classroom activities; however, their post descriptions included the acknowledgement that the learning objectives were never made explicit to the students. In their pre-case reflections, two preservice teachers wrote,
Miss Miller let the students handle and question the fossils to begin with to get their interest in introducing idea of them. Then with the excavation activities she led them to conclude that fossils are for both plants and animals, they are formed in different environments, and mainly, they are created through time, which is depicted by their depth in the soil. Ms. Miller would also conclude her lessons with talking about the activities and putting the main ideas into explicit terms.

I noticed a few different methods that Ms. Miller used to assist students in understanding the lesson objectives. One of which entailed the students applying skills used by paleontologists while they excavated for fossils in their shoeboxes. This is an engaging way to provide real life application to the concept of the objectives. Another method I noticed was allowing her students to write freely in their science journals. This is an important aspect to well-rounded instruction because all students have something to say and they are not always provided the opportunity to speak their mind. Providing them the time to pair share or write down their thoughts in an informal method is a great way to engage students who are more analytical learners or expressers. Finally, I felt as though the 3-D software would have really engaged the students, especially in this generation of students who are technology driven. Expressing the fossils held in front of them through a virtual model of the plant or animal it once was alone would have enhanced the classroom experience.

As with many preservice teachers in this particular category, student understanding of the learning objectives is often perceived as something that occurs through the completion of lesson activities or through a teacher-guided closure of the activity, rather than something that is shared with the student prior to the start of the lesson. This was the case with all of the pre-case reflections of the preservice teachers in this category; however, their views shifted in their post-reflections,

To improve student understanding she could have made the objectives more explicit. As in, students should know what fossils are. The objective says to introduce the idea of them, which she did, but through the lesson the student should have gotten a firm understanding of them to then lead into the next lesson.

Ms. Miller never actually readdressed the learning objectives. Instead, she used implicit strategies to set her students up for the lesson. An example of an implicit strategy used was through the use of animal track pictures. These pictures were used to guide students thinking toward the concept of time, when the fossils were first created.
Of these 19 preservice teachers who described the act of students’ completing an activity or assignment as a method to help aid in student understanding the lesson’s learning objective, 2 preservice teachers’ views shifted away from acknowledging formative assessment between their pre- and post-case reflections. In both pre-cases, the preservice teacher described the case teacher’s lack of explicitly sharing the learning objective with her students. In the post-case reflection, however, there is a shift back to the case teacher’s involvement in explaining or summarizing the main ideas for her students as they complete the lesson activities. One preservice teacher wrote, “She summarized the basic overview to fix the misconceptions but she should have let the students figure this out for themselves to make it more meaningful.”

4.1.3.1.2 Students did not understand the learning objective.

Of the 37 preservice teachers who participated in this study, five preservice teachers described the students’ lack of understanding the lesson’s learning objective. Two of the five students had similar views between their pre- and post-case reflections. The first preservice teacher simply stated, “To help students learn the lesson objectives, Ms. Miller didn’t do anything.” The second preservice teacher focused more on how the teacher, through her teaching, provided the students with an idea of what was being taught, however, students were not held accountable for this information. She stated,

Ms. Miller touches on the objectives through lecture. In addition, Ms. Miller notes that some fossils have features that indicate they were aquatic and others have features that indicate they probably lived on land. Ms. Miller then concludes by talking about how the environment may be different from the environment investigated on the previous day when the 'hole' wasn't very deep… Students now
know that information, but how well? They have no chance to actually use it further, and the information doesn't ever get brought up again.

Three of the five preservice teachers’ views shifted towards the acknowledgment of formative assessment. In the pre-case reflection, when asked how the case students were aided in understanding the lesson objectives, the preservice teachers’ responses were similar, as represented by one preservice teachers’ response, “She provided a picture of animal tracks with the students and related it to the fact that animals and plants can exist in the same area at different times.” All three responses reflected the idea that by participating in the lesson activities, the case students would all come to an understanding of the lesson objectives. For all three preservice teachers, their post-case reflections still described the classroom activities, but then concluded by stating that the activities did not tie in well with the objectives. This is represented by same preservice teacher’s post-case response,

The teacher provided students with scenarios of what she expected them to do in the activities but it was hard to relate them to the objectives. She could have had the students make their own tracks instead of using the picture in the beginning of the lesson. Also, the teacher could have made the objectives more specific and measurable and repeated them throughout the lesson.

4.1.3.1.3 Teacher summarized the activity.

Of the 37 preservice teachers who participated in this study, five preservice teachers described the case teacher’s involvement as the main reason for student understanding of the lesson’s objective. All five preservice teachers’ views remained the same from pre-case to post-case. Two specific examples of preservice teacher’s post-case responses are shared below.
Ms. Miller explained the misconception about fossils, she showed them a picture of animal tracks to prove that things can happen at the same place but at different times, and she leads discussions and has the students discuss among themselves about the fossils.

Miss Miller does a good job of helping her students understand the objectives. After they have held the fossils and discussed in groups about them she speaks to the whole class and summarizes different events and starts to explain why fossils are important and what we can learn from them, which directly addresses the objective. She provides them with hands-on activities with the shoebox and has them draw conclusions and then Miss Miller points things out during the activity so they are able to understand the purpose. It makes the learning objective fun.

4.1.3.1.4 Type of activity.

The remaining eight preservice teachers were coded into three smaller groups. Each of the three groups will be briefly discussed below. The first group consisted of three preservice teachers whose reflection focused on how the type of classroom activity aided students in understanding the learning objective. One preservice stated, “to help the students understand the objectives miss Miller set up mini activities to help replicate things that scientists do and look at answer questions they have.” The other two preservice teachers focused on the act of participating in a “hands-on” activity as a way for students to have a better understanding of the intended learning objectives. One of the preservice teachers’ stated, “Ms. Miller helped the students throughout the lesson to help them understand the lesson objectives. One way that Ms. Miller helped the students is she had the hands on activity with the shoeboxes.”
4.1.3.1.5 Student self-assessment.

The second group of preservice teachers described the act of student self-assessment as a way for students to understand the learning objectives. One preservice teacher stated, “Ms. Miller asked her students to reflect on the lesson objectives for the day before they went to recess to try and get them to understand the lesson objectives.” More specifically, another preservice teacher describe the actual self-assessment activities that were provided within the lesson.

Miss Miller helped her students understand the lesson objective by having her students do different types of assessment. She has her students do self-assessment by asking the students to put their heads down and answer multiple choice questions by raising their hand when they hear the right answer. The students are able to check their own understanding and assess their knowledge. The students also do self-assessment when the teacher asked them to reflect on the objective for the day and write down three things they learned, two things they still have questions about and one thing that would like to talk about tomorrow. Lastly, the students reflect on the experience done in class in their science journals... These are all good ways that Miss Miller helped her students understand the lesson objective. The students are able to reflect and check their own understanding on the lesson.

The third preservice teacher took this idea of self-assessment one step further as she reflected on how the case teacher used this student data to determine if the objectives were indeed being met. She stated, “Ms. Miller helped the students by constantly taking into account to where the students were at…She was able to constantly see where the students were in achieving the objective.”
4.1.3.1.6 Students reflect on the learning objectives after the lesson.

The last group of preservice teachers also connected with the idea of providing students with self-assessment opportunities; however, the assessments occurred at the end of the learning episode. The two preservice teachers’ responses are provided below.

She had the fossils placed on the tables and had her students talk about them. She then went on to talk about what they are. Throughout the lesson she had different activities for the students to participate in and she had the students reflect on the objectives at the end of the day.

To have the students understand the lesson objectives Ms. Miller had the students reflect on the objective after the lesson. To further their understanding of the lesson objectives she could have the students ask any questions they would have about the objective after certain parts of the activities throughout the four day lesson.

4.1.3.2 What could the teacher do to improve student understanding of the learning objective?

The third pre/post-case question had two parts. The first question was addressed in the previous section; describing how the preservice teachers in this study believed the case students was aided in understanding the learning objectives for the lessons. The following section will include data collected on the second part of the pre/post-case question; a description of how the preservice teachers felt the case teacher could have improved student understanding of the learning objectives.

Of the two questions posed in this case study question, the second has provided a more descriptive explanation and reflection of preservice teachers’ views relating to teachers’ actions and student understanding of learning objectives. In this question, the
preservice teachers are able to share their personal opinions of how the teacher could have provided a clearer link between the lesson activities and the lesson objectives.

4.1.3.2.1 Learning objectives need to be explicit.

Of the 37 preservice teachers who participated in this study, a majority (18 preservice teachers) stated that the teacher should have explicitly stated the learning objective for her students. Of the 18 preservice teachers: seven of their views remained the same, ten of their views shifted towards the acknowledgment of formative assessment, and one preservice teacher’s view shifted away.

Seven preservice teachers’ view that remained the same; however, their post-case descriptions included specific formative assessment examples. For example, one preservice teacher’s pre-case reflection stated, “I think she could improve the student understanding of the lesson objectives to be more clear in telling the students what the objectives are and to teach about the objectives.” In her post-case response, the same preservice teacher stated, “She could of written the objectives on the board for the students, she could of written "I can" statements to help the students know what the objectives of the lesson are.” Two of the preservice teachers provided more detail in their post-case responses by mentioning the need for not only more clear learning objectives, but also some form of communication between the student and teacher, so that both are aware of where the student stands in terms of understanding the learning objectives. For example, in one of the preservice teacher’s pre-case reflections, she stated,

Ms. Miller did not really address the objectives with her students. At the beginning of the first lesson, she should have explained to the students what her
expectations were for the lessons. Students should always be clear of their objectives in order to stay on task and to gain a better understanding of what specifically is to be investigated. After explaining the objectives, she could have opened the lesson with a discussion on what students thought fossils helped scientists to understand. This would help students to access their prior knowledge on the subject at hand. Ms. Miller could have recorded the responses from the students to compare them with their responses after the completion of the lessons.

In the same preservice teacher’s post-case, she states,

Ms. Miller could improve student understanding of the lesson objectives by posting these objectives for the students to see, each day. This would be a consistent reminder of what they need to focus on for the four lessons. In addition, by providing her students with feedback both times they were asked to write in their journals would be much more effective. If a student is confused or not understanding something, this needs to be addressed as soon as possible. She could also use these assessments as a way to shape her teaching of the lesson, the following day. If the majority of students don't understand the lesson the previous day, she may need to reteach the lesson in a different way, before moving on to a new lesson or concept.

This particular preservice teacher views the use of feedback as a way to modify instruction to better suit the needs of her students. The second preservice teacher has similar views about making learning objectives explicit, as well as providing feedback, yet the feedback is being use differently. In her post-case reflection, the preservice teacher states,

If I were the teacher, I would have the objective posted at the front of the room at the beginning of each lesson and revisit it during and at the close of the lesson each day. I might also have students write questions they still had about the objective on a feedback sheet at the close of the lessons, or possibly write how what they had learned helped them to better understand the objective. This places the objective as the focus of the lessons and by the end of the four-day lesson; students are very familiar and comfortable with it.

Although both preservice teachers mention the importance of feedback as a way for students to improve their understanding of the learning objective, the two preservice teachers view the way in which feedback is utilized in two different ways. As described,
the first preservice teacher mentions feedback as a way to modify instruction; this is teacher focused. The second preservice teacher mentions feedback as a way for students to self-assess and become familiar with the objectives; this is student-focused.

Three of the seven preservice teachers provided a brief pre- and post-case description of what the case teacher should have done to improve student learning. The following preservice teacher’s post-case reflection provides an example, “Ms. Miller can improve on students understanding the learning objectives by stating them better and explaining why they are doing the activities they are doing. If students are able to make these connections, they will learn more.”

Of the 18 preservice teachers who commented that the case teacher should have explicitly stated the learning objective for her students, ten of their views shifted towards the acknowledgment of formative assessment. From these ten preservice teachers’ pre- and post-case comments, three major shifts were categorized. The first shift can be described as the preservice teachers’ originally viewing hands-on science activities as a way for the teacher to improve student understanding of the learning objectives, but then shifting towards the acknowledgment that teachers need to make the learning objectives more explicit for their students. The first preservice teacher’s pre-case reflection included the following statement about hands-on activities. “She could let them make their own "fossil" using dirt and clay. This would help the students better understand how a fossil is created than just telling them about it.” In her pre-case, the preservice teacher stated,

To help improve student understanding of the objective she should give them "I can" statements based on the objectives at the beginning of each day so the class knows what is expected of them and they can monitor their own learning.
Another preservice teacher wrote in his pre-case,

It would have been neat to have reserved a school sandbox (if applicable) and have the students set up their own archeological dig while "in the field" of paleontology. This way students are able to get out from their desks and fully engage in the learning that they are expected to undergo.

Yet, in the same preservice teacher’s post-reflection, he shifted his answer, saying, “I think that Ms. Miller could improve by explicitly explaining the learning objectives for the students. It is important they understand some of the outcomes they should have after each activity.”

The second major shift was categorized as a shift towards the acknowledgment of student reflection as an important piece in assessing students understanding. Preservice teachers in this category had different ideas in their pre-case reflections; however, they all concluded with the importance of student reflection in their post-case reflections. For example, one preservice teacher stated in her pre-case, “I think she needed to explain the different events happen over time, allowing fossil to arise at different times, before she has the students write a story using the picture.” This statement indicates that a teacher-focused lesson would be needed in order for students to understand to the learning objectives. In her post-case reflection, however, the preservice teacher stated,

She could have posted the objectives each day for the students to see and had them reflect at the end of each lesson to see if the objectives were met. They could have done this through class discussions, writing in student journals (as long as she checked them), or an assessment.

The shift here is focused away from a more teacher-centered environment to a more student-friendly environment in which the teacher is requesting that students reflect on
whether or not they have met specific learning objectives. This notion is also voiced in
two other preservice teachers’ post-case reflections.

Something that Ms. Miller could have done to improve student understanding of
the lesson objective is to let the students know on the first day what she expects
them to know and at the end of the day, have the students discuss more on what
they learned.

I think it would have been very helpful for the students if Ms. Miller used the
objectives as focus questions or statements so the students always knew exactly
what they were working towards. This would also help them to take what they are
learning and see if they can make sense of it in regards to the objectives. She
could use frequent individual, small group or whole class reflection questions that
would be used to help the students periodically "check-in" to make sure what they
are learning and experiencing are relating directly back to the objectives.

The third, and last, major shift towards the acknowledgment of formative
assessment was categorized as the need to re-write the learning objectives to include
more detail than the objectives provided in the case study. One preservice teacher stated
in her post-case reflection, “I think this objective could have gone more in detail. ‘To
introduce how animals and plant can exist in the same area at different times.’” A second
preservice teacher stated, “The teacher could have made the objectives more specific and
measurable and repeated them throughout the lesson.” Both of these preservice teachers
point to the idea that clear learning objectives are important. Unlike the second preservice
teacher, the first preservice teacher neglects to re-write the objective in a measureable
form; however, acknowledging the fact that the original learning objective was not
appropriate is a step in the right direction.

Of the 18 preservice teachers who commented that the case teacher should have
explicitly stated the learning objective for her students, one preservice teacher’s view
shifted slightly away from the acknowledgment of formative assessment. In the preservice teacher’s pre-case reflection, she stated,

Ms. Miller did not explain to her students what the objectives of the lesson were. She could list her objectives on the board, or she could explain to the students after they’ve explored the topic what they learned from each exercise as it relates to her objectives.

The focus for the pre-case statement is that the teacher neglected to share the learning objectives with her students; the objectives should be clearly visible in the classroom. This preservice teacher, however, does mention that the teacher could also tell her students what is expected of them after the lesson has occurred. Although this is not a beneficial formative assessment strategy, the preservice teacher does make reference to the relationship between addressing the expected learning outcome as it relates back to the lesson objective. In her post-case reflection, the preservice teacher’s views seem to shift slightly away from the acknowledgement of formative assessment. She states,

Ms. Miller made sure to explain each concept that her activities were intended to teach in order to help her students understand the lesson objectives. She also checked for understanding when she asked her students a multiple choice question about fossils and had them answer in a way that was anonymous to their peers.

The preservice teacher then goes on to state, “This case didn't specify whether Ms. Miller posted her objectives prior to the lesson, however doing so would definitely help her students' understanding to improve their understanding of those objectives.” At the beginning of her reflection, the preservice teacher contradicts what she wrote in her pre-case by stating that the teacher did indeed explain the concepts as they related to the learning objectives; however, she goes on to state that having posted learning objectives would benefit the students.
4.1.3.2.2 More student-centered.

The next largest concentration of preservice teachers (eight members) described a more student-centered lesson as a way to improve student understanding of the learning objectives. Some of the preservice teachers’ ideas from the previous section correlate well with this current section, as providing clear and explicit learning objectives for students can help to create a more student-centered lesson. On the other hand, having a more student-centered lesson does not necessarily require the teacher to explicitly share his or her learning objectives. This is why the two categories were created during the coding process. Of the eight preservice teachers who described a more student-centered lesson, six of their views remained the same from pre-case to post-case, while one preservice teacher shifted towards the acknowledgment of formative assessment and another shifted away.

Of the six preservice teachers’ whose views remained the same, a common theme in their pre- and post-case reflections was the suggestion for students to be more active in the learning process. For example, one preservice teacher stated, “Mrs. Miller could ask students how this could be instead of just telling the class. This could be an opportunity for students to think critically about what they have discovered.” Another preservice teacher stated, “One thing I would suggest she could do to improve would be to allow a student led discussion so they have the opportunity to feed on each other and learn more from one another.” A third preservice teacher stated, “To further their understanding of the lesson objectives she could have the students ask any questions they would have about the objective after certain parts of the activities throughout the four day lesson.”
This last statement is interesting because the preservice teacher acknowledged the need for students to ask questions; however, this is suggested to happen at the end of the activity. The acknowledgment that students need to give and receive feedback during the learning process is a key aspect of formative assessment; this is missing from this particular quote. Moving more towards the idea of providing students with clear learning objectives in which students can use to self-assess their growth, one preservice teacher wrote, “One thing she could improve for the students is by making "I can" statements. That way, students can have personal accountability to their learning and can clearly assess what they learned.” Of special note, this particular preservice teacher did not mention the specific “I can” strategy in her pre-case, but did provide a general description of increasing student involvement based on student inquiry rather than teacher-driven instruction.

One of the eight preservice teachers who described a more student-centered lesson, shifted towards the acknowledgment of formative assessment. In her pre-case reflection, the preservice teacher stated, “Ms. Miller used the data that she got from her students, and put that data into the computer to show the different layer and what happens to the fossils overtime.” This statement does not reflect any thought of how these teacher actions helped improve student understanding. This teacher-directed activity did not address differences in students’ interpretations or conceptions of the results based on initial learning objectives set by the teacher. In her post-case reflection, the same preservice teacher stated,
To help students understand her objectives, Ms. Miller had her students use hands-on experiences to further their understanding. In the beginning of the day Ms. Miller tells the class what they will be doing in class but instead of her telling the objectives, have the class maybe think of an objective that makes sense to them to further help them understand.

This particular response is not an accurate representation of using formative assessment strategies to help students improve their understanding, but from the pre- to post-case reflection, the preservice teacher does recognize the need for objectives to be explicit, as well as the need for student involvement in the learning process.

One of the eight preservice teachers who described a more student-centered lesson, shifted away from the acknowledgment of formative assessment. She stated, “Ms. Miller did not explain to the students what she was trying to teach to them. She should have given a better introduction to fossils other than describing what they are and how they formed.” Yet, in her post-case reflection, the preservice teacher wrote, “She summarized the basic overview to fix the misconceptions but she should have let the students figure this out for themselves to make it more meaningful.” Again, this preservice teacher’s response is not an accurate representation of the correct use of formative assessment strategies in order to help students improve their understanding; however, her pre-case reflection, acknowledges the fact that students are not made aware of the learning objectives. The post-case reflection describes how the case teacher provided an overview of the misconception activity, but the students should have had the opportunity to work this out.
4.1.3.2.3 More or different type of assessment.

The third largest concentration of preservice teachers (five members) described the need for additional assessments as a way to improve student understanding of the learning objectives. Three preservice teachers’ views remained the same between pre- and post-case reflection and two preservice teachers’ views shifted towards the acknowledgment of formative assessment. Of the three preservice teachers whose views remained the same, two suggested changing how the assessment was structured in the case. For example, one of the preservice teachers stated,

I think Ms. Miller could have done a different assessment on the second day. I would have had the students write down the answers instead of having them put their heads on their desks, cover their eyes, then raise their hands for the correct answers.

The third preservice teacher suggested doing more of the same type of assessment. She stated,

She could improve student understanding by giving more formal assessments such as an exit slip or a formal test at the end of the unit. Ms. Miller could also do a few summative assessments, such as walking around the classroom and asking students she observes questions to see if they understand the lesson objective.

Of the two preservice teachers whose views shifted towards the acknowledgment of formative assessment, in their post-case reflections, both preservice teachers commented on the need for students to self-assess their conceptual understanding. In the pre-case description, the first preservice teacher wrote about the need to students to be more involved in sharing their ideas. In her post-case, she expanded this idea, stating,

To improve student understanding, I think that Ms. Miller might have an exit activity after each day instead of at the very end of all the lessons. In the exit slips, she should have questions that relate back to the objectives.
The second preservice teacher originally suggested that the teacher “cut some more complex ideas out, so the children could understand the basics of the fossils.” However, in her post-case reflection, the same preservice teacher stated, “To improve student understanding, I think Miss Miller could do some form of self-assessment at the end of each lesson, in order to adjust her instruction for the next day's lesson.

4.1.3.2.4 Different or additional student activities.

Of the 37 preservice teachers who participated in this study, five preservice teachers’ views remain; these preservice teachers can be grouped into three remaining categories. These three categories include: different/additional student activities, acknowledging students prior knowledge, and providing feedback for student use.

Three preservice teachers described different or additional student activities as a way for the teacher to improve student understanding of the learning objectives. Two of these students’ views remained the same from pre- to post-case reflection. Their views are represented by the following preservice teacher’s description. In the pre-case, one preservice teacher stated, “One thing I would change is the use of the picture. As a college student, I didn't really understand it so I can't be certain that a fourth grader would.” This particular preservice teacher was confused by the use of one activity in the case, but neglects to explain what caused this confusion. In her post-case, the same preservice teacher stated,

One thing that I think she could have done differently in order to help student understanding is have a group discussion after the completion of the activity. I do not really like how she had the students answer questions in their journals and then discuss them the next day in small groups. I think students would have
gained more if they had a concluding discussion as a class and then worked on their journals.

Although the post-case provides more detail, the preservice teacher is still suggesting that a change in the way the activity is presented (i.e. concluding as a class as oppose to smaller group discussion) would better suit the students’ understanding of the learning objectives.

One preservice teacher’s views shifted towards the acknowledgment of formative assessment. In the pre-case, the student stated, “Addressing students’ questions and comments would help improve student understanding by answering information they still were unclear about.” In her post-case, however, the preservice teacher’s reflection shifted. She stated,

Ms. Miller tried to help her students understand the objectives with fun and interesting activities. However, I don't believe that the activities helped the students learn the objectives. She could improve her students' understanding by making her activities more relevant to the objectives.

4.1.3.2.5 Acknowledging students’ prior knowledge.

The second of the three remaining categories included one preservice teacher’s view, which revolved around students’ prior knowledge. The preservice teacher stated, “I think Miss Miller should have tapped into their prior knowledge about fossils before she introduce the lesson to help them gather what they know to understand better.” Prior knowledge is certainly important to consider when trying to improve student understanding of the learning objective.
4.1.3.2.6 Providing feedback for student use.

The third remaining category also included one preservice teacher’s view, which shifted towards the acknowledgment of formative assessment. This preservice teacher focused on the ability to improve student understanding through feedback. The preservice teacher originally stated in her pre-case reflection, “To improve the students understanding she could provide real scientific explanations so students can see if they are close with their answer and feel more like a scientist.” This particular preservice teacher’s pre-case reflection is merely touching on her dislikes of the lesson structure; there is no mention of the lack or need for improved formative assessment. Her views in her post-case reflection shifted to reflect more formative assessment implementation.

To help improve the students understanding of the objectives the teacher could have acknowledge the work of the students more… Also, the journal entries could have received feedback instead of just putting a check mark or X. Students may answer a question, but it would help them to receive feedback to help them with their learning.

Although this particular response is focused more on improving student learning through feedback than on improving students understanding of the learning objectives, the response highlights an appropriate formative assessment strategy.

4.1.3.3 Discussion: Question three

Case question three focused on how well the learning objectives were understood by the students and what the teacher could do to improve this understanding. This question dealt with the role of both the student and the teacher in the learning process. When asked how students were aided in understanding the learning objectives, 21
preservice teachers’ views remained the same, 12 shifted towards the acknowledgement of formative assessment, and two shifted away. When asked how the teachers could improve student understanding, 19 preservice teachers’ views remained the same between the pre- and post-case reflection, 15 shifted towards the acknowledgement of formative assessment, and two shifted away. Within this discussion section, I will begin by highlighting the major themes that emerged from both questions within the preservice teachers’ pre- to post-case reflections. I will then conclude by offering an interpretation of how this data helps to answer my research questions.

4.1.3.3.1 Aiding students in understanding the learning objectives.

When describing how students were aided in understanding the learning objectives, more than half of the preservice teachers views remained the same between their pre- and post-case reflections. Several of the preservice teachers described the students’ lack of understanding the lesson’s learning objective, highlighting the absence of clear learning objectives in both their pre- and post-case reflections. Between pre- and post-case reflections, these preservice teachers held an adequate understanding of how learning objectives foster student learning. Data from the other preservice teacher, however, did not suggest an adequate level of understanding existed. These preservice teachers’ views focused on: providing students with classroom activities to help students grasp the intended concepts, and the teacher “addressing” the learning objectives through class discussion of each activity.
Providing students with opportunities to learn content through engaging class activities is indeed an important process; however, by simply completing an assignment the teacher can neither say the student has necessarily learned the intended content, nor can the teacher assume that students understand the learning objectives. The students can complete the assignment without truly understanding how the information fits within the context of the unit. In addition, and perhaps more importantly, the students can complete the assignment without being able to place their learning in context with what is expected (i.e. the learning objectives). Without sharing the intended learning objectives, the students do not have the context they need to self-assess their learning during this learning process. Several of the preservice teachers also described the teacher’s role in discussing the intended learning outcome with her students, and then using student feedback to help the teacher better assist students understand the objectives. Using feedback to alter instruction is certainly a valuable formative assessment strategy; however, these preservice teachers are describing a purely teacher-led learning situation in which the students’ role in neglected. The students are unable to self-assess their learning if the teacher does not provide her students with a learning target at the beginning of the learning process. In addition, simply discussing the activities outcome with the students does not directly address the objective of the lesson; it assumes the students can make a rational connection between the activities they completed in class and the unstated objectives in which the teacher holds the students accountable.

When describing how students were aided in understanding the learning objectives, 12 of the preservice teachers views shifted towards acknowledging formative
assessment. In the pre-case reflection, preservice teachers highlighted three different main ways in which the students were aided in understanding the learning objectives. These included: the type of activity completed in the lesson, the engagement level of the students, and the teacher’s role in concluding or summarizing important aspects of the lesson. The preservice teachers’ focus here is on instruction and student engagement rather than student understanding of the learning objective. In their post-case reflections, however, seven preservice teachers referenced a need for the case teacher to address the learning objectives with her students. Interestingly, the data also suggests a shift towards a more student-centered learning experience; one in which the students are asked to relate their learning to the specific objective rather than the teacher summarizing important content for the students. Three preservice teachers explicitly stated the importance of making the learning objectives specific and measurable, as well as repeating the objectives throughout the lesson. Several preservice teachers highlighted the importance of students self-assessing their understanding of the content based on the learning objectives. Specific class reflective activities were mentioned (e.g. exit slips and journaling). Self-assessment and reflection are important aspects of the learning process, and a critical process in formative assessment; including these ideas in their post-case reflections suggested a shift toward the acknowledgement of formative assessment. The data suggests, however, that the preservice teachers may view the process of reflection and self-assessment as one in the same. The act of reflection does not necessarily need a set of success criteria in which to make a judgment, where as self-assessment does. The case students could reflect on what they believed were successes in their learning for the
day or they could reflect of ideas or concepts they still have a hard time understanding. These successes and challenges may not match up with the teacher’s learning objectives for the lesson. To self-assess ones progress, a person makes judgments based on explicit and measurable success criteria.

Two preservice teachers were coded as shifting away from the acknowledgment of formative assessment. In their pre-case reflections, both explicitly stated how it was important for the case teacher to share the learning objectives with her students. In the post-case reflections, however, the preservice teachers described how the students should take the lead in making conclusions about the lesson, rather than the teacher summarizing the results. Although the post-case reflections may indeed harbor a valid point, the preservice teachers have neglected to describe how students are aided in understanding the learning objectives. The data suggests that the preservice teachers may equate completion of a class activity with understanding the specific lesson objectives.

4.1.3.3.2 How teachers could improve student understanding of the learning objectives.

When describing how the teacher could help improve student understanding of the learning objectives, more than half of the preservice teachers views remained the same between their pre- and post-case reflections. For a majority of the preservice teachers, their post-case reflection offered specific examples that were not included in their pre-case reflection. It is important to note that although the level of detail and choice of vocabulary may have changed between the pre- and post-case reflections, the preservice teachers’ ideas remained basically the same. This is why the preservice
teachers’ views were coded as remaining the same rather than shifting towards the acknowledgement of formative assessment. Pre-case reflections included the general idea that the teacher could clarify the learning objectives either verbally or in written form. Several post-case responses described the importance of utilizing “I can” statements during the start of the lesson. The particular concept of using “I can” statements was included within one the case studies discussed in class. Providing an example used within the class case discussion to support post-case reasoning suggests that the case discussions influenced preservice teachers overall understanding of the formative assessment process; however, the concept of providing students with clearer idea of the objectives was also mentioned in the pre-case.

Many preservice teachers pre- and post-case reflections included statements regarding the importance of providing students with explicit learning objectives, and some went further to highlight the importance of explaining to the students why the teacher has chosen particular activities; however, the data suggests that preservice teachers did not reflect on making students aware of the connection between providing explicit learning objectives and assessing these exact learning objectives through classroom activities. In other words, our students do not necessarily understand how the learning objectives specifically relate to the judgment in quality of student work. Rather, students often see class activities as producing correct or incorrect answers regarding general topics of study.

Interestingly, several preservice teachers highlighted the need for the teacher to change or increase the number of “assessments” done in class as a way for the teacher to
improve student understanding. Collecting student data is absolutely beneficial; however, assessing a student does not provide the student with a better understanding of the learning objective, it merely tests their knowledge of a particular concept. It also assumes that the assessments directly match up with the specific learning objectives for the lesson; this is often not the case. Preservice teacher terminology surrounding assessment is also important to note. One preservice teacher recognized the need for more assessment practices (i.e. exit slips); however, his particular response is of great interest because the term “formal” assessment was used to describe both an exit slip, which is usually used as a formative tool, and an end of unit test, which is summative in nature. In addition, the preservice teacher used the term “summative assessments” when describing the formative act of classroom questioning. This data suggests that even though case examples and case discussion occurred exclusively around formative assessment in the classroom, some preservice teachers may still lack the essential vocabulary to appropriately acknowledge formative assessment strategies.

When describing how teachers could improve student understanding of the learning objectives, 15 of the preservice teachers views shifted towards acknowledging formative assessment. Initially, preservice teachers’ reflections indicated that teachers could improve student understanding of the learning objective by: the type of activity completed by the students, the engagement level of the students, and the teacher’s role in concluding or summarizing important aspects of the lesson. Again, the focus was on instruction and student engagement rather than providing opportunities in which students could better understand of the learning objective. In their post-case reflections, however,
the focus was centered around providing students with an explicit knowledge of what was
even of them during the learning cycle and opportunities for students to reflect on
their understanding of these concepts. Several post-case reflections included a request for
the case teacher to make the objectives more specific, measurable, and stated more
frequently throughout the learning process.

Several preservice teachers highlighted the importance of self-assessment in their
pre-case reflections. In their post-case reflections, the preservice teachers added the
importance of having students self-assess based on the learning objectives. Although this
is a small addition to the post-case reflections, self-assessment is not truly assessment
unless the student has explicit success criteria in which to assess his or her knowledge.

Two preservice teachers were coded as having views that shifted away from the
acknowledgement of formative assessment. In both pre-case reflections, the preservice
teachers remarked on the importance of having clear learning objectives. In the post-case
reflections, the preservice teachers focused on how the students should have been given
the opportunity to work through the “misconception” assignment on their own. There was
no mention of providing clear learning objectives. In addition, the topic covered by the
misconception was not actually part of the learning objective for this lesson.

In addressing my first research question, the data suggests that the implementation
of formative assessment cases did influence preservice teachers’ knowledge of formative
assessment. Combining both questions, 27 preservice teachers were coded as having
similar views between the pre- and post-case reflections. Even though the preservice
teachers’ views may have remained fairly consistent between pre- and post-case
reflections, the amount of detail increased within many of the post-case reflections. Many preservice teachers elaborated on the collection of student evidence as well as using this evidence to alter instruction. Although these are critical aspects of quality formative assessment practices, this particular question was referencing students’ understanding of the learning objectives, not how teachers collect evidence of student learning. This increase in post-case description suggests that the preservice teachers incorporated ideas from previous cases and case discussions (e.g. using appropriate methods to collect evidence of student learning, and using student feedback to modify instruction); however, the lack of acknowledging the use of explicitly stated learning objectives suggests the preservice teachers may not have a sufficient understanding regarding the role learning objectives play in the students’ learning process.

Although not the case for the preservice teachers whose views remained the same, connecting learning objectives to improvement in student learning was the focus of many preservice teachers whose views shifted towards formative assessment acknowledgement between the pre- and post-case reflections. Pre-case reflections focused on instruction and student engagement. Post-case reflections, however, referenced a need for the case teacher to address the learning objectives with her students. Three preservice teachers explicitly stated the importance of making the learning objectives specific and measurable (e.g. using “I can” statement), as well as repeating the objectives throughout the lesson. Others highlighted the importance of students self-assessing their understanding of the content based on the learning objectives. Specific class reflective activities, as described and discussed in the cases, were mentioned (e.g. exit slips and
journaling). Identifying both explicit learning objectives and the process of self-assessment within the post-case reflections suggests that the preservice students gained insight from completing the case reflections and case discussions.

In addressing my second research question, the data suggests that specific characteristics can be identified within the preservice teachers’ reflection that suggests learning has occurred. Data suggests that after reading and discussing the first case in the preservice teachers’ methods course, the preservice teachers began to apply formative assessment concepts and strategies to their own case reflections. Many preservice teachers were at first satisfied that students understood the learning objectives for the lesson because the class activities seemed to reflect the appropriate content. Data from the post-case reflections suggested that many of the preservice teachers shifted their views, while others included more detail or specific examples to their post-case reflections. The preservice teachers addressed the need for explicit learning objectives to be shared with the case students, which included using “I can” statements during the lesson. Preservice teachers also applied other formative assessment strategies such as increasing the amount of student self-assessment and teacher feedback within the pre/post case lesson. These are the types of formative assessment strategies and concepts discussed during the class case discussions. Some preservice teachers made explicit connections between providing case students with increased teacher feedback based on the learning objectives, while others simply mentioned the need for more teacher-student communication. This data suggests that, whether preservice teachers specifically stated the relationship between providing the learning objectives and self-assess one’s
knowledge or described some variation in between, application of these strategies and concepts to their post-case reflections suggests that the preservice teachers have gained insight from the cases and the case discussions to further their knowledge of formative assessment.

4.2 Collecting Appropriate Evidence of Learning: Pre/Post Questions Four and Five

Case questions four and five deal with the concept of collecting appropriate evidence of student learning. Collecting evidence of student learning is an important aspect of formative assessment because it allows the teacher to help students bridge the gap between what they know and what they are asked to understand; providing information to help answer the question “how am I going to get there?” Assessment for student learning provides the teacher with the evidence needed to adjust instruction to meet the students’ needs. It also provides the student with an opportunity to determine what they do and do not understand, which in turn allows the student to better formulate questions to help them learn.

An issue that many new teachers face is collecting appropriate evidence that is directly related to the learning objectives. In other words, does the assessment ask students to share information directly related to the learning objectives for the lesson? Often times, the answer to this question is no. The assessment may be on a similar topic, but it does not provide evidence the teacher needs to determine if the students understand the specific objective. It is extremely important for teachers to always keep the learning objectives in mind when planning and executing a lesson. The teacher should always be
reflecting on how well the assessment or activity matches the learning objective.

Before reporting and discussing the results under this section, it is necessary to provide a brief description of how evidence of learning was represented in pre/post case. Overall, Ms. Miller presented several opportunities to collect evidence of student learning; however, two main issues can be identified with Ms. Miller’s process of eliciting evidence.

First, some of Ms. Miller’s assignments are not directly related to her “objectives.” For example, the homework assigned on the third day of class asked the students to distinguish between newer and older fossils. This is not one of the stated objectives.

Secondly, and most prominent throughout the entire case, Ms. Miller has planned several opportunities for students to learn; however, the unit is teacher-centered rather than student-centered. During the classroom activities, Ms. Miller offers the students an opportunity to interact with materials, but she rarely requires students to analyze and synthesize the information they have uncovered. Instead, Ms. Miller summarizes the learning objective for the students. This occurred throughout the unit: during the introductory exploration of the fossils, after the students were asked to examine the footprint diagram, during both shoebox fossil digs, and during the conclusion of the unit. One example that is of perhaps great interest occurs at the very end. Ms. Miller asked the students to address the common misconception that was introduced at the beginning of the lesson and then used the students’ responses as evidence of their learning throughout the lesson. Although this information may be indeed valuable, it cannot be used as evidence of learning the stated objectives because the topic addressed within the
misconception was not actually part of the objectives for the unit.

4.2.1 Pre/post case question four: Over the four-day period, do you think Ms. Miller collected enough evidence that her students understood the learning objectives for this lesson? Explain your answer.

Of the 37 preservice teachers who participated in this study, 16 answered that the case teacher collected enough evidence of learning over the four day lesson and 21 answered that the teacher did not collected enough evidence of learning over the four day lesson. Table 4.5 provides an overall description for preservice teachers’ agreement or disagreement to this question. Of the 16 preservice teachers who agreed, all preservice teachers described the act of students completing an activity or assignment as a method to help aid the teacher in collecting enough evidence of learning. In terms of the preservice teachers’ responses acknowledging formative assessment practices, 13 preservice teachers’ views remained the same between pre- and post-case reflections and three preservice teachers’ view shifted toward the acknowledgment of formative assessment.

Table 4.5

Summary of Preservice Teachers’ Responses to Pre/Post Case Question Four

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes…</th>
<th>No…</th>
<th># of PST</th>
<th># of PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion of assessment activities</td>
<td>16 (13S, 3T)</td>
<td>Assessments didn't gather enough/appropriate EOL</td>
<td>17 (12S, 5T)</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Teacher provided no feedback</td>
<td>3 (S)</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Students didn't have the opportunity to demonstrate understanding</td>
<td>1 (S)</td>
<td></td>
</tr>
</tbody>
</table>
4.2.1.1 Question four: Agreement

4.2.1.1.1 Completion of assignment/assessment activities.

A common theme emerged from all 13 preservice teachers whose views remained the same between pre- and post-case reflections. All preservice teachers briefly listed some combination of classroom activities as the method for the teacher to collect evidence of learning. This can be represented by the following preservice teacher’s response,

I do think that Ms. Miller collected enough evidence that her students understood the objective. I say this because she had the students create the story, answer the multiple choice question, discuss, fill an exit slip, journal, complete the cartoon drawing worksheet and address the misconception.

Some of the evidence, as stated above, is collected through daily classroom activities, such as the misconception story or cartoon worksheet. Other evidence is collected through assessments such as the multiple-choice question, exit slip, and journal. One preservice teacher mentioned an additional method of evidence collection, stating, “Overall, she did collect enough data to show how well the students understood the different time periods the fossils were found in. She did this through observation and having them fill out the different sheets.”

Two preservice teachers used different assessment terminology to describe what types of assessment were included in the lessons. One preservice teacher stated,

I do think Ms. Miller collected enough evidence that the students understood the learning objectives. She had formative assessments and informative assessments. They had to write in their journals, write a story about the animal tracks, and reflect on the objective of the day and write down three things they learned, two
things they still have questions on and one thing they want to talk about more the next day.

A second preservice teacher wrote,

Over the four-day period, I do think Ms. Miller collected enough evidence that her students understood the learning objective for the lesson. She had many different *formal assessment* strategies that she used during the lesson. For example, Ms. Miller had the students do a multiple-choice question at the start of a lesson. Another example is when the teacher had the students *reflect on the objectives* of the day after the lesson. She had the students write down three things they have learned, and two things they still have questions about. All of these strategies helped Ms. Miller gather enough evidence of the students learning throughout the four-day lesson.

As we have seen before, the terminology used to describe certain activities and assessments can differ between preservice teachers.

In addition to mentioning “formal assessment strategies” the previous preservice teacher also commented on how the students “reflected on the objectives of the day.” Another preservice teacher also mentioned the act of reflection; however, the teacher used reflections as a way to help students identify what the objectives were for the lesson. She stated,

She assessed their understanding in many different ways. Ms. Miller used the multiple choice assessment tool, which showed her what they learned about fossils. When she had the students create a story about the tracks, this could have shown her if they still had the common misconception about fossils. At the end of the second day she had them *write a reflection*. All these things could have given Ms. Miller enough evidence on her students understanding. She had them complete these activities right after the lesson, so this gave her a way of seeing what they took away from the lesson and what her objectives were for that lesson.

The preservice teachers have described their views on collecting evidence of learning in general terms. There was little to no distinction between collecting appropriate evidence of learning and aligning the collection activities to measureable learning objectives.
Three preservice teachers were coded as shifting towards the acknowledgment of formative assessment. In one example, the preservice teacher stated in her pre-case,

I do not feel that Miss Miller collected enough evidence showing that her students understand the objective. I feel that she did not have any specific assessments for her to evaluate on the students learning. She didn't give any exit slips or grade any papers. She just had the students reflect. There may be some students who still think the misconceptions about fossils because she didn't give enough assessments to evaluate her students at the end of each lesson.

The preservice teacher states that the teacher did not collect enough evidence of learning, describing the act of assigning summative grades as a more appropriate method. The preservice teacher’s views change between pre- and post-case. She states,

I do feel that Miss Miller collected enough evidence that her students understood the learning objective for this lesson. I feel that she assessed the students each day throughout the unit and was able to collect data and evidence. I do, however, believe that she collected more data as a whole class of understanding of the objective, rather than individual students understanding. Her assessments, I felt, were more whole class assessments, rather than individual assessments and her check each students understanding.

The preservice teacher highlights the need to assess individual student progress over whole group progress. In a pre-case reflection, another preservice teacher noted a need for improvement, but did not provide any further explanation or offer any suggestion for improvements. The preservice teacher stated,

Over the four day period I do not think that Ms. Miller collected enough evidence that her students understood the learning objective for this lesson because I think she could have used other lessons to further the understanding of her objective to make it clear to her students.

The preservice teacher, in her post-case reflection, changed her opinion of the case and offered reasoning for this change. She stated,

Over the four day period I think Ms. Miller did a good job collecting students understanding of the previous lessons. She had her students do self-assessments of
their learning from the lessons. This gave her evidence if the students were accomplishing the lesson objectives.

Although the case students did reflect on their understanding of the topic, providing students with clear learning objectives as a reference for judging growth was not mentioned. The last preservice teacher did mention the need for assessments to be directly related to the learning objectives. She stated,

Ms. Miller does a great job of using formative assessment in her class. She collected a lot of evidence that her students learned about looking at fossils in the context of space and time (she had them answer questions in a poll, gave 3-2-1 write ups, wrote journal entries) but none of her assessments directly related to the objective.

All three preservice teachers highlighted an aspect of formative assessment that was either missing or was recommended for use within the case scenario. The preservice teachers’ rationales were not complete; however, each demonstrated some increased acknowledgement of formative assessment between their pre- and post-case reflection.

4.2.1.2 Question four: Disagreement

The 21 preservice teachers who answered that the case teacher did not collected enough evidence of learning over the four-day lesson were categorized into three groups. These categorizes were created based on the preservice teachers’ post-case response. The three groups include: assessments did not gather enough/appropriate evidence of learning, the teacher did not provide feedback, and students did not have the opportunity to demonstrate their understanding of the learning objectives. Each category will be discussed below.
4.2.1.2.1 Assessments did not gather enough/appropriate evidence of learning.

With 17 preservice teachers, this is the largest among the three groups. Preservice teachers in this group described the case assessments as either not allowing teachers to collect enough evidence of learning or not being directly linked to the learning objectives. Of the 17 preservice teachers’ views, 12 remained the same between the pre- and post-case reflections and five shifted towards the acknowledgment of formative assessment.

Of the 12 preservice teachers whose views remained the same, a common theme expressed in their reflections touched on the lack of alignment between the class activities and the learning objectives for the lessons. Some comments were more general, such as this particular preservice teacher’s response,

I do not think that Ms. Miller collected enough evidence of student understanding because I could definitely see some missed opportunities for assessment throughout the lesson. She did have the students answer the multiple choice question on fossils, write a three, two, one exit slip, reflect on questions in their science journals, as well as indicate old and young fossils on a picture. However, these assessments did not seem to gather enough information for her to get a clear picture of her students' level of understanding.

Another preservice teacher commented on how “the activities did not seem as meaningful as they were entertaining.” More specifically, two preservice teachers commented on the reason for the ineffective activities. One preservice teacher stated,

I believe that Ms. Miller collected quite a bit of evidence throughout the four-day period; however, I don't believe these pieces of evidence demonstrate student understanding, in relation to the learning objectives. In addition, I think the final piece of evidence she collected should have been much more elaborate. For example, the final piece of evidence that was collected required the students to respond to the misconception that was brought up during the first day of the first lesson. This doesn't effectively represent evidence that her students' understand her learning objectives. All of her assessments need to be specific and align with her objectives, in order to be effective.
The second preservice teacher suggested a specific solution for solving this alignment problem. She stated,

I do not believe she collected enough evidence of your students understood the learning objectives even though she did a formative assessment after each day. I think that the last day she should have used the "I can" statements that we discussed and have them checked off and explain why it is they can do that statement and why they understand it.

The preservice teacher does not reference specific learning objectives, but she does highlight the need for students to use and explain their responses to “I can” statements.

The preservice teacher also describes the use of daily formative assessments, yet states that the teacher did not collect enough evidence of learning. In regards to referencing assessment, another preservice teacher stated,

I think that Ms. Miller should have done some kind of assessment at the very end. At the end, she just has the students discuss their misconceptions. It doesn't say if she has them write anything down or if it is all oral. If it is all oral, there needs to be more. Not every student is going to speak up and give his or her opinion.

To collect appropriate evidence of learning, this particular preservice teacher highlighted the need for an assessment at the end of the unit. Although all the preservice teachers state a need for a more appropriate avenue in which to collect evidence of learning, the use of formative assessments varied among the preservice teachers.

Within this group of 12 preservice teachers whose views remained the same, two other themes emerged. First, the teacher’s feedback was mentioned as a concern. These ideas are represented in the two preservice teachers’ reflections below,

No, I do not think Ms. Miller collected enough evidence of students' understanding of the objectives. She had them write in their journals without reading them, asked them to do activities like digging for fossils and writing stories that match tracks, but in neither activity did she offer a discussion or
feedback on the students work. She never really tested them to see how much they knew or what misconceptions they held.

I don't think Ms. Miller collected the evidence she needed to know if her students understood the learning objectives or not. Collecting journals and giving credit for complete and incomplete answering doesn't provide her with any understanding of her students. She should have graded her students' answers in order to understand their learning.

In both reflections, the preservice teachers have highlighted the act of teacher-student feedback as an important part of the process of collecting evidence of student learning. Important to also note is the reference to testing and grading, a summative act, which is shared in both reflections.

Lastly, both in written reflections and case class discussions, the theme of quality student self-assessment was mentioned. One preservice teacher wrote,

I do think that some ways Miss Miller gathered student understanding, like exit slips, are a good way to see if and where there is confusion to help her revise her next lesson. I also think that the thumbs up or down activity and journal entries were not that effective because some students could copy others or if the students reflected on having a bad experience, they might not have retained in the information.

For both written reflections and during case discussions, many preservice teachers voiced an underlying and persistent worry that students would not take certain formative assessment strategies seriously.

Of the 17 preservice teachers’ views, five shifted towards the acknowledgment of formative assessment. In general, the pre-case reflections stated agreement with the activities presented in the case. For example, one preservice teacher stated, “Yes, at multiple points she tested the kids to judge their understanding of the goals. She used multiple-choice, journal entries, and student surveys in order to do this.” In the post-case,
however, the preservice teachers’ views changed, recognizing the lack of connectedness between the activities and the learning objectives. For example, the same preservice teacher stated, “No, I don't believe she did…I don't believe that any of her assessments did a good job of directly addressing the specific learning objectives.

Another preservice teacher wrote in both her pre- and post-case reflections that the teacher’s assessment was not directly connected to the objectives; however, in her post-case reflection, the preservice teacher provided more detail for why she believed this. She stated,

I do not think Ms. Miller collected enough evidence of student understanding over the four-day period, to show that her students understood the lesson objectives. *Her evidence collected was weak, and primarily summative assessment with little student discussion or challenge.* Many of her methods included "right/wrong" answer questions. Also an example is found at the close of day 1. Ms. Miller made sure her students understood by summarizing the content herself, so she had absolutely no evidence that any of them understood. It was also difficult to gage understanding because the objectives were not talked about throughout the four days. She did not have evidence that the actual objective was clearly understood by her students.

In line with the idea that the case was too teacher-directed, and students were not asked to connect what they were learning in the activities to the learning objectives, another preservice teacher stated, “She didn't even do self-assessment over all of the four days. There was some group work, in the discussion, but I think some more assessment would have given Miss Miller a better idea of how much her students learned.” Creating more assessments was a theme that emerged in several of the post-case reflections, as exemplified by the following preservice teacher’s post-case response, “I feel there should have been more individualized assessment in order to know that each child understood.”
4.2.1.2.2 *Teacher did not provide feedback.*

Three preservice teachers were placed in this group. All three preservice teachers’ views remained the same between the pre- and post-case reflections and all three preservice teachers’ focused on the lack of teacher feedback. One preservice teacher stated, “She should have gave the students feedback on their answers for the students to reflect on.” This response focuses on improving student learning, not collecting evidence of student understanding. The other preservice teachers focused more on how the teacher used the information she collected to assess student understanding. These views can be represented by the following post-case reflection.

I do not think Ms. Miller collected enough evidence that her students understood the learning objectives. I think this because *she didn't read all of the students’ journals and go through the answers whole group.* She just gave them the journals back to discuss with their group what they wrote and then put them away. The responses in their journal could be right or wrong, but Ms. Miller did not check to see.

In this instance, the preservice teachers are not judging the quality of the journaling assignment; they are questioning the teacher’s use of student data in terms of judging student understanding.

4.2.1.2.3 *Students didn't have the opportunity to demonstrate understanding.*

Only one preservice teacher was placed in this group. Her views remained the same between her pre- and post-case reflection. In her analysis of the case study, this preservice teacher did not believe the teacher was able to gather enough evidence of learning because her students were not writing down their thoughts. She states,
There was very little opportunity for students to write things down and demonstrate their understanding of the activity that they were working on. I think that she was very dependent on what she saw them doing in class and not on the written work that she could have incorporated within the lesson.

4.2.1.3 Discussion: Question four

Case question four focused on the process of collecting appropriate evidence of student learning. Specifically, question four asked preservice teachers to evaluate how well the case teacher collected evidence of students’ understanding of the lesson objectives. The preservice teachers’ responses were first divided into two categories: either agreement or disagreement that the case teacher collected enough evidence of learning. Of the preservice teachers who agreed that the case teacher collected enough evidence to judge student understanding, 13 preservice teachers’ views remained the same and three shifted towards the acknowledgement of formative assessment. Of the preservice teachers who disagreed that the case teacher collected enough evidence to adequately judge student understanding, 16 preservice teachers’ views remained the same between the pre- and post-case reflection and five shifted towards the acknowledgement of formative assessment. Within this discussion section, I will begin by highlighting the major themes that emerged from both questions within the preservice teachers’ pre- to post-case reflections. I will then conclude by offering an interpretation of how this data helps to answer my research questions.

The preservice teachers who agreed that the case teacher collected adequate evidence of student learning all justified their agreement in the same manner; describing how the case students completed certain activities during the lesson. These activities
included assignments (e.g. creating a story, discussion, completing a worksheet) and assessments (e.g. exit slips, multiple choice questions, journaling). Although it is possible for the teacher to collect evidence of learning through these commonly described classroom activities, there was a lack in recognition in what type of evidence the teacher is actually collecting. If the goal was to collect evidence that any learning occurred, then perhaps this answer was adequate. If the goal was to collect evidence of learning based on the specified learning objectives, than this answer was less than adequate. The case activities focused on the general lesson topic (i.e. fossils) and did not address precise, measurable lesson objectives. In fact, nowhere in the case were objectives even stated. The case only described the general topics in which the teacher was planning to cover. The preservice teachers did not attend to this issue at any point during their pre- or post-case reflections.

The act of student reflection was intertwined throughout the preservice teachers’ writings. Many preservice teachers reference the act of reflection as a way to elicit evidence of learning. Reflection can certainly help gauge student understanding, but there must be specific criteria used to place a judgment on the level of student growth. The data suggested that preservice teachers view reflection as a stand-alone activity: one in which the teacher or student can judge overall student “understanding” simply through the completion of an activity. There was no indication that preservice teachers linked reflection of ones learning and understanding to a set of specific success criteria. In one particular case, a preservice teacher stated that reflections were used to help students identify the objectives. Even though there was no distinction between collecting
appropriate evidence of learning and aligning the collection activities to measureable learning objectives, the preservice teachers did describe general assessment methods, as well as general ways to collect evidence of student learning. This could be seen as a step in the right direction.

Data from several preservice teachers’ reflections suggested an inconsistency in the usage of assessment terminology. Purposefully described in both the written cases and case discussions, a distinction was made between formative and summative assessments: formative assessments are those that occur during the learning process to offer students an opportunity to build on their current knowledge and summative assessments occur at the end of the learning cycle and provide a final evaluation of student learning. Several preservice teachers, however, used the terms *formal* assessment and *informative* assessment to describe both formative and summative assessments. This is important to note because unless the preservice teachers offer detailed explanations for how they are using assessment terms, caution must be taken when deciphering their intended meaning.

Three preservice teachers were coded as having views that shifted towards the acknowledgement of formative assessment. The first preservice teacher acknowledged the formative assessments given throughout the lessons; however, she points out that the assessments were group or whole class based, rather than individually based. This is an interesting observation because it suggests that the preservice teacher is making the distinction between the appropriateness of collecting general evidence of learning from a group of students versus collecting evidence to judge individual understanding. The second preservice teacher focused on how self-assessments provide the *teacher* with an
appropriate measure of student understanding. The third preservice teacher highlighted
the need to align assessments with specific learning objectives. All three preservice
teachers highlighted an aspect of formative assessment that was either missing or was
recommended for use within the case scenario. Although the preservice teachers’
rationales were not complete, each demonstrated some increased acknowledgement of
formative assessment between their pre- and post-case reflection.

The preservice teachers who disagreed that the case teacher collected enough
evidence of learning disagreed for three main reasons: the assessments were not
appropriate, the teacher did not provide feedback, and the students did not have an
opportunity to demonstrate their understanding. A majority of the preservice teachers
expressed that there was a lack of alignment between the class activities and the learning
objectives for the lessons. The preservice teachers commented on how the activities were
more entertaining than educational. Others commented that the activities did not directly
or sufficiently relate to the learning objectives. All of these reflections are correct
observations; however, most of the preservice teachers did not describe a rationale for
their claims. One preservice teacher highlighted the fact that the last class assessment was
only over a small portion of what the students covered and did not adequately represent
evidence of understanding the learning objectives. In order to effectively assess evidence
of student learning, teachers must align all activities and assessments to the lesson’s
learning objectives.

In reflecting on the appropriateness of the evidence of learning collected, several
preservice teachers referenced the teacher’s use of formative assessment throughout the
unit. One preservice teacher stated that there was not enough evidence collected even though formative assessments were given everyday. Several preservice teachers voiced a concern about the quality of evidence collected from certain formative assessments in the lesson. For some preservice teachers, allowing students to self-assess their understanding could lead to unreliable results. Data supported that preservice teachers believe peer pressure plays a significant role in the level of honest self-reported answers. There were no further descriptions provided as to why the formative assessments did not adequately provide evidence of learning.

Another preservice teacher described the lack of opportunities for students to demonstrate their understanding in written form; the teacher was dependent on observing student understanding. This is not entirely true. In the pre/post-case, the case teacher asked students to complete four assignments/assessments in written form. The case teacher also asked the students to discuss, in small groups and as a whole class, the results of three other class assignments. There were opportunities for the teacher to read her students’ written work. There were also opportunities to share ideas with classmates and for the teacher to interject when needed. Data suggests that this particular preservice teacher may take issue with using non-written student communication as a form of formative assessment. Although written work is necessary, verbal responses can also provide appropriate evidence of student understanding. It’s important to recognize that collecting evidence of understanding comes in many forms; both written and verbal.

Although there was no mention of the absence of learning objectives, suggestions were made to include the use of “I can” statements. As examined during the in class case
discussions however, “I can” statements are directly taken from the lesson’s learning objectives. Another preservice teacher suggested the need for an assessment at the very end of the unit. Data suggested that this preservice teacher might not see the value in the small daily formative assessments given during the lesson; rather, to accurately determine the students’ level of understanding, there was the perceived need to administer a summative grade. Along with the need for more summative assessments, several preservice teachers also identified the act of feedback as being an important aspect in collecting evidence of learning. Several preservice teachers focused on how the teacher communicated students’ performance rather than the kind of activities the teacher used to collect evidence of learning. Many preservice teachers did not agree with the type of feedback that was offered to the students. Providing feedback to further the students’ understanding is critical, but not needed to gauge student understanding.

Rather than judging the quality of the assessments, several preservice teachers were questioning the teacher’s use of student data that was collected. Instead of focusing on the actual activities and assessments done in class, as most of their peers did, these preservice teachers focused on what the teacher did with the data collected, to determine if the students actually met the learning objectives. The data suggests that preservice teachers did not feel the teacher thoroughly read student responses and therefore could not adequately judge student understanding. This is an important point to highlight because the type and quality of the assessments a teacher provides her students is equally as important as how the teacher uses the student data to judge for understanding.
Another group of preservice teachers were coded as having views that shifted towards the acknowledgement of formative assessment. This group highlighted the need for more student-based, individualized assessments within the lessons. One preservice teacher correctly argued that they case teacher did not allow for her students to demonstrate an understanding of the material because the teacher provided a summary of all the important learning points. Preservice teachers also stated that more individualized assessments were needed. The data suggested that the preservice teachers believed the individualized assessments described in the case (e.g. class worksheets, exit slips, self-assessment, journals) were not a sufficient method of collecting student understanding. The preservice teachers did not directly identify the need to improve the current assessments within the case; however, the data suggests that the preservice teachers, by requesting more formative assessments, recognize a need that the current assessments may not adequately assess student understanding.

In addressing my first research question, the data suggests that the implementation of formative assessment cases did influence preservice teachers’ knowledge of formative assessment. Twenty-nine preservice teachers were coded as having similar views between the pre- and post-case reflections. Even though the preservice teachers’ views may have remained fairly consistent between pre- and post-case reflections, the amount of detail increased within many of the post-case reflections. Instead of providing a general statement about the need to improve the assessments used to collect student data, specific examples were provided. These examples showcased the preservice teachers’ understanding of certain aspects of formative assessment. Many preservice teachers
elaborated on the lack of opportunities given to students to discuss their ideas. Preservice teachers also made the connection between adequately assessing student understanding and basing that assessment on specific learning objectives. This increase in post-case description suggests that the preservice teachers incorporated ideas from previous cases and case discussions (e.g. using appropriate methods to collect evidence of student learning, creating student-centered environments to promote discovery.

Eight preservice teachers views shifted towards the acknowledgement of formative assessment between the pre- and post-case reflections. Pre-case reflections included rather vague descriptions regarding preservice teachers’ general agreement that the assessments were an appropriate measure of student understanding. Post-case reflections, however, referenced a need for specific changes with the case assessments. Preservice teachers questioned the appropriateness of the individualized assessments described in the case (e.g. class worksheets, exit slips, self-assessment, journals), claiming that they were not a sufficient method of collecting student understanding. The preservice teachers requested more formative assessments, focusing on the collection of individual student responses. The preservice teachers also made note of how instruction should be more student-centered, allowing students to formulate solutions on their own and then share what they have learned through this process. Identifying and elaborating on assessment weaknesses with the case study suggests that the preservice students gained insight by completing the case reflections and case discussions.

In addressing my second research question, the data suggests that specific characteristics can again be identified within the preservice teachers’ reflection that
suggests learning has occurred. Data suggests that after reading and discussing the second case in the preservice teachers’ methods course, the preservice teachers began to not only evaluate the current methods of student assessment, they were also able to apply previously discussed formative assessment concepts and strategies to the current case situation. Many preservice teachers were at first satisfied with the quality of assessments used within the case lesson as well as the way in which the teacher collected evidence of student understanding of the lesson topic. Data from the post-case reflections suggested that many of the preservice teachers shifted their views, while others included more detail or specific examples to their post-case reflections. The preservice teachers questioned the assessment methods within the case lesson and identified areas in which assessment could have yielded more appropriate results. Preservice teachers also applied other formative assessment strategies within their case reflections. This included recognizing the connection between the need for explicit learning objectives when collecting evidence of learning, as described and discussed with first case. This also included the theme of quality feedback and the role feedback plays in improving both teaching and learning. Feedback was described and discussed in the third case. Although question four was asking preservice teachers to analyze whether the teacher collected appropriate evidence of learning within the pre/post case, many of the preservice teachers recognized how explicit learning objectives and teacher feedback cycles affect the quality of student learning. This data suggests that by applying these strategies and concepts to their post-case reflections, the preservice teachers have gained insight from the cases and the case discussions to further their knowledge of formative assessment.
4.2.2 Pre/post case question five: Based on the lesson objectives, in what ways do the lesson activities provide an assessment for student learning?

Question five is unique because the data were easily categorized by preservice teachers’ views of formative assessment (i.e. views moving away, moving towards, or staying the same) from pre- to post-case reflections. Table 4.6 demonstrates this by categorizing preservice teacher responses by their views and then subcategorizes further to provide a general description of how the case lesson does or does not provide an assessment for student learning. Table 4.6 is split into three groups, preservice teachers’ whose views remained the same, shifted towards the acknowledgement of formative assessment, and shifted away from the acknowledgement of formative assessment. Many preservice teachers provided more than one type of “evidence” to support their answer; therefore, the columns add up to more than the total number of preservice teachers who participated in this study.

Of the preservice teachers’ whose views remained the same from pre- to post-case, a majority the preservice teachers in this category identified particular lesson activities as a way to for the teacher to assess student learning. A majority of these descriptions either included a general report of how the activity could measure student learning based on vague learning objectives or did not mention the relationship between the lessons activity and the intended learning objectives. Three preservice teachers described how the lesson activities did not relate directly to the learning objectives.
Table 4.6

*Summary of Preservice Teachers’ Responses to Pre/Post Case Question Five*

<table>
<thead>
<tr>
<th>Preservice Teachers Views Remained the Same</th>
<th>Preservice Teachers Views Shifted Towards Formative Assessment</th>
<th>Preservice Teachers Views Shifted Away From Formative Assessment</th>
<th># of PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment was done through the completion of the following activities:</td>
<td>Assessment can be done through activities, but…</td>
<td>Began with (see below) then shifted to an adequately done assessment through completion of activities</td>
<td># of PST</td>
</tr>
<tr>
<td>Journaling</td>
<td>14</td>
<td>Assessments lack appropriate results</td>
<td>3</td>
</tr>
<tr>
<td>Exit slips</td>
<td>11</td>
<td>Activities are teacher led</td>
<td>2</td>
</tr>
<tr>
<td>Multiple choice question</td>
<td>9</td>
<td>There is a lack of adequate teacher feedback</td>
<td>1</td>
</tr>
<tr>
<td>Cartoon drawing</td>
<td>7</td>
<td>Activities don't directly assess LO</td>
<td>1</td>
</tr>
<tr>
<td>Animal tracks (misconception)</td>
<td>6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Small/Large group discussion</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Assessment for learning based on what teacher could/did do in lesson</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fossil dig</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Activities do not relate directly to LO</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Self-assessment</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Of the preservice teachers who identified particular lesson activities as a way for the teacher to assess student learning, several themes emerged between the written pre- and post-case descriptions. First, all but two of the reflections focused solely on what the *teacher* would to do with information collected during a learning episode. The preservice teachers rarely described any action taken by the students to improve their own learning.
When discussing journal writing, one preservice teacher stated, “These forms of assessment may not be the most effective but [the teacher] is at least getting some feedback from the students.” Another preservice teacher wrote about the benefits of exit slips, stating that this type of activity provided “great ways to see where students are at after the first day.” Perhaps of special note is the response from one preservice teacher in specific regards to the case students’ involvement in self-assessment. When referencing self-assessment activities in the case, one preservice teacher stated, “During the lessons the students did a self-assessment of what they knew about fossils before the lesson, to give Ms. Miller an idea of where each child's learning was before she began her unit.”

Again, the focus is on what the teacher does with student feedback rather than how the activities provide an opportunity for students to learn from the assessments. This teacher-focused view is common throughout the reflections; however, some preservice teachers did recognize the role of the student. One preservice teacher referenced a particular self-assessment activity and wrote,

> The way this relates to a form of assessment is because at any point the teacher can ask the students to engage in their results. This could be completed through sharing with their partners, whole group discussions, or even collection and evaluation of results by the teacher. I felt that this was an effective way to place the responsibility of learning into the hands of the fourth grade students in the classroom.

In this particular case, the student not only recognizes the role the teacher plays in collecting and acting on student feedback, but the role of the student is also highlighted.
Second, several preservice teachers used the terms *reflection* and *assessment* interchangeably. When referencing a self-assessment activity, the preservice teachers would highlight the act of student reflection. One preservice teacher wrote,

> These lesson activities provide both formative and summative assessment as well self and peer assessment. These assessments help with student learning. The students are able to *self reflect* on their understanding of the lesson objective by giving various questions and asked to raise their hand when they hear the correct answer, reflecting on the objective in writing down three things they learn, two they still have a question on and one thing they would like to talk about. The students also *self-assessed* themselves throughout the lesson by writing in their science journals and *reflecting* on their learning.

Another preservice teacher wrote about the reflection and self-assessment process stating,

> The lesson has the students answer multiple-choice question, *reflect* on the lesson by writing down three things they've learned, two things they still questions about, and one thing they would like to talk about. Ms. Miller also has the students *reflect* in science journals, as well as addressing the common misconception they talked about at the beginning of the four days. These *assessments* were based on the day-to-day activities, but I still don't feel like the lesson objectives were included.

Both preservice teachers mentioned learning objectives, but failed to mention the connection between reflection and/or self-assessment in terms of using the learning objectives to determine their level of understanding.

Along the same line of thought, several preservice teachers commented that the activities were appropriate or adequate for the lesson; however, these particular activities did not specifically relate to the learning objectives. This third theme can be represented by the following preservice teacher’s response, “The cartoon drawing activity was a simple assessment of seeing if students could identify old and young fossils. This *did not go along with the objective directly*, but aided in student understanding of fossils.” In this particular instance, even though the activity does not directly relate to the objective, the
preservice teacher finds the activity appropriate because it is relating to the topic of the lesson.

Lastly, and perhaps of greatest interest, was the theme of collecting valid assessment results. Throughout the case reflections, some preservice teachers felt uncomfortable using particular daily formative assessment activities as a way to assess student understanding in a valid and trustworthy manner. One preservice teacher stated, “As for formative assessment, I felt this lesson did not provide the students with a formal exit slip or test to give them a chance to assess themselves.” The preservice teacher’s focus here is on a more summative or “formal” assessment.

From pre- to post-case, seven preservice teachers were categorized as having their views shift towards formative assessment. These preservice teachers all identified problems with using the lesson activities as way to measure student understanding based on the learning objectives. First, in the pre-case, two preservice teachers described the teacher’s activities as a “fun” and appropriate way to provide the teacher with a “quick check for the students understanding.” However, in the post-case reflection both preservice teachers commented on the ineffectiveness of the assessments provided. The assessments “lacked meaningful results” and were more an “exploration of the topic” rather than directly relating to measurable learning objectives.

Second, another preservice teacher initially describes the activities as “used to assess learning based on objectives” but then shifts their reflection to state that the activities are teacher-directed. She states that the lesson activity is “intended to provide an assessment of student learning based on the lesson objectives, but the answers are
given instead at the end.” The preservice teacher then refers to the lack of information in the case by highlighting the fact that it is unclear whether the students are actually discussing the learning objectives. The preservice teacher states, “[The teacher] does have a group discussion after the activity, so if students are discussing what the fossils can tell them about the past environment, then the objective may have been addressed.”

Feedback was a third topic that surfaced within the pre- and post-case reflections. In her pre-case, one preservice teacher wrote about how two of the case activities could be used as an assessment for student learning. For one of the assignments, the preservice teacher indicated that the activity might not be an appropriate assessment; however, the preservice teacher did not offer an explanation for this opinion. She stated, “When the students explained their different versions of the animal tracks story that was a sort of assessment of their understanding of this idea.” The preservice teacher went on to simply describe the other types of activities in the case lesson: the exit pass and journal writing. In her post-case reflection, the preservice teacher described why she felt one of the activities was not an appropriate assessment. She stated, “Unfortunately, the teacher only graded these journals as complete or incomplete, which did not provide helpful feedback.”

The last theme that surfaced between the pre- and post-case reflections focused on the lack of connectivity between the activity and the intended learning objective. In the pre-case, one preservice teacher voiced a dislike for the activities, but did not provide her rationale. In the post-case, the same preservice teacher stated in more detail,
The first activity required the students to write a story about the different tracks on the picture they were given. I am not sure how this connects with what she wants her students to learn…This activity does not relate to the learning objectives either. In conclusion, the activities, although fun and creative, do not directly relate to the student learning objectives.

A second preservice teacher shared a similar reaction to the case. In her pre-case, the preservice teacher stated, “Miller's activities are generally great ones in terms of assessing student knowledge.” But then went on to identify a possible problem, stating the activity “can give the teacher an idea about how a couple of the students have done but not many.” In this particular instance, the preservice teacher is recognizing that the assessment may not meet the teacher’s full needs. In her post-case, the preservice teacher identified a specific problem with how the case teacher used the assessment activity. She stated, “I don't believe that the lesson activities provided an assessment of student learning of the objectives, because they didn't assess the objective.

From pre- to post-case, two preservice teachers were categorized as having their views shift away from formative assessment. The first preservice teacher identified a problem between the selected activities and the intended learning objectives. In her pre-case reflection, the preservice teacher stated, “Where the actual thinking became involved was in class discussion and in the reflections. This is where Ms. Miller could see if the lesson's objectives were met.” In her post-case, however, the preservice teacher linked each activity to a specific learning objective, stating, “Multiple-choice questions are an assessment based on the first objective. The cartoon and the addressing of the misconception on assessment to see if students understand that fossils come from different ages, which is part of the second objective.”
The second idea represented in the pre- and post-case focuses on student evidence produced through the lesson activities. In her pre-case reflection, one preservice teacher wrote,

I feel the lesson objective should have been altered to say: students will understand that fossils can be formed at different points in time. If the objective were to be changed the assessments that the teacher collected after each lessons would suffice.

Through this description, the preservice teacher is stating a need to rewrite the objective in terms of student involvement; however, the preservice teacher has not described a measureable way in which the student will accomplish their “understanding” of how fossils form over time. In her post-case description the preservice teacher does not address the need to rewrite the learning objectives. She states, “The students produce an artifact for each lesson, which helps Ms. Miller assess their work.”

4.2.3 Discussion: Question five

Of the preservice teachers’ whose views remained the same from pre- to post-case, a small number recognized that the activities did not relate directly to any specified learning objectives. On the other hand, most of the preservice teachers described the lesson activities as appropriate with either no mention of the lesson objectives or based on a vague description of the objectives. When asked to describe the activities that provided an assessment of student learning, many preservice teachers descriptions included the use of the terms reflection and assessment; however, these terms were often used interchangeably. For student reflection to equate to self-assessment, the student must have some measureable objective in which to assess their work. In these particular
cases, no learning objectives were actually specified. This is problematic because students may be able to reflect on what they learned, but this may be unrelated to the learning objectives for the lesson. Perhaps the preservice teachers assumed the activities directly related to appropriate and measurable learning criteria in which the students could reflect upon; however, this was not explicitly written in their reflections. Without having specific objectives to reflect on while completing the lesson activities, the student cannot measure their understanding based off of what the teacher is expecting them to learn.

Another key theme that surfaced through the pre- and post-case reflections was that some preservice teachers felt uncomfortable using particular daily formative assessment activities as valid assessment student understanding. The terms “informal” and “formal” were used to describe activities based on the student data that each provided. Some preservice teachers were uncomfortable with the idea that an “informal” activity could be used to provide teachers with an overarching view of their students understanding as well as provide a student with an opportunity to self-assess their understanding of the lesson material. Tests, a summative assessment, were a suggested alternative and described as providing the students with an assessment that allowed students to gain a better gauge of their understanding. The idea that summative assessment is the only valid measure of student learning seems to be a misconception among some of the preservice teachers in this research population. What is of greatest interest is that no matter if the assessment activity is formative or summative in nature, if
there is an absence of clear learning objective, it is difficult to gather appropriate
evidence of student learning.

From pre- to post-case, seven preservice teachers were categorized as having their
views shift *towards* formative assessment. Post-case reflections all included identifying
problems with using the lesson activities as a way to measure student. At first, several
preservice teachers noted that the lesson activities were entertaining and an appropriate
way to gather evidence of learning; however, in their post-case reflections, it was noted
that the assessments actually lacked meaningful data. More importantly, one preservice
teacher described the activities as more of an “exploration of the topic” rather than
directly being linked to a specific learning objective. This was the intended case
response; preservice teachers should be able to identify the case teacher’s lack of
specificity in terms of learning objectives. Another preservice teacher not only
highlighted this same issue, she also pointed out that the case teacher did not allow the
students to come up with their own answers; the teacher provided the “correct” answer
for the students. This preservice teacher noted that the teacher-centered environment
offered limited opportunities for the activities to be used in a formative nature.
Continuing to focus on the teacher’s role in collecting adequate evidence of student
learning, one preservice teacher highlighted the lack of quality teacher feedback as a
reason that the activities were not appropriate assessments. The teacher was described as
only marking the journals as complete or incomplete without providing any sort of
feedback to help assist the student in furthering his understanding the concepts.
From pre- to post-case, two preservice teachers were categorized as having their views shift away from formative assessment. Both preservice teachers’ pre-case reflections described how the learning objectives were not met through the different lesson activities. Specific examples of how the case teacher could improve student understanding of the learning objectives were included. In the post-case reflection, however, there is a clear shift in opinion. One preservice teacher described that the learning objectives were indeed aligned with the lesson activities. The preservice teacher did not recognize that these “lesson objectives” were in fact broad topics rather than specific objectives. The second preservice teacher described how the students produced some sort of artifact from each lesson, and that this artifact could be used as appropriate evidence of learning. The preservice teacher, however, did not mention the appropriateness of the activity/artifact in terms of the actual learning objectives; rather it was assumed that the activity would provide adequate evidence of student understanding based on an appropriate learning objective. It is unclear why these two preservice teachers’ views shifted away from the acknowledgement of formative assessment.

In addressing my first research question, the data supports that the implementation of formative assessment cases did influence preservice teachers’ knowledge of formative assessment. Although a large number of preservice teachers were coded as having similar views between the pre- and post-case reflections, data suggests that post-case reflections included additional ideas that supported the preservice teachers’ growth in formative assessment understanding. Pre- and post-case reflections both highlighted the need for the teacher to set clear and explicit learning objectives; however, some of the post-case
reflections also highlighted the importance of student involvement in the formative assessment process. Preservice teachers often neglect the importance of student involvement in the formative assessment process and focus solely on what the teacher does in the classroom; therefore, these the inclusion of student-centered activities suggests that the preservice teachers incorporated ideas from previous cases and case discussions (e.g. providing students with an opportunity to self-assess their own learning and creating student-centered environments to promote discovery and understanding).

Seven preservice teachers views shifted towards the acknowledgement of formative assessment between the pre- and post-case reflections. Pre-case reflections included rather vague descriptions regarding preservice teachers’ general agreement that the lesson activities provided an assessment of student learning based on certain learning objectives. Some preservice teacher appreciated the entertainment-value of the activities rather than the appropriateness of the activities based on the specified learning objectives. Post-case reflections, however, referenced a need for specific changes to lesson objectives (e.g. starting the objective with the statement, “Students will be able to…”) and with the case activities (e.g. altering activities to provide more student description).

Post-case reflections also included the acknowledgement that the case teacher’s actions offered limited opportunities for the activities to be used in a formative nature. Examples included the lack of descriptive and specific feedback on student work, and providing the students with a summary of the main points of the lesson rather than allowing the students to come up with the ideas on their own. There is no question that feedback plays a crucial role in increasing student awareness of a concept and the
preservice teachers brought to light a very important point about how the use of feedback should be more formative in nature.

In addressing my second research question, the data suggests that specific characteristics can be identified within the preservice teachers’ reflection that suggests learning has occurred. After reading and discussing the formative assessment cases in the preservice teachers’ methods course, the post-case data supports that the preservice teachers began to both evaluate the current methods of student assessment and apply previously discussed formative assessment concepts and strategies to the pre/post case situation. Many preservice teachers were at first satisfied with the type of activities used within the pre-case lesson as well as how these activities related to the overall theme of the lesson. Data from the post-case reflections showed that many of the preservice teachers shifted their views, while others included more detail or specific examples to their post-case reflections. The preservice teachers began to question the relationship between the activities and the learning objectives; more specifically, the preservice teachers evaluated the lesson for clear learning objectives to find that the lesson activities were more of an “exploration of the topic” rather than focused on specific learning objectives. In addition, the preservice teachers also recognized the teacher’s role in providing appropriate formative assessment. This included the theme of quality feedback as well as providing an opportunity for students to take ownership of their learning. Examples were provided that described how teachers could use self-assessment to help students better relate to the class work. The preservice teachers also noted that the way in which the teacher provided feedback could affect student learning. The inclusion of
student-centered activities suggests that the preservice teachers incorporated ideas from previous cases and case discussions. During their method class, feedback was described and discussed in the third case and self-assessment was described and discussed in the fourth case. Although question five was asking preservice teachers to analyze whether the activities provided an assessment of learning based on the learning objectives, many of the preservice teachers recognized how feedback cycles and student self-assessment affect the quality of student learning. This data suggests that by applying these strategies and concepts to their post-case reflections, the preservice teachers have gained insight from the cases and the case discussions to further their knowledge of formative assessment.

4.3 Providing Guided and Scaffolded Feedback: Pre/Post Question Six

Feedback is the backbone of formative assessment. For effective formative assessment, the teacher needs feedback from the students and the students need feedback from the teacher. What is most important to emphasize here is that for feedback to have any meaning for the student, the teacher must ask the students to do something with the feedback; this is a two-way street. Applying meaningful feedback encourages student learning because the students use the feedback to help guide them to the ultimate goal or objective. Without feedback, a teacher would not have adequate information to understand where her students are in the learning process and then subsequently how to best guide her students toward the learning goal.

For feedback to be meaningful, it must have the following characteristics:
1. Timely: given back to the student soon after the work has been completed

2. Understandable: written is student-friendly language; omitting highly technical terms

3. Specific: strengths and weaknesses of student work are identified

4. Directive: guidance for how to improve the identified areas

Before reporting and discussing the results under this section, it is necessary to provide a brief description of how feedback was represented in pre/post case. Throughout this case, Ms. Miller did very little to support student growth through feedback of student work. Many student tasks were assigned, but student input was not reviewed or commented on by Ms. Miller. At the beginning of the unit, students had an opportunity to explore real fossils. Instead of having a discussion about the students’ thoughts, Ms. Miller provided the students with a definition of a fossil and an explanation of how they were formed. After creating stories based on the footprint diagram, Ms. Miller asked only one student to share his story and then continued by summarizing the learning activity for the students. Ms. Miller started the second class-period with a multiple choice question for the students to answer, but failed to inquire or discuss student responses. Lastly, Ms. Miller collected the students’ science journals towards the end of the unit. The student responses were a great way for Ms. Miller to gather students’ evidence of learning; however, the line of communication ended there. Instead of providing guided and scaffolded feedback, Ms. Miller “graded” on completion. The students were given no feedback to help guide their learning.
4.3.1 Pre/post case question six: How does Ms. Miller incorporate feedback in the lesson? In what ways do you think the feedback encouraged student learning? In what ways do you think the feedback encouraged improvements in teaching?

Pre/post question six is divided into three separate questions. How Does the Teacher Incorporate Feedback? How Does Feedback Encourage Student Learning? and How Does Feedback Encourage Improvements in Teaching? General descriptions taken from the preservice teachers’ reflections for each of the three questions are summarized in Table 4.7. In this section, results from each of the three questions will be discussed. A full description of the benefits, or lack of benefits, for each of these themes, as reflected by the preservice teachers, are described in the context of how feedback encouraged both student learning and teacher improvements.

Table 4.7

*Summary of Preservice Teachers’ Responses to Pre/Post Case Question Six*

<table>
<thead>
<tr>
<th>How does the Teacher Incorporate Feedback?</th>
<th># of PST</th>
<th>How Does Feedback Encourage Student Learning?</th>
<th># of PST</th>
<th>How Does Feedback Encourage Improvements in Teaching?</th>
<th># of PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journaling (used in an inappropriate way to collect/provide feedback)</td>
<td>15 (7S, 8T)</td>
<td>Feedback does not encourage student learning</td>
<td>10 (8T, 2S)</td>
<td>Feedback was used to change instruction</td>
<td>12 (8S, 2T, 2A)</td>
</tr>
<tr>
<td>Exit Slips</td>
<td>11 (9S, 2T)</td>
<td>Students encouraged to think</td>
<td>5 (2S, 2T, 1A)</td>
<td>Feedback is used to help instructor see where students need help</td>
<td>9 (7S, 2T)</td>
</tr>
</tbody>
</table>
Table 4.7 – Continued

*Summary of Preservice Teachers’ Responses to Pre/Post Case Question Six*

<table>
<thead>
<tr>
<th>How does the Teacher Incorporate Feedback?</th>
<th># of PST</th>
<th>How Does Feedback Encourage Student Learning?</th>
<th># of PST</th>
<th>How Does Feedback Encourage Improvements in Teaching?</th>
<th># of PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journaling (used in an appropriate way to collect//provide feedback)</td>
<td>6 (5S, 1A)</td>
<td>Journals</td>
<td>3 (S)</td>
<td>Feedback did not encourage teacher improvements because the assessments were not authentic</td>
<td>4 (T)</td>
</tr>
<tr>
<td>Teacher led discussions</td>
<td>5 (3S, 2T)</td>
<td>Exit passes</td>
<td>3 (S)</td>
<td>Feedback did not encourage teacher improvements because the teacher did not do anything with this information</td>
<td>3 (T)</td>
</tr>
<tr>
<td>Animal tracks assignment</td>
<td>4 (S)</td>
<td>Encourages students to review</td>
<td>2 (1S, 1A)</td>
<td>Feedback encouraged teacher-led discussion</td>
<td>1(S)</td>
</tr>
<tr>
<td>Teacher did not incorporate any feedback measures</td>
<td>3 (T)</td>
<td>Feedback is used to fix student answers</td>
<td>1 (S)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3D assignment</td>
<td>2 (S)</td>
<td>Discussion encourages learning</td>
<td>1(S)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>Students feel their views are important</td>
<td>1(S)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
4.3.1.1 How does the teacher incorporate feedback?

When asked how the teacher incorporated feedback, seven themes emerged within the preservice teachers’ responses. The preservice teachers answered this question by describing activities used throughout the lesson. These activities are listed within Table 4.7 and include: journaling (used in an inappropriate way to collect/provide feedback), exit slips, journaling (used in an appropriate way to collect/provide feedback), teacher led discussions, animal tracks assignment, a claim that the teacher did not incorporate any feedback measures, and the 3D assignment.

Due the nature of this three-part question, most of the preservice teachers answered the first question by simply listing the lesson activities that they felt enabled (or did not enable) feedback. The explanation for their agreement or disagreement was then described in more detail by answering the last two questions: how the feedback encouraged student learning and improvements in teaching. In the following section, I will therefore only highlight the preservice teachers’ descriptions that offered agreement or disagreement over the incorporation of feedback activities. I will describe the preservice teachers’ reasoning in the following sections, as they pertain to the last two questions.

Based on the response to how the teacher incorporated feedback, a majority of the preservice teachers’ were coded as having similar views between their pre- and post-case reflections. As previously stated, when asked how the teacher incorporated feedback, most of the preservice teachers simply listed lesson activities. For example, one preservice teacher stated, “She incorporates feedback by asking the students what they
learned, what they have questions about, and one thing they like to learn [exit pass].”

Another preservice teacher wrote, “Ms. Miller incorporated feedback when she led a discussion referring to the ‘foot print’ activity the students conducted the previous day.”

In more general terms, one preservice teacher wrote,

The feedback that Ms. Miller gave throughout the lesson could be when they students are doing the hands-on activity and when they did the journal entries. I think there are plenty of opportunities everyday throughout the lesson where the teacher could give the students feedback.

These comments remained the same from pre- to post-case reflections. Another preservice teacher’s reflection remained the same between her pre- and post-case description; however, her opinion of the use of feedback in the lesson was different. She stated,

Ms. Miller did not incorporate much feedback into her lesson. The only clear feedback she gave the students was a star or "x" on the journal entries. This is a very poor form of feedback since the students see that they either did great or failed with little reflection on what was good or what still needed work.

This response was common among the post-case reflections for a majority of the preservice teachers; almost equal number of preservice teachers either included such views in their pre-case reflections (i.e. had the same views pre- and post-case reflection), while the other half shifted towards including such views in their post-case reflections. In terms of shifting towards the acknowledgment of formative assessment, preservice pre-case reflections included such statements as, “Ms. Miller's feedback of these lessons is through the reflection in their science journals.” And “Ms. Miller incorporates feedback in her lesson by looking at journals; having students answer questions in what they
learned the previous day, circle the fossils.” Post-case reflections reveal the shift, as captured by the following statement,

Ms. Miller's feedback consists of stars and an "x" to "communicate" to her students. This feedback does nothing for the students and their learning because there are not comments of where the student understands the material and where they may need help.

Another preservice teacher had a slightly different reason for disagreeing with the type of feedback provided. She stated, “I don't think Ms. Miller incorporated any type of feedback in her lesson. She continued each of her lessons without thinking about her students understanding from previous lessons.”

Only one preservice teacher was coded as shifting away from the acknowledgement of formative assessment. In her pre-case reflection she stated,

She never gave feedback for the first journal (although she had them use it later in pure conversation which was probably more helpful than feedback she would've given) and her marking of a star or x on the question sheets (which students also discussed in groups) was purely for grading, not for feedback.

In her post-case response, however, she stated, “I liked the 3-2-1 feedback [exit pass] students did halfway through the lesson. Students were encouraged to consider what they learned, didn't learn and what they wanted to learn.”

4.3.1.2 How does feedback encourage student learning?

In terms of how feedback encouraged student learning, eight major themes emerged from the preservice teachers’ written reflections (Table 4.7). The largest grouping of preservice teachers within one theme indicated that the feedback described within the case did not encourage student learning. Eight preservice teachers views
shifted towards formative assessment and two preservice teachers’ views remained the same. For the two preservice teachers whose views remained the same their pre- and post-cases reflections included the following views,

For the journals, she only put marks if the student gave a response or not; she did not give any feedback as to the responses being correct or incorrect or other ways to think about things. I think the feedback in this case did not encourage student learning at all. If anything it only hindered student learning. For those who provided answers, they don’t know if what they said makes sense or not and they are just left to assume they were correct since they received a star. For those who did not have answers, an ‘x’ basically tells them they are wrong and gives no prompting or incentive for them to improve…Since there was no appropriate or effective feedback there was no way for it to encourage improvements in learning.

The eight preservice teachers’ whose views shifted towards formative assessment began their pre-case reflections indicating how a certain activity within the lesson encouraged feedback. For example, one pre-service teacher stated, “She [the teacher] incorporates feedback by having the students write reflections and share them. I think it encouraged student learning by having the students write questions about what they want to learn.” In the post-case reflection, however, the preservice teacher wrote,

In the reflection in their journals Ms. Miller marks it with a star if they answered the questions and with an x if they did not answer all of the questions. I don't think that this type of feedback really encourages student learning at all, it just tells the student whether or not they completed the assignment.

Here, a shift occurs between describing how the students are encouraged to reflect on what they would like to learn in the future to describing how the teacher’s “feedback” doesn’t encourage student learning.

The second major theme that emerged from the data focused on the way a lesson activity encouraged students to think about their own learning. Two preservice teachers’ views remained the same. Both focused on how the exit slip activity allowed students to
reflect on what they had learned during the lesson, as well as how the exit slip responses provided the teacher with a method for revising her next lesson based on student response. Two preservice teachers' views shifted towards formative assessment. In the pre-case, one preservice teacher wrote,

She [the teacher] asks the students to write down what they have learned, what they have questions about, and what they would like to learn. This helped engage students because they felt like they were learning about things they actually wanted to.

In the post-case, however, the preservice teacher’s view shifts to also include how feedback could help identify areas of student work that need further attention.

She [the teacher] incorporates feedback by asking students to write down things they still have questions on and think they wanted to learn about. This helped encourage student learning because they were able to tell where they needed more help and what they wanted to know more about.

The shift within the pre- and post-case reflection is important to note. The preservice teacher initially highlights the importance of increasing student engagement by allowing the students to choose what they are learning about, but then shifts to highlighting how student learning is encouraged through the feedback students provide their teachers.

Within this category, one preservice teacher’s view was categorized as shifting away from formative assessment. In her pre-case reflection, the preservice teacher stated,

Other then [sic] her giving them the correct answer on the second day the only other feedback students received was whether they answered the questions in their journal or not. According to the paper it did not say if she gave any feedback past the students answering the question or not.

In her post-case reflection the preservice teacher states,

She incorporated feedback when she had the students fill out the little pieces of paper at the end of a lesson. It helped encourage students learning by making them think about what they had actually learned that day.
Here the focus shifts from a lack of teacher feedback to the teacher providing an opportunity for students to reflect on their learning.

The third major theme that emerged focused on journaling; three preservice teachers fit into this category, all with views that remained the same from pre- to post-case. One preservice teacher wrote,

Ms. Miller also read their journals and gave feedback by giving a star or an "x." The feedback encouraged the students in that if their questions were answered in the next day of the lesson. The feedback could also encourage the students in that if they got a star in their journal, this could encourage the students to want to learn more about fossils.

Although providing summative marks, such as a grade or star, limit a student’s tendencies to reflect or improve on their work, this preservice teacher identified a possible connection with students taking further action to improve on their understanding of a topic based on teacher or peer “feedback.”

The fourth major theme that emerged from the written reflections was feedback from exit slips. Three preservice teachers fit into this category, all with views that remained the same from pre- to post-case. One preservice teacher wrote, “The feedback encourages student learning by allowing the students to reflect on their learning. They were able to write down the information they learned and encourage them to ask more questions and give Miss Miller feedback.” One preservice teacher did make a connection between the teacher obtaining student feedback and the teacher using this to assess students learning in relationship to the lesson objectives. She stated,

It [exit slips] gives students a chance to give feedback to Ms. Miller and allowed her students to have a choice in the lesson. *This feedback encourages student learning by giving students a chance to have a say in what they need to learn to*
reach the objective. The students were able to give Ms. Miller an understanding of what they were struggling with and had questions on. And encourages students to really reflect on their learning and showed that Ms. Miller cared about their learning.

Only one preservice teacher explicitly stated the connection between using self-assessment as a tool for students to determine any gaps in understanding and relating these gaps to specific learning objectives for the lesson.

The fifth major theme that emerged from the written reflections was how feedback encouraged students to review their work for better understanding in order to take charge of their own learning. Two preservice teachers were placed in this category; one with views that remained the same and one with views that shifted away from formative assessment. For the preservice teacher whose views remained the same, she stated

Ms. Miller incorporated feedback when she led a discussion referring to the "footprint" activity the students conducted the previous day. The students did investigations by digging through the sand to find different fossils, and the teacher led a discussion discussing their findings and the importance of different locations and depths of fossil evidence that helped encourage the student learning. It helped the students by recalling points they made the previous day for review and clarification.

The preservice teacher whose views shifted away from formative assessment began by stating,

I really liked how Miller gave feedback on the fossil dig activity taking answers together and using it to fix misunderstandings and teach more. However, her feedback for other activities and assessments was lacking. She never gave feedback for the first journal (although she had them use it later in pure conversation which was probably more helpful than feedback she would've given) and her marking of a star or x on the question sheets (which students also discussed in groups) was purely for grading, not for feedback.
In this statement, the preservice teacher describes how the teacher’s feedback focuses more on a summative mark rather than formative feedback. In her post-case reflection, however, the preservice teacher describes the exit slip as a way for the students to take charge of their learning based on being provided the opportunity to choose the lesson topic.

I liked the 3-2-1 feedback students did halfway through the lesson. Students were encouraged to consider what they learned, didn't learn and what they wanted to learn. This gave students a chance to reflect on their learning and take charge with their learning by writing what they wanted to learn.

The sixth idea to emerge from the pre- and post-case reflections included how feedback was used to fix student answers. Although there was no description in the case of where this occurred, one preservice teacher stated,

I think that the feedback that Ms. Miller did provide encouraged student learning because the students were able to see that they were doing something correctly or incorrectly and were able to fix something if there was an issue.

Nowhere in the case did it describe a time when the teacher provided students with feedback based on their work; however, some of the preservice teachers described that the students could use feedback to help modify learning.

The seventh idea to emerge from the pre- and post-case reflections included how discussion encourages learning. Under this theme, two types of activities were discussed. First, class discussion was identified as a way for the teacher to interact with students. One preservice teacher wrote, “An appropriate form of feedback occurred during class discussions. At this point in time, she [the teacher] was able to interact with students about what was being taught. Discussions can help to optimize student learning.” Another type of activity involved peer-discussion. One preservice teacher stated, “In addition,
when students discussed their journal responses with their peers, they were assessing feedback from one another. Feedback from peers can be just as effective as feedback from the teacher, in some cases.”

The eighth idea to emerge from the pre- and post-case reflections included how students felt their views were considered to be important.

The feedback encourages learning because it makes them [the students] feel the topics they want to discuss are important. The students don't feel their feedback goes unnoticed. The feedback also encourages student learning because they are taking the initiative to ask questions, come up with discussion ideas and really understand the learning objectives.

In this particular response, the preservice teacher is referring to the exit slip activity. Unfortunately, the only feedback that is occurring during this activity, as described in the case, is a student reflection that is handed in at the end of the class period. This is a one-way line of communication; within the case the student does not get any feedback on his or her response. The teacher may use the students’ information to help guide future lessons, but this was not indicated in the case.

4.3.1.3 How Does Feedback Encourage Improvements in Teaching?

In terms of how feedback encouraged improvements in teaching, five major themes emerged from the preservice teachers’ written reflections (Table 4.7). Three of the five themes focused on the positive aspect of feedback within the case: feedback was used to change instruction, feedback was used to see where students needed help, and feedback encouraged teacher-led discussions. Two themes highlighted the lack of improvements based on feedback: feedback did not encourage teacher improvements
because the assessments were not authentic, and the teacher did not do anything with the feedback that was given to her.

Twelve preservice teachers’ reflections were categorized as using feedback to change instruction: eight of their views remained the same, two shifted towards formative assessment, and two shifted away. For the preservice teachers whose views remained the same, a common response is represented by the following preservice teacher’s written reflection,

The feedback encourages improvements in teaching because they gave Miss Miller the opportunity to reflect on herself and see what the students are still struggling with. It gave her the opportunity to adjust her lessons to meet the learning objective and understanding of her students.

For the two preservice teachers’ categorized as having views that shifted towards formative assessment, both had pre-case written reflections that lacked detailed description. For example, one preservice teacher wrote, “I think there are plenty of opportunities everyday throughout the lesson where the teacher could give the students feedback.” This type of response offers little description of the preservice teacher’s thoughts on the case or any indication that the preservice teacher understands the link between feedback and improvements in teaching. In contrast, the post-case written reflection the preservice teacher wrote,

Ms. Miller didn't incorporate feedback too much in this lesson. In the reflection in their journals Ms. Miller marks it with a star if they answered the questions and with an x if they did not answer all of the questions. I don't think that this type of feedback really encourages student learning at all, it just tells the student whether or not they completed the assignment. I think that this type of feedback does give the teacher an opportunity to see where her students are at and adjust the rest of her lesson to get every student on track.
Here the preservice teacher describes her view regarding the case teacher’s use of feedback, and clarifies ways in which the teacher could use student feedback.

For the two preservice teachers’ categorized as having views that shifted away from formative assessment, in their pre-case both recognized that the case did not offer a description of how the teacher used the student information to improve her teaching.

Other then [sic] her giving them the correct answer on the second day the only other feedback students received was whether they answered the questions in their journal or not. According to the paper it did not say if she gave any feedback past the students answering the question or not.

Although minimal in description, the preservice teacher recognizes that the case did not describe how the teacher was going to use the student responses to help improve student learning. In the post-case written reflections, both preservice teachers indicated that the feedback was indeed used to improve teaching “if there were any misconceptions about what the students had written about on their piece of paper.” This is an opposing view from the pre-case reflection.

Nine preservice students’ reflections were categorized as using feedback to help the teacher identify where students were struggling. Seven of their views remained the same and two shifted towards formative assessment. For the preservice teachers whose views remained the same between pre- and post-case, the common idea within the written reflection can be represented in this preservice teacher’s quote,

The feedback encourages improvements in teaching because they gave Miss Miller the opportunity to reflect on herself and see what the students are still struggling with. It gave her the opportunity to adjust her lessons to meet the learning objective and understanding of her students. The feedback gives both the students and the teacher a time to reflect on the learning objective.
The preservice teachers whose views shifted towards formative assessment included a pre-case reflection that indicated how the teacher provided feedback, when in fact it did not actually occur in the case. One preservice teacher wrote, “I really liked how Miller gave feedback on the fossil dig activity taking answers together and using it to fix misunderstandings and teach more. However, her feedback for other activities and assessments was lacking.” Here, the preservice teacher acknowledges that feedback did not occur within much of the case, but she does mention a form of feedback during the fossil dig discussion in class. The case describes this situation as a teacher-lead discussion in which the teacher describes the correct answer to the students, as a form of feedback. This teacher-lead activity of providing the students with the correct answer is in fact not a form of feedback; the teacher is merely telling the students the correct answer. In the post-case reflection, the preservice teacher does not touch on the teacher-led discussion, but she does comment on the teacher’s ineffective feedback methods. The preservice teacher stated,

An ineffective way that Ms. Miller incorporates feedback into the lesson is by putting a star or "x" on each student's journal response…I don't believe this form of feedback encouraged improvements in teaching because it was never mentioned that she would shape the lesson, the following day, based on student responses.

Four preservice teachers’ reflections identified the case assessments as “not authentic” and therefore not encouraging any teacher improvements. All four students’ views shifted towards formative assessment. All four pre-case reflections included a vague description of an activity the teacher asked the students to complete. For example, one preservice teacher wrote, “She asked them to write about questions they had. She
could then use this information to guide her teaching and encourage students to ask questions.” The post-case reflections were more detailed and described how the teachers use of the assessment activities were not useful for collecting appropriate student feedback. One preservice teacher wrote,

Ms. Miller incorporated feedback when she led a discussion referring to the "footprint” activity the students conducted the previous day… Her feedback didn't seem to encourage improvements in her teaching because it wasn't authentic. She didn't take the time to really assess student learning besides the first assessment.

Another preservice teacher wrote,

The only feedback Ms. Miller gave was in the form of the journals that she didn't even grade. It was graded as a pass/fail simply based on completion…As long as the student wrote some sort of response they were given a star on their paper and lead to believe that these ideas are correct. I understand the point of never telling students "you're wrong"; however, some sort of feedback is needed if the students are forming incorrect ideas about the topic. It didn't seem to change Ms. Miller's approach to the lesson either since she wasn't assessing the student's responses rather she assessed their ability to put words on paper in order to get a star instead of an "x". Eventually her students will learn that they need not know the correct answers, but instead be able to jot anything down in order to get credit.

In both responses, the preservice teachers have highlighted the teacher’s ineffective methods of feedback; the teacher didn’t take the time to fully read the student responses and simply marked the work as either complete or incomplete.

Three preservice teachers’ reflections identified the case teacher as not using the student feedback to improve her teaching. All three students’ views shifted towards formative assessment. In the pre-case reflections, the three preservice teachers generally described how the case teacher could use the student feedback to improve teaching and learning. For example, one preservice teacher wrote,

Her assignment on three things they'd learned, two things they had questions about, and one thing they wanted to talk about provided Ms. Miller with feedback
in the middle of the lesson...The feedback encouraged improvements in teaching by informing Ms. Miller about what her students still had questions or were unsure about so she could readdress that information.

The preservice teachers’ post-case reflections, however, suggest a understanding that the teacher’s feedback must be detailed and focused on student responses rather than on how much of the assignment was completed. One preservice teacher wrote,

The case did not indicate...whether she provided feedback on the students' three, two, one exit slip. Her feedback on the questions students answered in their science journals was simply complete or incomplete, based on whether they answered all of the questions. Throughout the lesson Ms. Miller did provide explanation and clarification of activities and concepts, however this was not feedback for students' work. Her lack of feedback likely did not do much to encourage student learning. Hopefully Ms. Miller used the students' three, two, one exit slips to improve her teaching by informing her of where she should focus her attention.

One preservice teacher’s reflection focused on how the act of feedback encouraged teacher-led discussions. This preservice teacher’s view remained the same between her pre- and post-case written reflection. The preservice teacher’s reflection suggests that using the student feedback as a guide for further discussion can benefit the teacher’s plan for improving the learning experience. The preservice teacher wrote,

Miss Miller incorporated feedback in her lessons by allowing her students to write in their science journals. They write about what they learned and some questions I still have. This encourage student learning by having them write down their ideas and hopefully grow from them. One way this feedback encourages teacher learning is by having a clear discussion and asking them questions.

4.3.2 Discussion: Question six

Pre/post question six was divided into three separate questions, which asked the preservice teachers to describe how they thought feedback was incorporated within the
lesson, how this feedback encouraged student learning, and how the feedback informed improvements in teaching. As described earlier, due to the nature of this three-part question, most of the preservice teachers answered the first question by simply listing the lesson activities that they felt enabled, or did not enable, feedback. There were, however, some interesting comments that accompanied the list of activities presented by the preservice teachers within their pre- and post-case reflections.

First, in a description of where feedback was incorporated in the case lessons, one preservice teacher described the “hands-on activity” and the journals as being an outlet for feedback; however, in the description the preservice teacher stated that feedback “could” occur during these activities. The preservice teacher went on to state, “I think there are plenty of opportunities everyday throughout the lesson where the teacher could give the students feedback.” This data may suggest that the preservice teacher identifies a lack of feedback within the case, but recognizes that these particular activities could provide an opportunity for such feedback to occur.

Second, many of the preservice teacher responses included a description of how simply checking student work for completion is an ineffective method of feedback. A few preservice teachers explicitly made the distinction between formative feedback and summative grading. One preservice teacher stated, “Her marking of a star or ‘x’ on the question sheets…was purely for grading, not for feedback.” This represents a crucial distinction between formative and summative assessments; this is a distinction that was not often described in the preservice teachers’ pre- or post-case reflections.
Lastly, one preservice teacher was coded as having views that shifted away from the acknowledgment of formative assessment. This code was applied because the preservice teacher stated in the pre-case reflection that the lesson did not provide the students with an opportunity to give or receive feedback; however, in her post-case reflection the preservice teacher stated, “I liked the 3-2-1 feedback students did halfway through the lesson. Students were encouraged to consider what they learned, didn't learn and what they wanted to learn.” While this last statement is true, the “feedback” the students were giving during the “3-2-1” activity was actually more of a reflection of what they felt they learned, as well as an opportunity to suggest further topics of interest. The preservice teacher is describing the act of self-assessment; an important aspect of formative assessment, but not necessarily related to feedback that is based on the learning objectives. Although one might argue that self-reporting what one has believed to have learned is a form of feedback, for this to be truly formative assessment the student would need to base her self-assessment off of explicit learning objectives. In this pre/post case, learning objectives did not clearly exist.

The second of the three-part question asked about how feedback encourages student learning. Similar to the first question, a common theme that emerged among preservice teachers’ reflections within the second question included the relationship between student/teacher feedback and student self-assessment. The most common activities described under this category were the exit pass activity and journaling. Within these descriptions, the process of self-assessment was again often highlighted in terms of providing “feedback” to the teacher. More specifically, the preservice teachers described
how students were allowed to provide “feedback” in terms of a self-assessment of what they learned, what they still had questions about, and what they would like to learn about in the future. There are several larger issues present here. First, as described before, although collecting these types of student reflections can indeed be beneficial information for teachers, for the process of self-assessment to yield appropriate feedback, the self-assessment must be based on common learning objectives. In other words, the student must compare what they think they have learned to what was explicitly described as the learning objective for that lesson. Such learning objectives were not described in the case. Without clear learning objectives, the students’ self-assessment is merely a metacognitive reflection that may or may not be based on the intended learning outcomes for the lesson.

Secondly, the self-assessment reflections were handed to the teacher, but no further action occurred within the case. Nowhere in the case did it describe a time when the teacher provided students with scaffolded feedback based on their work; however, some of the preservice teachers described opportunities in which the students could use feedback to help modify learning. Using feedback to modify learning is a significant part of the formative assessment process so the acknowledgment of this process is meaningful; however, within this acknowledgement the preservice teacher should also identify how this process, as represented within the case description, is indeed lacking. Within the case description, there is only a one-way line of communication; the student does not get any feedback on his or her response. The teacher may use the students’ information to help guide future lessons, but this was not indicated in the case. Therefore, some of the preservice teachers may have assumed that the teacher used students’
responses in planning future class lessons. The preservice teachers may have also assumed that the act of completing an exit slip or journal entry encouraged student learning; that every student took the initiative to relate her classwork to the learning objectives, and then used this information to formulate questions or discussion ideas.

Placing the responsibility of learning in the students’ hands was not an uncommon theme among preservice teacher responses. Here, increased engagement or motivation based on the opportunity to choose an “interesting” topic was identified as promoting effective learning. Interestingly, the preservice teachers did not describe the importance of teaching the students the skills necessary to monitor and self-assess their learning based on specified learning objectives. Perhaps the preservice teachers assumed these skills were already taught or perhaps the preservice teachers did not recognize a need for the students to be instructed on how to self-assess ones learning.

The third question asked preservice teachers to describe how feedback, as represented in the case, encouraged improvements in teaching. Overwhelmingly, many preservice teachers described how the case teacher could use student feedback to help modify the lesson to better suit the needs of the students. Using student feedback to improve both learning and teaching requires the teacher to engage in the students’ work; identifying areas of strength and areas to improve, and then using this information to help guide further instruction and learning. This is an excellent way to employ formative assessment practice in teaching and learning. Unfortunately, this did not actually occur in the case. Nowhere in the case did it describe the teacher using student work to determine student strengths and weaknesses. The teacher only graded for completeness. The case
also never described the teacher providing students with descriptive feedback based on their work or asking the students to use the feedback to help modify or enhance their understanding of the material. Perhaps the preservice teachers were assuming that the student work was assessed for understanding, and that both the teacher and students used this information to create feedback cycles that would help in improving both teaching and learning; however, this simply was not part of the case description. It is arguable that the students’ singular act of completing an exit pass would encourage student learning, as described by several preservice teachers. How the students interact with this information is what is most important. The teacher must use this information to structure appropriate activities to suite student needs. From the post-case response, some of the preservice teachers suggested that the simple act of completing an exit slip would provide the teacher with an opportunity to promote discussion through which she could ask the students clarifying questions. This may be true; however, the teacher must provide structured feedback for the students to use to improve their learning. Discussion may not suite this need. In addition, and perhaps more importantly, it is what the teacher asks the students to do with this feedback that is the catalyst for better understanding.

When asked about how feedback encouraged improvements in teaching, multiple preservice teachers provided post-descriptions that supported the lack of quality feedback practices, and therefore the lack of improvements in teaching. Interesting to note is the added detail provided within the post-case reflection that acknowledges a lack of adequate formative assessment. Due to the added detail, six preservice teachers were coded as shifting towards the acknowledgement of formative assessment. Several
preservice teachers described how the case teacher did not take the necessary time to review student work and modify instruction based on the review. Other preservice teachers addressed the fact that the case teacher wasn’t assessing student work based on the correctness of the content, but rather the students’ ability to turn in a completed assignment.

In addressing my first research question, the data suggests that the implementation of formative assessment cases did influence preservice teachers’ knowledge of formative assessment. The post-case reflections included additional ideas that supported the preservice teachers’ growth in formative assessment understanding. Between pre- and post-case reflections for the last two questions (encouraging student learning and encouraging improvements in teaching), 21 preservice teachers shifted their views about the quality of feedback represented in the case. The preservice teachers began by indicating that the case teacher collected, and in return provided, appropriate feedback; however, the post-case reflections highlighted the lack of feedback provided to the students. A few preservice teachers recognized that the case teacher provided her students with summative markings that measured completion rather than the students’ level of understanding based on the intended learning objectives. These preservice teachers recognized that the case teacher did not provide any specific or directive feedback that could improve student learning through scaffolded guidance. Preservice teachers often neglect the role of the student in the formative assessment process; pre-case data supports this finding. The recognition of providing students with feedback that can be used to foster improvements in student learning, as demonstrated in the post-case data, suggests
that the preservice teachers incorporated these ideas from previous cases and case discussions about feedback in the classroom.

Another shift towards formative assessment, as noted between pre- and post-case data, occurred in the preservice teachers’ description of the use of exit pass data. Initially, several preservice teachers described the exit pass as a way to engage students in the learning process because the students were able to write down topics they wished to learn about in the future. Although this opportunity may indeed increase student engagement, this is not a formative use for the exit pass activity. In the post-case reflection data, the preservice teachers highlighted how the exit pass activity encouraged student learning because through this process of self-reflection, both the teacher and the students were better able to identify areas the students needed additional help. Using student reflections to gather information about how well they understand the learning goals, and then using this data to inform both teaching and learning, is a major goal of formative assessment. Data suggests that the preservice teachers incorporated these ideas from previous cases and case discussions about feedback in the classroom.

In addressing my second research question, the data suggests that specific characteristics can be identified within the preservice teachers’ reflection that suggests learning has occurred. The post-case data supports that the preservice teachers began to both evaluate the current methods of student assessment and apply previously discussed formative assessment concepts and strategies to the pre/post case situation. At first, many preservice teachers were satisfied with the type of feedback activities used within the pre-case lesson, as well as how the teacher used the feedback to improve teaching and
learning. Data from the post-case reflections, however, showed that many of the preservice teachers shifted their views or provided more detail to their post-case reflections. Through an evaluation of the case, several preservice teachers identified the lack of feedback throughout the lesson activities. This was represented in several ways. First, one preservice teacher described how the teacher did provide her students with explanations and clarifications of activities and concepts, but the preservice teacher went on to state that this was not feedback for students' work. This is an important reflection because the preservice teacher identifies the difference between telling her students what they need to know and providing guidance in the form of feedback to help improve learning. Second, the preservice teachers also noted that the case teacher did not provide students with formative feedback on their work; rather, the teacher merely graded for completion. Lastly, several preservice teachers identified the fact that the case teacher did not use student work to modify her future instruction. Identifying the lack of quality feedback with in the case suggests that the preservice teachers incorporated ideas from previous cases and case discussions. During their methods class, feedback was described and discussed in the third case in terms of how feedback cycles affect the quality of student learning and teacher instruction. This data suggests that by applying these strategies and concepts to their post-case reflections, the preservice teachers have gained insight from the cases and the case discussions to further their knowledge of formative assessment.
4.4 Offering Opportunities for Peer- And Self-Assessment: Pre/Post Question Seven and Eight

Self- and peer-assessment are an important aspect of student learning. Self-assessment allows students to take a critical look at what they think they understand and what areas they may have difficulty with. To be able to self-assess, the students must have clear learning objectives and success criteria, and guided feedback to use to assess their own learning. The process of peer-assessment offers students an opportunity to critically analyze peer work based on stated success criteria. This in turn provides the students with a more detailed understanding of the learning task, which can be applied to their own work. When done well, self- and peer-assessment encourage students to take responsibility for their own learning, as well as provide opportunities for students to better understand the methods and intent of the learning episode. Self- and peer-assessment help students to answer where they are now in their learning, where they need to go, and how they are going to get there.

Before reporting and discussing the results under this section, it is necessary to provide a brief description of how self- and peer-assessment were represented in pre/post case. Ms. Miller offered two opportunities for student self-reflection. Keep in mind that reflection is not always the same as self-assessment. Students may be asked to reflect on a particular topic, but do not assess their own understanding of the topic based on the expected learning outcomes.

The first opportunity for reflection occurred at the end of the first day’s lesson when Ms. Miller asked the students to fill out an exit pass describing: what they learned,
what they still have questions on, and a related topic they would like to discuss the next day. This activity is a great way for students to think about the day’s activities; however, there are several issues related to how Ms. Miller handled this activity. First, to accurately and adequately assess one’s learning, a person must know what the learning goal or objective is and in this particular case, the students were given assignments without the description of the overarching objective for the lesson. Secondly, nothing was done with this information. Ms. Miller didn’t use student responses to modify or justify classroom instruction. Although it was asked, Ms. Miller didn’t consider students’ interest in topics for the next class period.

The second opportunity for student reflection occurred at the end of the third day. Students were asked to reflect on the shoebox activity in their journals. Ms. Miller did not include any reflection prompts; rather she included several questions for the students to answer. These questions are more like an assignment to collect evidence of learning rather than a form of student self-reflection or assessment.

One opportunity was provided for peer-assessment during this case. This occurred during the final class period, after the journals had been returned to the students. Ms. Miller asked the students to share their journal responses with their tablemates before putting their journals away. This is a great start; however, simply sharing responses with another student doesn’t qualify the activity as peer-assessment. Ms. Miller needed to provide the students with criteria for assessing their peers’ work based on the intended learning objectives. This was not done.
4.4.1 Pre/post case question seven: When thinking about student learning throughout this lesson, what purpose did both group and individual work serve? Did these activities provide an opportunity for students to peer- and self-assess their work? Explain your answer.

There were four main areas targeted in pre/post-case question seven. The first two areas gathered information regarding preservice teachers’ views on individual work and group work within the classroom setting (Table 4.8) and the last two areas gathered information regarding preservice teachers’ views on self-assessment and peer-assessment (Table 4.9).

4.4.1.1 Purpose of Individual Work

When asked about the purpose of individual work, six themes emerged from the preservice teachers’ reflections (Table 4.8). All but one of the preservice teachers’ descriptions remained the same between their pre- and post-case reflection. The most common description for the purpose of individual work was that it served as an avenue for students to reflect on their learning. For example, one preservice teacher stated, “The individual work was to help the students think back on what they learned from each day and think of what other questions they may have.” Some preservice teachers described this reflection in terms of a self-assessment. For example, one preservice teacher stated, “Individual work allows students to self-asses their own work. If they can't *retell* the information, then they probably did not comprehend the information.” For this particular preservice teacher, self-assessment included the ability to reiterate the information presented in class. Several preservice teachers highlighted the independence portion of
“individualized work” by stating, “Individual work encouraged independent thinking of the student to see if they understand the material and could apply what they learned during experiments and discussions.” Here, the preservice teacher not only highlights the student’s ability to understand the information, but also to show understanding through the process of application. Another preservice teacher wrote, “The individual work gave the students the opportunity to show what they knew without the influences of others.”

Table 4.8

*Summary of Preservice Teachers’ Responses to Pre/Post Case Question Seven: Individual and Group Work*

<table>
<thead>
<tr>
<th>Purpose of Individual and Group Work?</th>
<th>Individual Work # of PST</th>
<th>Group Work</th>
<th># of PST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess own learning</td>
<td>10 (S)</td>
<td>Learn from each other</td>
<td>19 (S)</td>
</tr>
<tr>
<td>Helps teacher assess students</td>
<td>8 (S)</td>
<td>Working together/collaboratively</td>
<td>15 (S)</td>
</tr>
<tr>
<td>Encourages students to think/reflect</td>
<td>5 (S)</td>
<td>To inform teacher instruction</td>
<td>2 (S)</td>
</tr>
<tr>
<td>Demonstrates what students know</td>
<td>3 (S)</td>
<td>Make students accountable</td>
<td>1 (S)</td>
</tr>
<tr>
<td>Holds students accountable</td>
<td>1 (S)</td>
<td>Not connected to learning objectives</td>
<td>1 (S)</td>
</tr>
<tr>
<td>Not connected to learning objectives</td>
<td>1 (T)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Many preservice teachers offered other purposes of individual work. Providing students with enough time to work with new ideas was highlighted as being an important aspect of individual work. One preservice teacher wrote, “These [individual work activities] gave time for each student to self assess because they were able to *take the*
time to think about what they knew and what they still needed to learn about.” Other preservice teachers focused on how individual work benefitted the teacher. For example, one preservice teacher stated, “I think the purpose of individual work was a way for the teacher to see individual progress/understanding thus far.” Another preservice teacher remarked, “Individual work served as formative assessment for the teacher, although she didn't really use it to help her teaching or learning about student comprehension.” Although this preservice teacher suggested the use of individualized work was to promote formative assessment, she acknowledged the fact that this did not actually occur within the case.

One preservice teacher was coded as having a view that shifted towards the acknowledgement of formative assessment. In her pre-case reflection, the preservice teacher described how individualized work provides some form of differentiation. She stated,

The purpose for group and individual work throughout the lesson serves as an opportunity to meet the needs of different types of learners. Some students learn best in groups, and others work better individually. However, it is important for students to learn both individually and in groups to better prepare them for real world applications.

Here the focus is not only on providing different learning opportunities, but she also highlights the general skills a student will gain by participating in individualized (and group) work experiences. Her pre-case reflection has a pedagogical emphasis, focusing on general methods rather than focusing on what is happening in the case. In her post-case description, however, she describes how the individual work fits in with the goals for the lesson. She stated, “Group and individual work served the purpose for busy work.
The activities may have been interesting for some students, but overall I don't think students made any connections with the activities to the lesson objectives.”

4.4.1.2 Purpose of group work

When asked about the purpose of group work, five themes emerged from the preservice teachers’ reflections (Table 4.8). All preservice teachers’ descriptions remained the same between their pre- and post-case reflection. A majority of the preservice teachers’ reflections included information about working together in a group setting to promote learning; therefore, these preservice teachers were all coded within the top two themes. These two themes are closely tied together. Both contain descriptions of ways in which students learn in a group setting; however, the difference lies in describing how the learning occurs and the type of learning activities involved. The first theme focuses on the opportunity for students to learn from their peers. For many of the preservice teachers, this was the extent of their description. Some preservice teachers provided some additional detail as to how this learning might occur. For example, one preservice teacher wrote, “While working in groups, students were able to have conversations in their groups and share the different ideas each person had. This creates many diverse conversations and opens the eyes of some students to think in different ways.” For the second theme, working collaboratively, the preservice teachers offered more description as to how the students might learn from each other by describing the activities that students do while working collaboratively. Several preservice teachers described the students’ ability to compare and contrast their ideas, while others
highlighted the opportunity for students to help *clarify any confusion* one might have had with the lesson material. One preservice teacher described this collaboration as a real-world process. She stated, “The group work served to help students work collaboratively, as real scientists do, to come up with ideas…”

The third theme included preservice teachers’ reflections that focused on how the teacher benefited from group work. For example, one preservice teacher wrote, “I think the purpose of individual work was a way for the teacher to see individual progress/understanding thus far.” Another preservice teacher noted the use of group work for similar purposes, but noted that it was not executed well within the case. He wrote, “Group work served as formative assessment for the teacher, although she didn't really use it to help her teaching or learning about student comprehension.” Paralleling the idea of using group work to satisfy the teachers need to assess student understanding, one preservice teacher stated, “I think having both group and individual allowed students to be *held accountable* for their learning…” The focus shifts from providing students with learning opportunities to using these activities as a method of collecting student data to determine what they have learned. Lastly, and as reported above with individual work, one preservice teacher disagreed with the use of group work stating, “Group and individual work served the purpose for busy work. The activities may have been interesting for some students, but overall I don't think students made any connections with the activities to the lesson objectives.”
4.4.1.3 Were self- and peer-assessment opportunities encouraged?

The last two areas targeted in pre/post-case question seven gathered information regarding preservice teachers’ views on whether self-assessment and peer-assessment were encouraged through the actions of the teacher within the case. The preservice teachers either agreed or disagreed (Table 4.9) on whether or not the case encouraged this type of formative assessment. After coding the preservice teachers’ pre- and post-case reflections, it became clear that the preservice teachers often used the same reasoning for describing how the self- and peer-assessment opportunities were either encouraged or not encouraged throughout the case. Due to this reason, the data for both self- and peer-assessment opportunities will often be reported together.

Table 4.9

Summary of Preservice Teachers’ Responses to Pre/Post Case Question Seven: Self- and Peer-Assessment

<table>
<thead>
<tr>
<th>Were Self- and Peer-Assessment Opportunities Encouraged?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of PST</td>
<td># of PST</td>
</tr>
<tr>
<td>Journaling</td>
<td>15 (13S, 2T)</td>
<td>No feedback</td>
</tr>
<tr>
<td>Comparison/ Discussion/ Clarification</td>
<td>10 (9S 1A)</td>
<td>General (no description)</td>
</tr>
<tr>
<td>Exit slips</td>
<td>5 (4S, 1T)</td>
<td>Discussion/reflection</td>
</tr>
<tr>
<td>Providing/Using feedback</td>
<td>5 (4S, 1T)</td>
<td>No opportunities provided by the teacher</td>
</tr>
<tr>
<td>Description of assessment opportunity</td>
<td>7 (3S, 4T)</td>
<td>Participation equated to credit</td>
</tr>
</tbody>
</table>
Many of the preservice teachers provided brief and general statements regarding how the case teacher “encouraged” self- or peer-assessment. For example, one preservice teacher stated, “When the students write in their journals this gives them an opportunity to self-assess their work.” There were, however, several responses that provided more detail as to why some preservice teachers believed that self- and peer-assessment were encouraged. Some preservice teachers described why journaling and exit slips were a good self-assessment. One preservice teacher, when referencing the exit slip, wrote,

If they [the students] realized that they had more than two questions to write down or couldn't come up with three things they had learned, that something would need to be done differently. This may require speaking with peers or the teacher to ensure that they understand the lessons.

Using the exit slip questions as a way for students to determine what they did and did not know was a common response when referring to self-assessment practices; however, there was no mention of self-assessing based on the expected learning outcomes. Rather, it was described as a process of reflection, with students being asked to describe what they think they learned and what they still may have questions about. These preservice teachers did describe how the students used the self-assessment to help them ultimately understand the material. This is indeed a part of the self-assessment process. Other preservice teachers, however, described the purpose of self-assessments as a way to provide feedback to the teacher. One preservice teacher stated,

When writing their three, two, one exit slip students had the opportunity to self-assess their learning. Hopefully this was done to inform Ms. Miller's instruction.
The students were asked to answer questions in their journal as a form of self-assessment. This activity informed Ms. Miller of her students' level of understanding after having received instruction.

Another preservice teacher wrote, “The 3-2-1 reflections at the end of day 2 were great examples of self-assessment that gave the teacher useful feedback.” Although feedback is a vital part of the formative assessment process, teacher feedback does not necessarily have to be part of the self-assessment process. Rather than benefitting the student, here the focus was solely on what the teacher could do with the student information. Several preservice teachers referenced feedback but also described how the students could have used teacher feedback to help them assess their own understanding of the material. For example, one preservice teacher wrote, “The individual assessments could have served as a self-assessment. The students could look back at the feedback given from Ms. Miller and used that as a guide to understand and see where they were.” Due to the fact that the emphasis was placed on the student using feedback to guide her own learning (i.e. assessing her understanding of the material based on teacher feedback), this particular preservice student was coded as shifting towards the acknowledgment of formative assessment. Similarly, another preservice teacher was also coded as shifting towards the acknowledgement of formative assessment. In his pre-post reflection, the preservice teacher wrote, “Group work was for discovering and learning while the individual work was more for assessment in the teacher's benefit.” In his post-case reflection, however, the preservice teacher wrote,

Individual work served as an opportunity to reflect on whether or not they were understanding the material and were able to reflect on themselves…The individual work gave the students a chance to self-assess because they had to think about what they had learned and think about what was clear/unclear.
Again, there is a shift from using self-assessments purely for teacher use to using the process of self-assessment to improve or encourage student metacognition.

Several preservice teachers synonymously associated the act of individualized work with the process of self-assessment, as well as the act of group work with the process of peer-assessment. In their descriptions, the preservice teachers described students as self-assessing their learning when doing individual work or peer-assessing when doing group work. For example, when asked about peer-assessment opportunities, one preservice teacher wrote, “Group learning allowed students to work together and have their minds come together. It allowed them to come up with ideas together and help each other understand what is going on in the lesson.” Several preservice teachers focused on the act of discussion as a way to incorporate peer-assessment. For example, one preservice teacher wrote, “They were able to peer-assess their work when they discussed the journals and worked in groups. They were able to compare other student’s knowledge to their own.” From the data, there was no indication that this discussion or comparison was assessing the intended learning outcomes. One preservice teacher touched on this by stating, “The one group work that allowed for peer-assessment would be when students shared their journal responses with each other. This would allow for discussion and correction, but it could also just as easily not lead to peer-assessment.” This was the only statement within the pre/post data that acknowledged the fact that discussion may not lead to peer-assessment.
Another view of peer-assessment was described in terms of using group experiences to help students work together to clarify learning content. For example, one preservice teacher wrote,

> When it came to group work, it was a way for students to encourage and clarify information for others as well as these activities allowed for peer and self-assessment. This is because the journals were a reflection on their experience during this lesson and describe what they learned. I think this provided peer-assessment because as said before, students work together and were able to clarify and understand information that some students may have been struggling with.

Lastly, one preservice teacher described several different learning strategies to aid in the process of self- and peer-assessment. She stated,

> I think having both group and individual allowed students to be held accountable for their learning. They got to do the activities in groups but at the end of the day they had to be able to write on their own what they learned. These activities did give the students time to peer and self assess. The balance of group work and individual work allowed for those moments for students to give and get feedback.

One preservice teacher was coded as shifting away from the acknowledgement of formative assessment. In her pre-case reflection the preservice teacher stated, “I do not believe that there were any true moments where the students were given the opportunity to peer-evaluate, other than insight that could have come from whole group discussions.” In her post-case reflection, she wrote, “In a surface level sense, yes I do believe that the activities acted as a method of peer-evaluation. I think that the small group discussion was the most effective tool/activity used to assist in student/peer evaluation.” Both pre- and post-case reflections were brief and did not provide any detail to support the claim; however, the simple shift from disagreement to agreement was enough to code the preservice teacher as shifting away from the acknowledgement of formative assessment.
4.4.1.3.2 Self- and peer-assessment opportunities were not encouraged.

Three major themes were reported within the preservice teachers’ pre- and post-case reflections: the absence of feedback, the role of discussion, and general descriptions regarding the lack of assessment opportunities.

The data from multiple preservice teachers’ reflections were coded as providing “general descriptions” of how self- and peer-assessment opportunities were not encouraged. These descriptions were brief and provided little to no justification for the preservice teachers’ reasoning. For example, one preservice teacher wrote,

The work in the lesson helped give students the correct ideas about fossils however the lack of peer or self-assessment gives the students no way to find out if their ideas are correct. The activities are great ideas but they must include more assessment opportunities if they are to be optimally successful.

From this statement, it is unclear what the preservice teacher defines as “assessment opportunities.” Another preservice teacher made a general statement about the assessment opportunities; however, her pre- to post-case reflections was coded as shifting towards the acknowledgement of formative assessment because she highlighted how the lesson assessments did not foster peer feedback (e.g. “glows and grows”). She stated, “These activities [group and individual assignments] have their way of assessing but in the whole group assessment I don't see anything that will benefit any ‘glows or grows’”.

The second largest theme focused on the feedback cycle between students and teachers. Multiple preservice teachers described a lack of self- and/or peer-assessment opportunities due to the lack of teacher feedback. One preservice teacher stated, “The students were not given any opportunities to self-assess since their work was not given
back to them with any focus, instructions or questions that directed them in self-assessment.” Another preservice teacher wrote,

    The students shared responses and did group activities together but did not provide students with any assessment or understanding of their learning. The teacher gave them an activity to share their responses to a peer, but did not provide any assessment or feedback by doing this.

For both of these responses, the focus is on the lack of teacher feedback within these peer- and self-assessment processes. Some preservice teachers highlighted the lack of student feedback, as represented by this preservice teacher’s quote: “The students did not peer-assess any work since they did not review each other’s responses and were not asked to give feedback for the responses.” Here the responsibility of providing adequate feedback has shifted from the teacher to the student. At this point, the preservice teachers have all focused on the act of providing feedback, when the process of self- and peer-assessment includes much more than simply providing feedback. In some cases of self-assessment, feedback is actually not needed. Several other preservice teachers also highlighted this lack of feedback; however, the preservice teachers described how this lack of feedback affected the students’ ability to reflect on their understandings. One preservice teacher wrote, “I don't think these activities allowed the students to peer or self-assess accurately at all. They didn't reflect on their work with feedback to evaluate how well they understood.” Several preservice teachers were coded as shifting toward the acknowledgement of formative assessment. One preservice teacher’s pre-case reflection stated, “Students were not really given the opportunity to peer/self-assessed their work other than seen if there groups were correct.” Her post-case reflection offered a detailed rationale for why the peer- and self-assessment process was not adequate. She stated,
The activities did not provide much work for peer and self-assessment. The students are able to share their work with each other by they do not peer-assess. The students are also not self-assessing themselves because the feedback they are receiving is simply right or wrong. It isn’t challenging them to fix it if it is marked wrong.

Here the preservice teacher is highlighting the need for students to apply the feedback they are given in order to better recognize how their understanding can be modified.

Providing students with an opportunity to reflect on peer or teacher feedback is an important aspect in the self-assessment process. This is highlighted by one preservice teacher’s remarks. She stated, “I do not believe students were able to self assess themselves because the journals were graded and returned back to them and immediately asked to share what they had written down.” When self-assessing, a student can either be asked to assess their own learning prior to allowing a teacher or peer to view their work or based on the peer/teacher feedback that has been provided to them after their work has been shared. In either case, the students and teachers must base their feedback on the specified learning objectives for the lesson. Of the data collected, only one preservice teacher was identified as making this distinction. She stated, “Overall I don't think students made any connections with the activities to the lesson objectives. The activities didn't provide opportunities for students to peer- and self-assess their work because as long as the students participated, they received credit.”

The third largest theme focused on the act of discussion within the peer- and/or self-assessment process. In this category, preservice teachers highlighted both the use and lack of discussion as rationale for the weak implementation of peer-assessment. For example, one preservice teacher stated,
I think some of these opportunities do provide an opportunity for peer and self-assessment, like reflecting on the lesson by writing down what they have learned and so on, but some do not, such as having students answer questions in the science journal with no discussion as a whole group.

In the case, the journaling activity represented an individual activity in which the students were asked to answer a set of questions. Once the journals were returned to the students, the teacher encouraged the students to discuss their responses in groups. This particular preservice teacher has described the act of whole-group discussion as an important factor in the assessment process. On the other end of the spectrum, one preservice teacher faulted the assessment activity because it was discussion based. She stated,

Group worked during this lesson served as an opportunity to discuss current thoughts and gain new ideas from peers. It gives an opportunity for peers to explain ideas to each other and help one another understand— they share ideas... There was no peer assessment in the group worked because it was mainly discussion.

In both examples, the role discussion plays in the assessment process is not clearly described. The benefits of discussion, in terms of advancing the peer-assessment process, are also not defined.

4.4.2 Discussion: Question seven

Question seven was divided into four main questions. For the first two questions, the preservice teachers were asked to describe the purpose of individual and group work. For the last two questions, the preservice teachers were asked to describe how self- and peer-assessment was encouraged in the case. Placing these two sets of questions together was done purposefully to determine if the preservice teachers could make a distinction between the different pedagogical processes. Most of the preservice teachers described
individual work as work used to assess student understanding and group work as work that allowed students to share and learn from each other. It is interesting to note that the former focuses on assessment and the latter focuses on learning. Many preservice teachers associated the act of individualized work with the process of self-assessment, as well as the act of group work with the process of peer-assessment. This data suggests that the preservice teachers may have a fundamental misunderstanding of the function for each of these. Multiple preservice teachers stated that working in groups allowed students to talk about and compare their understanding, which in turn allows peers to assess each other’s understanding of the content. Discussion and comparison can be an important process within peer-assessment, but unless the students are basing this assessment on the stated learning objectives, discussion of the assignment may not lead to an assessment of the intended learning outcomes. Simply having a discussion may not provide peers with the feedback they need to improve their understanding. For some preservice teachers, the act of discussion was more about brainstorming than about providing peers with constructive feedback to improve learning. The role of discussion and the benefits of discussion within the peer-assessment process were not well defined by a majority of the preservice teachers in this study. Similarly, the act of completing an assignment individually does not automatically mean that the student has self-assessed his learning. Again, this type of assessment is based on specific learning criteria. It is possible for a student to complete an assignment without determining if he fully understood the intended learning outcome for the lesson. In describing individualized work, multiple preservice teachers indicated that the act of reflection was also synonymous with the
process of self-assessment. This could be true, but this is not always the case. To self-assess one’s learning, there needs to be a set of success criteria in which to make a judgment. The act of reflection does not necessarily need a set of success criteria. A student could reflect on what she believed were successes in her learning for the day or she could reflect on ideas or concepts she still has a hard time understanding. These successes and challenges may not match up with the teacher’s learning objectives for the lesson. To self-assess one’s progress, a person makes judgments based on explicit and measureable success criteria. This distinction was not addressed in the preservice teachers’ pre- or post-case data.

Another point of interest to note from the preservice teachers’ reflection data was the strong connection between assessment and feedback. Several preservice teachers referred to the process of self-assessment as a way for the teacher to gather feedback on student learning. Self-assessment was not a process to help students assess their level of understanding; it was a process to inform the teacher’s instruction. Others stated that students needed teacher feedback to properly self-assess their learning. Teacher feedback can play an important role in providing students with the tools to help them assess their own learning, but it is not entirely necessary. For self-assessment to occur, the student can either assess her own work based on the learning criteria or use the feedback she is given as a guide for assessing her own work. In other words, the student must compare what she knows with the feedback that is provided to her, and then use this feedback to help guide her understanding. As noted by several preservice teachers, the process of self-assessment is done alone to provide the student with an opportunity to compare,
process, and question her own understanding based on the learning objectives; this process holds the student accountable, teaching her to take ownership of her own learning.

In addressing my first research question, the data supports that the implementation of formative assessment cases did influence preservice teachers’ knowledge of formative assessment for the last two of the four sub-questions within case question seven; however, the data collected between pre- and post-case reflection for the first two sub-questions shows no change. This lack of change is not a surprise. The first two questions asked preservice teachers to describe the purpose of both individual and group work. This was done to gather a better understanding of how the preservice teachers viewed such work in relationship to how the preservice teachers described the self- and peer-assessment processes. Preservice teachers often synonymously associate the purpose of individual and group work with the self- and peer-assessment process. Interestingly, the preservice teachers’ reflection data suggested a similar result. The focus of case four was on what constitutes well-executed self- and peer-assessment within the classroom. Case four’s content and the discussion surrounding case four within the preservice teachers’ methods course did not specifically focus on the purpose of individual and group work; therefore, it’s not surprising that there was no change between any of the preservice teachers’ pre- and post-case reflections, with the exception of one preservice teacher’s views shifting towards the acknowledgement of formative assessment.

Between the pre- and post-case reflections regarding how well self- and peer-assessment were encouraged within the case, 19 preservice teachers views shifted
towards the acknowledgement of formative assessment. Many of the preservice teachers began by providing a general description of how self- and peer-assessment could be a good pedagogical approach, but these descriptions offered little acknowledgment of the purpose or benefits of assessment on student learning. The post-case reflections, however, included descriptions of the parts of the case that limited the use of self- and peer-assessment practices, as well as suggested improvements. Most notably, the lack of specified learning objectives were identified as a major issue; without learning objectives, the students could not self- or peer-assess their level of understanding.

Another shift towards formative assessment, as noted between pre- and post-case data, occurred in the preservice teachers’ description of the use of feedback. Initially, several preservice teachers described the act of peer-assessment as one that automatically occurred through group work or discussion. Although these activities may indeed lead to adequate peer-assessment, discussion without the use of objective-based feedback is not formative in nature; this point was discussed within the preservice teachers’ post-case reflection data. Similarly, a shift occurred when describing the purpose of self-assessments. At first, many preservice teachers described how important self-assessments were for teachers because it provided them with student data to help improve future lessons. Post-case data included a shift towards viewing self-assessments as those that benefit the student; they are done to provide the student with an assessment of their own level of understanding. Using self- and peer-assessment as a way to improve student understanding is a major goal of formative assessment. Data suggests that the preservice
teachers incorporated similar ideas from the previous cases and case discussions that occurred in the preservice teachers’ classroom.

In addressing my second research question, the data suggests that specific characteristics can be identified within the preservice teachers’ reflection that suggests learning has occurred. Similar to many of the other pre/post case questions, the post-case data for case question seven supports that the preservice teachers began to both evaluate the current methods of assessment and apply previously discussed formative assessment concepts and strategies to the pre/post case situation. At first, many preservice teachers simply stated that the objective of self-assessment was to benefit the teacher. The preservice teachers did not describe any benefit for the student. Data from the post-case reflections, however, showed that many of the preservice teachers shifted their views or provided more detail to their post-case reflections. After evaluating the case, several preservice teachers identified the lack of opportunities for students to determine their level of understanding. Many preservice teachers continued to describe how the teacher could benefit from the self-assessment process, but the preservice teachers also included how this student/teacher interaction could benefit the student. For example, several preservice teachers described the self-assessment process as an opportunity for students to show that they know and to use teacher feedback to help guide their understanding. This is an important reflection because the preservice teachers identify the difference between assessment to improve instruction and assessment to encourage student learning.

Preservice teachers also demonstrated the ability to apply ideas that were described in the case and discussed in the preservice teachers’ methods course. For
example, several preservice teachers pointed out that the case offered little opportunity for students to peer-assess each other’s work. In addition to the learning outcomes being unclear, the teacher only provided the students with a short amount of class time to discuss what they had written in their journals; they were asked to share their responses, not to assess each other’s work. One preservice teacher described this situation as hindering the students’ ability to share “glows and grows” with each other. Glows and grows was a strategy highlighted during the case discussion that focused on providing students with constructive feedback based on specific learning objectives. The feedback assesses both strengths and areas the student could improve. This data suggests that by applying such strategies and concepts to their post-case reflections, many of the preservice teachers have gained insight from the cases and the case discussions to further their knowledge of formative assessment.

4.4.3 Pre/post case question eight: How would you incorporate additional self- and peer-assessment opportunities?

Pre/post case question eight asks the preservice teachers to determine what additional types of self- and peer-assessment opportunities could be implemented within the case. From the preservice teachers’ pre/post case data two major themes emerged (Table 4.10). The preservice teachers’ reflections were categorized under the following themes: the implementation of additional work and the implementation of formative assessment strategies. In Table 4.10, under the two themes is a more detailed description of the preservice teachers’ responses. These responses will be reported and discussed in this section.
Table 4.1

Summary of Preservice Teachers’ Responses to Pre/Post Case Question Eight

<table>
<thead>
<tr>
<th>Additional Self- and Peer-Assessment Opportunities</th>
<th># of PST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional Work</strong></td>
<td></td>
</tr>
<tr>
<td>Share work with peers for correction and validation</td>
<td>8 (6S, 2T)</td>
</tr>
<tr>
<td>Ask students to do more reflection</td>
<td>7 (3S, 4T)</td>
</tr>
<tr>
<td>Discussion groups for student and teacher to check for understanding</td>
<td>4 (1S, 3T)</td>
</tr>
<tr>
<td>Additional general classroom assignments described</td>
<td>4 (3S, 1A)</td>
</tr>
<tr>
<td>Students should explain their reasoning</td>
<td>2 (S)</td>
</tr>
<tr>
<td>Provide explicit instruction/modeling for students</td>
<td>2 (T)</td>
</tr>
<tr>
<td><strong>Formative Assessments</strong></td>
<td></td>
</tr>
<tr>
<td>Share work with peers for correction and validation</td>
<td>6 (5S, 1T)</td>
</tr>
<tr>
<td>Providing individual feedback</td>
<td>6 (2S, 4T)</td>
</tr>
<tr>
<td>Additional formative strategies described</td>
<td>5 (3S, 2T)</td>
</tr>
<tr>
<td>Focus on learning objectives</td>
<td>4 (1S, 3T)</td>
</tr>
</tbody>
</table>

4.4.3.1 Additional work

When asked to describe additional self- or peer-assessment opportunities, many of the preservice teachers described lesson activities that provided additional opportunities for students to practice skills or procedures. Many of the examples, however, simply provided additional descriptions to an activity that was already presented in the case. For example, one preservice teacher stated,

I would give students the opportunity to write a journal entry at the end of each day. This would allow students to see the information that they are missing and ask questions that they may have. This would also work as a review on the information that they discovered that day.

Other activities were different from those presented in the case and were meant to take the place of the case activities. For example, one preservice teacher suggested that, “I would have them write a journal entry and have the students peer review. They would also create a poster of their findings. For individual [self-assessment] they could answer
more thorough questions.” Both of these preservice teachers’ reflections were examples of suggested activities to incorporate more self- and peer-assessment opportunities; however, both types of activities lacked an adequate description of why they would qualify as a self- or peer-assessment.

One of the larger categories under “additional work” described how sharing and comparing work with peers helped incorporate more assessment within the lesson. This is represented by the following preservice teacher’s reflection. She wrote,

I would have students rotate from table to table and write down their observations of the fossil boxes that are at each one. Then, they can compare to their neighbors and see what things they had in common and what things were different.

In terms of addressing the issue of reflection, one preservice teacher was coded as shifting towards the acknowledgement of formative assessment. In her pre-case reflection she wrote,

More group and individual assessment would be maybe having each table of student create their own fossil with clay and provide clues to what animal it is. Then as a group each table would get a student created fossil and the clues and have to figure out what they think it is.

The activity in this description may be engaging for the students, but it does not address the actual learning objective for the lesson. In her post-case reflection, she stated,

I feel like there wasn't any time spent on reflecting...You could have a KWL chart in which they start with what they know at the beginning and then fill the learned part after the lesson. This is a great self-assessment tool.

The pre-case response focused on changing the lesson activity while the post-case response focused on implementing more reflective practices to help students self-assess their level of understanding.
The ultimate goal of self- and peer-assessment is for the students to check their level of understanding. Four preservice teachers specifically described this process within their pre/post case reflections. Several preservice teachers were coded as having views that shifted towards the acknowledgment of formative assessment. These views can be represented by one preservice teacher’s reflection. In her pre-case reflection she simply stated, “I would provide time for students to be able to ask questions throughout the lesson.” Within the pre/post case, the amount of time provided for students to ask questions was never identified as an issue. In her post-case reflection, the preservice teacher identified different strategies to better incorporate peer-assessments. She added,

I would incorporate more student-based learning activities. A good peer assessment would be something that we learned in class called glows and grows. After working with a partner or small group have each member assess each other with what they liked and what can be worked on.

The preservice teacher focuses on shifting the teacher-centered case lesson to a more student-centered lesson as well as incorporates a peer-assessment activity that was highlighted in the preservice teachers’ class discussion of the case.

When asked to describe additional opportunities for self- or peer-assessment, four of the preservice teachers’ reflections were coded as providing general descriptions of case activities. For example, one preservice teacher stated, “I would incorporate more peer-assessment that may be beneficial, such as working as small groups to solve a question about fossils, or creating questions as a group to answer.” These statements offer little description as to how the activities would indeed promote self- or peer-assessment. One preservice teacher was coded as having views that shifted away from the acknowledgment of formative assessment. Her pre-case reflection did provide description
as to how the activities would indeed promote self- or peer-assessment; however, her post-case reflection did not. She stated in her pre-case reflection,

For self-assessment on the first day, the students could complete a concept map about what they learned about fossils and how they are found. Then, Ms. Miller could conduct a short, whole class review about the material and the students could check to see what they did/did not include on their concept map. To self-assess for the journal reflections, the teacher could have read through each question to facilitate a whole class discussion and the student could fill in any information they were missing and make stars next to information they did include.

The preservice teacher includes the concept map activity, which is often used in the self-assessment process. In addition, she describes how the teacher could use the students’ journaling responses to better address any conceptual gaps in knowledge. In her post-case reflection, however, the preservice teacher only describes new activities the students could complete. She states,

I would use worksheets, graphics, or poster projects where the students would need to define what a fossil is and they would need to describe what about the fossil that helps scientists to know about past environments based on the fossils (the depth they are buried) and why.

One aspect of the peer-assessment process that was not often found in preservice teachers’ reflections was the mention of peer-assessment instruction. Without instruction on how to provide appropriate peer feedback, the peer-assessment process is often reduced into group work activities. This issue is exemplified in one of the preservice teacher’s pre- and post-case reflections. In her pre-case reflection, she stated,

In terms of peer-assessment I believe the teacher could have done more. Specifically, instead of having the students perform two journal activities she could have asked them to partner up and discuss the questions they would have otherwise wrote about. Including a balanced variety is important when utilizing assessment in any classroom. Ms. Miller, as stated, could have included more socialized methods of assessment as opposed to the written or recorded methods.
The preservice teacher is describing an activity in which the students discuss, rather than assess, their journal entries. In her post-case reflection, the preservice teacher stated,

Honestly, I would provide more guided dialogue. I think that the students were given the opportunity, however they were not given much direction on how to move forward with peer-assessment. Additionally, I think that it would be better to model these behaviors for my students. I would show them how to properly evaluate a peer, the types of questions to consider, and various strategies they could use.

This preservice teacher was coded as having views that shifted towards acknowledging formative assessment. She identified the need for peer-assessment instruction and modeling in order for the case students to fully understand what the assessment process entailed. This concept was discussed in the preservice teachers’ method course during the self- and peer-assessment case.

4.4.3.2 Formative assessment

Of the 37 preservice teachers who participated in this study, 21 included some description of the formative assessment processes within their pre/post case reflections. These processes were broken down into eight different categories. The largest category included descriptions that focused on peers sharing work for the purpose of correcting or validating conceptual understandings as represented in each other’s work. A common reflection included the following statement: “I would incorporate more peer-assessment by adding something in the final class. Where students could make comments and their peers journals and add to answers they may have given instead of simply discuss answers.” Although this type of description may not address all that is involved in
adequately peer-assessing student work, the idea of moving away from simply sharing answers is an example of moving towards a more formative activity. One preservice teacher was coded as shifting towards the acknowledgement of formative assessment. In her pre-case reflection, she described the use of summative assessments. She stated, “The only thing I may have done differently is to give the students a written test after the class discussion of what they have learned, so the teacher can better see if the students learned the objectives of the lesson.” Not only did this preservice teacher describe the use of a summative end-of-unit test, but she also described the purpose of this test as one that would benefit the teacher. In her post-case response, the preservice teacher’s described a more formative approach. She stated, “I would incorporate more peer assessing by having the students switch journals with their peers and reading and correcting their answers. These would help the students better.” The focus shifted to a more student-centered approach to assessing conceptual understanding.

Proving an opportunity for peers to read and comment on student work is an important step in the peer-assessment process. Just as important is providing the students with specific feedback to help guide their learning process. This idea was captured in several preservice teachers’ pre/post case reflections. For example, one preservice teacher wrote, “One way peers could have assessed some ones work was looking at the story from the first day and providing feedback to the individual.” The preservice teacher identified an activity within the case and suggested a way to improve the assessment process. Similarly, another preservice teacher wrote, “I would provide written and oral discussions for small group and whole group assessment to check for student
understanding, as well as [provide] individual feedback on student journal entries and multiple-choice tests.” In these examples, the preservice teachers have identified the need for individualized feedback. Just as important as providing the students with direction for improvement is providing students with the opportunity to use this information to improve their level of understanding. Several preservice teachers whose views both shifted towards the acknowledgement of formative assessment captured this idea. In her pre-case reflection, one preservice teacher wrote, “To incorporate better peer and self-assessment opportunities I would have students write in their journals and check for understanding by reading each journal. I would then have a whole group discussion about the questions so students can share and check their work.” Although this could be a beneficial start to the self- and peer-assessment process, the preservice teacher extended her description in her post-case reflection stating,

In the case of the self-assessment I would give students feedback on their journal answers as a whole group and allow students an opportunity to correct any misunderstandings. I would also use the sheet they wrote about what they still had questions on, and have students answer their questions to see where they are.

Another preservice teacher included similar views in her post-case reflection stating,

I would also mark which questions the students got incorrect on their questions. The students would then get an opportunity to fix their work...This form of self-assessment allows students to see where they are and where they should be in the lesson.

In addition to the suggestion of proving an opportunity for students to use feedback to help guide improvements in learning, several preservice teachers suggested other formative strategies to increase student understanding. For example, one preservice teacher wrote,
For better self-assessment, I would give a short quiz, possibly not graded because it is a way for me to see where my students understanding is instead of penalizing them if they are so confused - this quiz would be in the middle of the lesson or would replace some assessment.

The key points to address here are the use of quizzes as a non-graded tool to help students identify what concepts may still need clarification and the placement of the quiz in the middle of the lesson when learning is still the focus. Two other preservice teachers described formative strategies; both had views that shifted towards the acknowledgement of formative assessment. In her pre-case reflection, the first preservice teacher wrote, “I would increase more self-assessments by having the students individually do an end of the unit activity.” There is no description as to how this activity would improve the self-assessment process. In addition, the placement of the activity at the end of the lesson indicates a more summative use of the data. In her post-case reflection, however, the preservice teacher stated,

I would have the students self assess themselves daily by each of them doing an exit slip or a reflection poster or a worksheet to turn and at the end of each day...I would incorporate more self and peer assessment opportunities in various ways. I would have the students do more exit slips or answer more questions for self-assessment. I would also have them reflect each day in their science journals on their understanding of the lesson.

Although the description does not provide specifics as to how these daily reflections relate to the specific learning objectives for the unit, the preservice teacher has shifted to a more formative view of classroom assessment. Another preservice teacher also demonstrated a shift from a summative to a formative view of assessment. Her pre-case reflection stated,
I really liked the set-up of this lesson. The only thing I may have done differently is to give the students a written test after the class discussion of what they have learned, so the teacher can better see if the students learned the objectives of the lesson.

Again, the assessment activities are summative in nature and done for the purpose of providing the teacher with student data. In her post-case reflection, the preservice teacher wrote,

I would incorporate more self-assessing by having the students correct their own work and their reflections... These would help the students better learn the objectives that Ms. Miller expected the students to know by the end of the lesson.

Although this is not a complete description of the self-assessment process, the preservice teacher has shifted her view to include a more student-centered approach in which she highlighted the connection between the lesson activities and the objectives they encompass.

Alignment between lesson objectives and lesson activities is a vital part of the formative assessment process. Several preservice teachers highlighted this connection within their case reflections. Several preservice teachers’ views shifted towards the acknowledgment of formative assessment. For example, in her pre-case reflection one preservice teacher wrote,

More group work would naturally lead to more self-assessment opportunities. It might help to fill out papers about what they still want to know at the end of every lesson to allow them more time to think about their own understanding.

The preservice teacher did not provide any rationale for her statement linking group work to self-assessment. In addition, providing more time for students to self-assess may not be beneficial if alignment and feedback are not part of the assessment process. The preservice teacher addresses this in her post-case response by stating,
I would change the teacher's feedback to be *more meaningful* to the students by making it a graded assignment that checks for student *understanding of the objectives*. I would also change the discussions about fossils from teacher led ones into *peer-to-peer discussions* with teacher guidance to ensure that students come to the correct conclusions.

The preservice teacher suggested the use of graded assignments, which is normally viewed as a summative assessment; however, the preservice teacher described the purpose of the graded assignment as one that helped students check their conceptual understanding based on the learning objectives. Again, I think this is not a perfect description of the self-assessment process, but it does represent a shift towards appropriate assessment practices. Another preservice teacher provided more detail in her post-case reflection, describing the role of learning objectives throughout the entire learning process. She stated,

> A big component to addressing self and peer assessment opportunities lies in *reworking the objectives*. I am still not convinced that the students understood what they were supposed to be learning. I would have made the objectives *manageable and measurable* and *posted them* on the board at the start of each lesson. I may have had the students put the objectives in their own words and write them in their journals, this way they would have the *objectives with them at all times*. This activity would have ensured that they understood what was being asked of them. After creating effective objectives, I would have *taiored my assessments based solely off of them*. Journal writes are a good way to self-assess, but my questions would relate to the objectives. In addition, I would provide the students with *feedback* regarding their responses. We would also have a short class discussion the next day where students could share responses or ask questions *based upon* their responses.

This response describes the whole process involved in self- or peer-assessment: starting with measureable learning objectives, followed by assessment alignment, feedback, and time for using feedback to improve student understanding.
4.4.4 Discussion: Question eight

Pre/post case question eight asked the preservice teachers to determine what additional types of self- and peer-assessment opportunities could be implemented within the case. As with the other case questions, a few of the preservice teachers’ views did not change between their pre- and post-case reflections. For some of the preservice teachers, the post-case reflections described “more of the same” type of activity previously described in the pre/post case. For example, some preservice teachers reiterated the same type of activities even though they were poor examples of self- or peer-assessment. Others suggested new activities (e.g. creating a poster or answering more thorough questions), but these offered no improvement on the assessment process. Some preservice teachers still suggested that group work equated to peer-assessment; comparing answers with a group member was the same as assessing a peer’s work for accuracy. With all of this said, there were subtle shifts between pre- and post-case reflections that were noticeable. Preservice teachers, who at first described the act of sharing answers with a group member as a method of peer-assessment, included a component of discussion in their post-case reflection. When sharing answers, students are usually looking for right or wrong answers, not asking why a student included certain ideas within his answer. Discussion can promote this type of inquiry between peers. This is an example of a small shift towards better understanding the peer-assessment process. Other preservice teachers demonstrated slightly stronger shifts towards the acknowledgment of formative assessment. These preservice teachers included self- and peer-assessment strategies (e.g. KWL charts and “grows and glows”) that were discussed in the preservice teachers’
methods class. Some preservice teachers demonstrated very strong shifts in acknowledging formative assessment when they tied previously discussed formative assessment methods in with the process of peer- and self-assessment. This include the need for the students to assess based on specific criteria (which in turn are based on explicit learning objectives) and then from this criteria offer constructive feedback in which the peer can use to help improve his or her understanding.

In addressing my first research question, the data supports that the implementation of the formative assessment cases did influence preservice teachers’ knowledge of formative assessment. In their post-case reflections, 22 of the preservice teachers modified their views to reflect a better understanding of the self- and peer-assessment process. The modifications included ideas or concepts taken directly from the case studies (e.g. using the explicit learning objectives as criteria for peer- and self-assessment) and other times the modifications came from something that was referenced during the case discussion (e.g. providing students with instruction on how to peer-assess and then modeling this process for them).

In addressing my second research question, the data suggests that specific characteristics can be identified within the preservice teachers’ reflection that suggests learning has occurred. Data supports that after reading and discussing the last case in the preservice teachers’ methods course, the preservice teachers began to question the lack of formative assessment concepts and strategies within the pre/post case. At first, many preservice teachers were satisfied that group and individual work led to adequate peer- and self-assessment opportunities, but after reading and discussing the fourth case, the
preservice teachers began to question the appropriateness of the assessment processes presented in the pre/post case. This led preservice teachers to begin to apply formative assessment concepts and strategies to their own case reflections. For example, one of the bigger challenges within the formative assessment process is getting preservice teachers to recognize that assessing students is not enough to improve student learning; all of the formative assessment characteristics must be in place. These preservice teachers identified the need for: objectives that were measureable and manageable, alignment between the learning objectives and the lesson activities, feedback based on the objectives, and opportunities for students to use the feedback to improve learning. These were the types of formative assessment concepts represented in the cases and discussed during each of the class case discussions. The questioning and application of appropriate self- and peer-assessment methods suggests that the preservice teachers gained insight from the cases and the case discussions to further their knowledge of formative assessment.
CHAPTER 5

CONCLUSIONS, IMPLICATIONS, STRENGTHS AND LIMITATIONS, AND FUTURE WORK

5.1 Conclusions

Formative assessment has demonstrated powerful improvements in student motivation and learning (Black & Wiliam, 1998b; Wiggins, 1998) as well as influential effects on the nature of classroom instruction (McMillan, 2002). To successfully implement formative assessment, teachers must make learning goals explicit, assess these goals in an accurate and timely fashion, and then use the assessment data to inform instruction and improve student learning (Stiggins, 1999). Improving the process of student learning involves continuous teacher-student interactions. Teachers facilitate the feedback cycle by gathering student data, scaffolding instruction based on the collected data, and perhaps most importantly, offering appropriate opportunities for students to use guided feedback to improve their learning (Black, Harrison, Lee, Marshall, & Wiliam, 2004). Students are asked to use this scaffolded feedback to further guide their learning.

The process of formative assessment is neither straightforward, nor do many preservice teachers have personal or professional experience with the formative assessment process. To add to this complexity, the topic of formative assessment in preservice education has been severely neglected (Bond, Roeber, & Branskamp, 1997; Stiggins, 2001). Ideally, preservice teachers should be taught how to assess students in the context of the “real-world” classroom; however, preservice teachers often have minimal pedagogical experience, so the skills needed to accurately make such
professional judgments in the classroom are often lacking. Teacher educators, therefore, should model the formative process for their students as well as intertwine this process throughout the curriculum to demonstrate the prevalent nature of formative assessment in teaching and learning (Buck & Trauth-Nare, 2009; Buck, et al., 2010; Grimmett, 1988; Shulman & Colbert, 1989; Volkmann, 2000). In addition, preservice teachers should be provided an opportunity to critically reflect (Grimmett, 1988; Shulman & Colbert, 1989; Volkmann, 2000) on the use of formative assessment in the classroom; this can be done by using peer and teacher feedback to help advance preservice teachers’ use and understanding (Hughes & Large, 1993; Orsmond, Merry, & Callaghan, 2004; Orsmond, Merry, & Reiling, 1996). The process of reflection offers preservice teachers an opportunity to assess their understanding in light of class discussion and feedback.

Preservice teachers can benefit from a method of instruction that includes an introduction to the classroom setting, as well as modeling, discussion, and instruction on how the formative assessment process exists within the teaching and learning environment. Schön (1987) argues that these skills can be developed through case reflection because cases offer examples that provide students with an opportunity to grapple with real situations they will face in their professional careers. Merseth (1991a) states that cases can help preservice teachers develop fundamental skills necessary for professional success, as well as provide opportunities to learn from different experiences. These skills and experiences include: critical analysis and problem solving skills, providing opportunities for reflective practice, exposing students to unfamiliar teaching settings and context, and creating an active learning environment.
Using case methodology can provide a type of instruction suitable for the problems faced by preservice teachers. The purpose of this study was to investigate the effect case methodology had on preservice teachers’ understanding and use of formative assessment in the context of a science classroom. In doing so, I set out to answer the following research questions:

1. To what extent does the implementation of formative assessment cases in methods instruction influence preservice elementary science teachers’ knowledge of formative assessment?

2. What descriptive characteristics change between the preservice teachers’ pre-case written reflection and post-case written reflection that would demonstrate learning had occurred?

5.1.1 Addressing the research questions

In addressing the results of this study, data from eight case questions were sorted into three main categories; preservice teachers’ views that either shifted away from the acknowledgement of formative assessment between pre- and post-case reflections, views that remained the same between pre- and post-case reflections, or views that shifted towards the acknowledgement of formative assessment between pre- and post-case reflections. It is important to note that the intent of this research was not to label the preservice teachers’ views as right or wrong, but to identify any shifts, no matter how small, which may have occurred in their fundamental understanding of formative assessment. Figure 5.1 summarizes these shifts for each of the pre/post case questions.
The study included 37 preservice teacher participants. For some of the case questions, preservice teachers provided more than one type of answer. In doing so, there were more than 37 responses reported. For other case questions, not all 37 preservice teachers addressed the question within their reflection, causing less than 37 responses to be reported. Due to this fact, and for ease of reference, the data is displayed in terms of percentages.

![Change Between Pre/Post-Case Reflections](image)

*Figure 5.1. Preservice Teacher Change Between Pre/Post-Case Reflections for Pre/Post Case Questions*

In addressing the first research question, the data supports that case implementation did influence preservice teachers’ knowledge of formative assessment. In
between the pre- and post-case, preservice teachers were given four cases to read and reflect on, as well as approximately 25 minutes of class time to discuss their reflections for all of the questions associated with each of the cases. In terms of the recommended time of one hour, at minimum, allotted for case discussion (Miller & Kantrov, 1998), this intervention occurred within a relatively short amount of time. With this being said, shifts in the acknowledgment of formative assessment between pre- and post-case reflections were still common. These shifts help support the argument that case implementation, even with shorter case discussion, can influence preservice teachers’ knowledge of formative assessment.

Approximately 26% of preservice teachers’ reflections demonstrated a shift towards the acknowledgement of formative assessment. Preservice teachers placed in this category had pre-case descriptions that either did not contain any information regarding formative assessment or contained inaccurate information regarding the use of formative assessment. The post-case reflections were revised to include accurate formative assessment concepts that were either represented within one of the four individual cases assigned between the pre/post-case or discussed during the preservice teachers’ method course. For the preservice teachers who modified their ideas to reflect the themes that were represented within the cases, these ideas included: creating measurable learning objectives; making learning objective explicit and physically visible to the students; using appropriate methods to collect evidence of learning; providing opportunities for students to self- and peer-assess; creating student-centered learning environments; using feedback to modify instruction and help guide student learning; and using explicit learning
objectives as criteria for self- and peer-assessment. For the preservice teachers who modified their reflections to include specific ideas or examples taken directly from the case discussions, these ideas and examples included: switching from a teacher-centered to a student-centered classroom; viewing learning objectives as a target to “hit” when self-assessing; reworking the learning objectives to include more student-directed language, such as “students will be able to…”; acknowledging that discussion does not necessarily equate to peer-assessment; and providing students with instruction on how to properly peer-assess. Shifting views, from pre- to post-case reflections, towards more inclusion of accurate formative assessment processes provides evidence to help support the claim that case implementation did influence preservice teachers’ knowledge of formative assessment.

Approximately 69% of preservice teachers’ reflections remained the same between pre- and post-case reflections. At first glance, this may appear to indicate that case implementation did not influence preservice teachers’ knowledge of formative assessment; however, this is not an accurate assumption. For some preservice teachers, their overall assessment of how formative assessment was used within the case did remain fairly consistent between pre- and post-case reflections. These views included both accurate and inaccurate ideas regarding formative assessment. Again, the intent of this research was not to label the preservice teachers’ views as right or wrong, but to identify any shifts that may have occurred in their understanding of formative assessment. For many preservice teachers, however, even though their views were coded as remaining the same, their post-case reflection included additional information to help
support their claim. This was demonstrated in two main ways: either the amount of detail within their post-reflection increased or the preservice teacher applied examples or ideas from previous cases and case discussions. This additional acknowledgement or clarification within the post-case reflection is important to note because it provides support to the claim that case methodology influences students knowledge of formative assessment practices. So if the intent of this research is to look for evidence to support case methodology’s involvement in improving formative assessment knowledge and implementation, and this is done through identifying shifts in preservice teachers’ reflections, why are the preservice teachers’ who have added additional formative assessment information into their post-case reflection not coded as shifting towards the acknowledgment of formative assessment? These preservice teachers overarching view of the use of formative assessment within the cases remained the same. They included more information or examples to help support their view; they did not change their view.

Approximately 5% of preservice teachers’ reflections demonstrated a shift away from the acknowledgement of formative assessment. For all pre-case reflections, the preservice teachers supported some aspect of formative assessment. The post-case reflection changed to either contradict the previous reflection or to reflect on an entirely new aspect that did not represent knowledge of formative assessment. The data supports that this shift occurred for two main reasons. First, several preservice teachers described the case’s lack of learning objectives as appropriate because the case lesson was merely an “introduction” to the unit. Second, other preservice teachers supported the act of completing an assignment as evidence the students understood the material. Both views
are incorrect and certainly need to be addressed. It is unclear how students came to these conclusions. Further investigation is needed in this area.

The second research question was focused on identifying changes in the descriptive characteristics between the preservice teachers’ pre- and post-case written reflections that would demonstrate learning had occurred. Identifying when learning has occurred can be a tricky endeavor; however, identifying the types of changes that occurred throughout the study between pre- and post-case reflections, can provide important data to help identify learning. As described earlier, the purpose of providing preservice teachers with case methodological experiences was to help foster the skills of teaching with formative assessment, in a context that was applicable to a real classroom setting. The preservice teachers read and reflected on cases, discussed their case reflections in class, and then answered post-case reflective questions. The post-case provided the preservice teachers’ with a different, yet comparable teaching context. The preservice teachers’ ability to transfer their knowledge to the post-case situation was important to note. The ability to transfer knowledge has been identified by the National Research Council (2000) as a skill possessed by more expert thinkers. The council stated,

Experts’ knowledge is connected and organized around important concepts (e.g., Newton’s second law of motion); it is “conditionalized” to specify the context in which it is applicable; it supports understanding and transfer (to other contexts) rather than only the ability to remember (p. 9).

The preservice teachers in this study are novice teachers, but their post-case data supports growth, or learning, in the skills needed to move towards a more expert-type of thinking. The data from the preservice teachers’ post-case reflections suggest the transfer of knowledge through several different actions. These actions include the evaluation and
questioning of formative assessment strategies used within the post-case, coupled with the application of formative assessment strategies and concepts to improve the teaching and learning represented in the post-case.

Comparing pre- and post-case reflections, the data supports a noted change in how the preservice teachers evaluated the case content. For many of the pre-case reflections, the preservice teachers were satisfied that the case students understood the concepts as they were addressed within the case instruction. Rationale provided for this statement included: the case teacher reiterated and summarized the main points at the conclusion of the case activity; the class activities reflected the overall theme of the lesson; and the lesson activities were entertaining. In terms of instruction, some of the preservice teachers also incorrectly noted that group and individual work equated to self- and peer-assessment. In addition, the preservice teachers focused heavily on how student data could be used to help inform teaching, with little to no mention of student benefits.

Within the post-case reflections, the preservice teachers began to evaluate the case content, question the lack of formative assessment concepts and strategies within the case, and apply formative assessment concepts and strategies within their own case descriptions. Many of the preservice teachers began to evaluate the case, acknowledging a lack of student involvement in the learning process. Several preservice teachers identified the lack of opportunities for students to determine their level of understanding. Many preservice teachers continued to describe how the teacher could benefit from the self-assessment process, but the preservice teachers also included how this student/teacher interaction could benefit the student. Evaluation of the post-case led many
preservice teachers to question the appropriateness of the assessment methods within the case lesson, and many identified areas in which assessment could have yielded more appropriate results. The preservice teachers also began to question the relationship between the activities and the learning objectives. In addition, the preservice teachers recognized the teacher’s role in providing appropriate formative assessment. Critically evaluating and questioning the teacher and students use of formative assessment within the case suggests preservice teachers growth in understanding the process of formative assessment.

Perhaps more powerful is the preservice teachers’ ability to apply previously discussed concepts and strategies to a new context within their post-case reflections. Strategies such as “glows and grows” and “I can” statements were either modeled within the cases or discussed during the preservice teachers’ methods course. Many preservice teachers applied these strategies to different, yet comparable situations within the post-case. In addition to applying specific strategies within their post-case reflections, the preservice teachers also applied some of the formative assessment characteristics. These preservice teachers identified the need for: objectives that were measureable and manageable; alignment between the learning objectives and the lesson activities; feedback based on the objectives; and opportunities for students to use the feedback to improve learning. These were the types of formative assessment concepts represented in the cases and discussed during each of the class case discussions. The evaluation, questioning, and application of appropriate formative assessment methods suggest that
the preservice teachers gained insight from the cases and the case discussions to further their knowledge of formative assessment.

5.2 Implications

Black and Wiliam (1998) demonstrated the effectiveness of formative assessment on student learning; however, Maclellan (2004) argued that preservice teachers commonly exhibit limited knowledge regarding assessment principles, which hinders their ability to utilize formative assessments. Modeling and intertwining the formative assessment process throughout the preservice teaching curriculum can help novice teachers understand the pervasive nature of formative assessment (Buck & Trauth-Nare, 2009; Buck, et al., 2010; Grimmett, 1988; Shulman & Colbert, 1989; Volkmann, 2000); however, Buck et al. (2010) identified a need for further research regarding the extent to which continuous exposure to formative assessment throughout preservice teachers’ educational program can affect the preservice teachers’ ability to utilize formative assessment in their own teaching. In addition to continuous exposure to formative assessment, preservice teachers should be provided an opportunity to critically reflect (Grimmett, 1988; Shulman & Colbert, 1989; Volkmann, 2000) on the use of formative assessment in the classroom, using peer and teacher feedback to help advance their use and understanding (Hughes & Large, 1993; Orsmond, Merry, & Callaghan, 2004; Orsmond, Merry, & Reiling, 1996).

Based on the elements of quality formative assessment (Assessment Reform Group, 2002; Black, Harrison, Lee, Marshall, & Wiliam, 2004; Stiggins, 1999) and
quality teaching (Grimmett, 1988; Shulman & Colbert, 1989; Volkmann, 2000), both have identified the act of modeling and reflection as key attributes for teacher success. Abell et al. (1998), Harrington (1995) and Levin (1995) argue that case based pedagogy can play an important role in enhancing preservice teachers’ ability to reflect on teaching and learning. Abell et al. and Harrington also suggested that case reflection allowed preservice teachers to examine and reflect on their own assumptions and beliefs of teaching and learning. Cases can provide a view into the classroom that many preservice teachers have yet to experience. Through these cases, formative instruction can be modeled. Explicit modeling, scaffolding, and guidance are key to increasing preservice teachers understanding and use of formative assessment (Buck & Trauth-Nare, 2009; Buck, et al., 2010).

The results gathered from this study further strengthen the existing literature on formative assessment instruction in preservice teacher education, and support the call for further attention of this issue both in the field and in research. Data from this study supports the advancement of preservice teachers’ acknowledgement of formative assessment and it’s use within the teaching and learning environment. Based on previous research, the data from this study supports the use of case methodology as a way of modeling and scaffolding the use of formative assessment processes in teaching and learning.
5.3 Strengths and Limitations

5.3.1 Strengths of case methodology

Case methodology has been successfully used as a primary teaching method in law, business and medical education (Garvin, 2003). In these disciplines, case method promotes challenging decision making situations (Kim et al., 2006), helps students apply the theory and principles taught at the university, develops diagnostic and persuasive skills required for effective teaching, and prepare students to be independent problem solvers (Garvin, 2003). Law, business, and medical disciplines utilize case method for different pedagogical outcomes; however, one outcome is similar. The disciplines all provide students with real-world, identifiable situations that encourage students to tie theory to practice, while simultaneously providing students with applicable learning situations in which they are able to build the skills they need as future professionals. “Time in the classroom must somehow translate directly into real-world activity: how to diagnose, decide, and act” (Garvin, 2003, p. 56).

When looking at case method in preservice teacher education, Niland (1956) points to three unique characteristics of case method that promote effective learning: the case material is real, lifelike, and applicable to the student; the case provides an opportunity for preservice students to practice making professional decisions; and the case method allows preservice teachers the opportunity to take part in their learning and to think analytically and constructively. I will highlight these three unique characteristics below.

First, many preservice teachers have limited K-12 classroom experiences. Their
university classes are often filled with theory or skill building, yet the preservice teachers have no prior experience in which to connect to these newly learned ideas. Case method can help to elevate some of these issues. With case method, the student reads the case and is transformed into the role of a teacher. This is beneficial because a majority of the preservice students experiences place them in the student role, with little emphasis on how a teacher thinks or deals with certain case situations. Niland (1956) states, “Thus because the raw material of instruction is concrete, specific, and personal, it is more easily visualized by the student” (p. 87). In addition, the case is told like a story, which most often peaks the preservice teachers interest. This “real-life” case may not be identical to something they will experience in the field, but it will give the preservice teacher a general idea of the types of situations they may have to deal with. In addition, through the case method process, preservice teachers will have the opportunity to engage in thoughtful discussion that can lay the foundation for how they may approach problems in the future.

Second, although the preservice teacher is not physically participating in the case story, they are asked to place themselves in the situation. What would they do in this particular situation? What case situations have led the preservice teacher to make this decision? Are they other reasonable solutions for this case? Dunn (1956) states, “The case method is a most satisfactory means of developing the student’s ability to act in situations, which combine personalities with facts. It does this by schooling him in inquiry and to analyze” (p. 95). Niland (1956) supported this method of thinking by stating,
The frequency with which he [the student] has to do this accustoms him to the decision-making process, including the exercise of his analytical and critical thinking and the exercise of his imagination. Thus he not only exercises his capacities daily and develops his skill but also develops self-confidence and willingness to accept responsibility (p. 88).

The case situations will not be identical to the situations the preservice teacher may have to deal with in the actual school setting; however, if the preservice teacher has experience in analyzing and critically thinking about the situation, he or she may also feel more comfortable in the role of the teacher who is expected to make such decisions. Merseth (1991) adds, “teaching is neither generic nor simplistic and therefore needs a medium that represents it accurately” (p. 17). In addition, Merseth states that cases help in “moving students toward greater sensitivity to context and uniqueness. The technique exposes learners to differing interpretations of complex situations and provides them an opportunity to examine and to rehearse the skills required of effective teachers” (p. 17).

This leads into the third characteristic. As limited with the lecture method of instruction, case method allows the preservice students to actively participate in the learning process (Shulman, 1996). With the helpful guidance of their instructor, preservice teachers are asked to first participate in reading, comprehending, analyzing, and solving problems posed within the case itself. The preservice teachers are asked to place themselves in the case characters positions. Then secondly, the preservice teachers are expected to participate in class discussions, sharing and defending their personal thoughts about the case situation, as well as learning how to assimilate or respectfully question other preservice teachers’ views. Merseth (1991) adds,

Moreover, to enter a case discussion, students must bring to bear prior knowledge and experience, as well as more personal feelings, dispositions, and values. These
characteristics afford a more thorough integration of self into the developing teacher role because participants articulate and explore their own beliefs and opinions about teaching (p. 18).

These discussions help provide a starting point in which preservice teachers can explicitly share their views, helping both instructors and beginning teachers work through inaccurate or unfamiliar notions of teaching (Feiman-Nemser & Buchmann, 1985).

Cases in education are not uncommon; however, the cases I have created are unique in that they focus on formative assessment. Although formative assessment is something that teachers do on a daily basis, this topic is often skimmed over in teacher education. Preservice teachers are often given case examples of classroom management or inquiry teaching, but they often do not have the opportunity to view formative assessment in the context of what it looks like in an actual teaching situation. My project, therefore, offers a unique contribution to the field of preservice education. Preservice teachers have been exposed to multiple cases in which the concept of formative assessment is not only explicit, but the classroom application and teacher/student response to using formative assessment is also demonstrated in a way that preservice teachers can analyze, discuss, and apply to their current teaching situations. Doyle (1990) states,

The students’ task in studying prototypes is not to find the right answer but to interpret the situation and understand the theoretical issues involved. Given that much of teachers’ knowledge is conditional and context-specific, multiple representations will be needed to help teachers develop the professional knowledge needed for practical reasoning about classroom tasks (p.13).
5.3.2 Limitations of case methodology

As with any type of pedagogical methodology, case method has potential limitations. Dunn (1956) argues that the case method is not utilized as much as other teaching pedagogies in higher educational settings because of the cost (e.g. time commitments), the skill and comfort level of the instructor, and the ease and affordability of the persistent and highly common lecture method. In addition, an argument can be made that case method is not used because of student related problems (McAninch, 1993; Shulman, 1992), which will be discussed below. In this section, I will highlight the most predominate limitations as cited in the case method literature as well as personally experienced during my research. These limitations incorporate the limitations cited by Dunn, McAninch, and Shulman, and can be chunked in to three main categories: issues with the case method format or process, problems encountered by the instructor (i.e. case facilitator), and problems encountered by the student.

5.3.2.1 Case limitation

With the implementation of case method comes several possible limitations. I will first focus on the issues that accompany the case in terms of the process of case method. The time commitment involved in using case method is rather large. This is due to the fact that, unlike a typical lecture method in which topics can be covered relatively quickly, topics within the case method pedagogy are discussed in detail over an extended period of time. Students and teachers express opinions and ask questions, both of which take instructional time. This is a major limitation stated not only in the literature, but also
expressed by the instructor of the course in which I implemented case method. As in most situations, courses often expect a large variety of concepts and theories to be covered by the end of the term. If case method is a relatively slow means of covering material (McAninch, 1993), other topics may need to be limited or eliminated from the course. This can be problematic for instructors, as the instructor I worked with confirmed on several occasions. Other issues, also related to time limitations, highlight particular problems with case format. First, due to the number of cases implemented during my research, the instructor was only able to provide approximately 30 minutes for class discussion for each of the cases. Students were expected to read and reflect on the case prior to class discussion, but this did not always occur. Secondly, for two of the four cases, the instructor stopped the discussion prior to addressing all the major points of the case. Even though students still had opinions and experiences to share, the instructor needed to move on in order to cover the course content for the day; the format for case discussion was altered due to the impending time strain.

5.3.2.2 Student limitations

The development of skills using the case method can be slow. It also assumes that students have a basic knowledge of facts and certain level of maturity, as well as the readiness to accept responsibility for their own learning (Niland, 1956). The process of case method is usually foreign to students. Many students are accustomed to sitting in class and being told what they need to learn, with minimal opportunities to analyze, interpret, and problem-solve solutions from the data presented in class. Case method is
meant to be a student-centered learning process. As with any student led instructional process, student engagement and willingness to participate is paramount in the success of the instruction (McAninch, 1993). If students are not critically thinking about the case problem, the case method of instruction can be ineffective. Even for the students who are fully engaged in the case method process, there are still some limitations. Actual classroom experiences are limited for many teacher education students. This often promotes overgeneralized conclusions to a particular case (Shulman, 1992). Memorable cases can be a highly useful tool for preservice teachers, as the students can think back to these cases when encountering similar situations in the classroom; however, the preservice teachers must acknowledge that not all solutions are appropriate or successful in every instance.

Student fatigue is another potential student limitation that may have occurred during the process of data collection. Due to the possible stresses of student life (e.g. a full load of classes, internship responsibilities, job responsibilities), students’ schedules may have been more flexible at the beginning of the semester when they completed their pre-case reflections. However, as the semester progressed, and as the homework load began to increase, it is possible that the pre-service teachers put less of an effort into reflecting on the post-case reflection questions.

Perhaps another limitation in regards to my own research was the inability to generalize the results from this student body to the overall preservice teacher community. This, however, is not unexpected. In fact, as stated earlier, qualitative data collection does not necessarily lend itself well to generalizability; and indeed this is not the purpose of
the project’s data collection. Creswell (2009) pointed out “the value of qualitative research lies in the particular description and themes developed in context of a specific site” (p. 193). This is not to say that we can’t conclude meaningful results, nor does it mean that we can’t broadly generalize the results we do observe (Yin, 2003). Regardless, the lack of generalizability may be seen as a limitation by many researchers.

5.3.2.3 Instructor limitations

Although the case method process encourages students to freely discuss case issues using Socratic dialogue, the instructor is still in control of the discussion (Williams, 1992). In fact, the methods in which the instructor chooses to facilitate case discussion, as well as the dialogue and questions the instructor prepares and executes with the students, has a great impact on case method success (Morgan, 1951). Due to the students’ experiences and perceptions, the instructors’ role can be challenging. As with any type of discussion-based instruction, the instructor can only plan a certain amount of questions and be prepared for a certain amount of student responses. The instructor must be skillful in quickly thinking about how unanticipated student responses can be utilized to not only inquire about why a student responded in such a manner, but how that idea ties in to the overall picture of the case (McAninch, 1993). Doyle (1990) stated, “What a case is and how it is used depends, that is, upon fundamental understandings of what teachers do and how they acquire the ability to carry out their work successfully” (p. 8). The instructor needs to recognize when student discussion is off track, but still beneficial to the topic, and when the discussion is veering away from the goal of the case (Miller & Kantrov,
1998). As part of my research methodology, I was not the person conducting the case discussions. For this reason, I prepared a facilitator’s guide for each case, as well as met with the instructor prior to each case to discuss the case goal and work out any confusions or conflicts. Although the instructor was a highly competent educator, she was not the researcher; therefore, a limitation in my research was the fact that I, as a silent observer, could not interject at any point during the case discussions. I believe this is the most significant limitation of my research.

5.3.3 Future work

The limitations from this research project have prompted many ideas and questions regarding future work. The main limitations from my dissertation research that need to be addressed in future work revolve around the conflict of time (in relationship to course content and allotted course time during the semester) and the limitation of implementing case method in another instructor’s course.

Instructors frequently struggle in covering the desired content in the amount of time allotted during the course. This was certainly the case with the instructor I was working with during my data collection. If a particular topic was discussed in more detail, and more time was taken out of each class to do so, the instructor felt that other concepts would need to be condensed. This problem ultimately led to an issue of reducing the time spent on certain case discussions. One question to be addressed in the future would be to examine the correlation between abbreviated case discussion and how that affects the quality and quantity of student discussion. How would the lack of instructor and peer
input, as well as the depth of topics or opinions covered during the discussion time, ultimately affect the quality of a student’s reflection? These issues have led me to question the feasibility of highlighting only one particular topic or concept within a case. Perhaps combining certain course content within the case may be a more beneficial learning experience for the student. For instance, if one of the goals in a particular course was to teach and model inquiry teaching, could a case focusing on using formative assessment within the context of an inquiry lesson be more time efficient for the instructor while remaining effective for the student?

The second limitation, implementing formative assessment cases in another instructor’s course, is also of great concern. The lack of formative assessment education in preservice teacher education courses is rather large. Whether the instructor merely glosses over the concept of formative assessment or the instructor is truly unfamiliar with how to teach the process and use of appropriate formative assessment, cases focusing on formative assessment can help bring this much needed real-world context to preservice teachers. With this stated, formative assessment “experts” cannot implement and discuss each of these cases with all of the preservice teachers around the country. So how can university instructors best utilize these cases? I believe the answer to this question is to create a facilitator’s guide to help instructors properly and adequately address the formative assessment issues within each of the cases. This, however, has already been done. As I stated in my methodology section, I created a facilitator’s guide for each of the cases. The instructor who administered the cases and facilitated the discussions had access to these guides. This has led me to question the depth and breath of information in
the facilitator’s guide. Does there need to be more detailed information, perhaps explicit research-based information, included in the guides or do the guides need to be simplified to accommodate for the minimal time instructors may have when reviewing the guide prior to case discussion? How does the instructor’s prior knowledge of formative assessment influence how and what they emphasize during case discussions? Lastly, how is the case discussion and emphasis on formative assessment affected by the instructor’s belief of the valued importance of formative assessment?

In addition to the two main limitations previously addressed, there are several ideas that would be of great interest to investigate in future work. First, it would be interesting to conduct a longitudinal study to determine the impact of the cases on the preservice teachers’ future use of formative assessment in classroom. This current study demonstrated the impact of the cases on preservice teachers’ knowledge of formative assessment; however, to follow through, it would be of great interest to investigate the extent to which the preservice teachers use formative assessment once they start their professional teaching careers. Do the preservice teachers implement the types of formative assessment processes that were exhibited, discussed, and reflected on within their case-based methodological instruction? Second, the data collected within this study are self-reflections, thoughts and ideas about implementing formative assessment in the classroom. Continuing with the reflective nature of the study, it would be interesting to obtain the preservice teachers’ view of how these cases have benefited their understanding and use of formative assessment in the process of teaching and learning. Do the preservice teachers feel that the cases were beneficial in helping them
contextualize formative assessment practices in a “real-world” classroom setting? How do the preservice teachers’ perceive their growth in formative assessment understanding between pre- to post-case reflection?
REFERENCES


Appendix A

Human Subjects Institutional Review Board Approval and Consent Form
Date: November 20, 2012

To: Bill Cobern, Principal Investigator
    Amy Bentz, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 12-11-20

This letter will serve as confirmation that your research project titled “Using Case Method to Explicitly Teach Formative Assessment in Preservice Teacher Education” has been approved under the exempt category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study”). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: November 20, 2013
Western Michigan University
Mallinson Institute for Science Education

Principal Investigator: Bill Cobern
Student Investigator: Amy Bentz
Title of Study: Using Case Method to Explicitly Teach Formative Assessment in Preservice Teacher Education

You have been invited to participate in a research project titled “Using Case Method to Explicitly Teach Formative Assessment in Preservice Teacher Education.” This project will serve as Amy Bentz’s dissertation requirement for her doctorate in Science Education. This consent document will explain the purpose of this research project and will go over all of the time commitments, the procedures used in the study, and the risks and benefits of participating in this research project. Please read this consent form carefully and completely and please ask any questions if you need more clarification.

What are we trying to find out in this study?
Formative assessment is an integral part of improving teaching and learning, yet it is often neglected in teacher education. In this study, we are trying to find out if using cases to facilitate formative assessment instruction is beneficial to preservice teachers. More specifically, we are interested in finding out if the act of discussing cases as an entire class helps preservice teachers better understand the process of formative assessment.

Who can participate in this study?
Any student enrolled in ED 4010, Teaching Elementary School Science, during the Spring 2013 semester can participate in this study.

Where will this study take place?
The cases will be completed as part of your ED 4010 coursework and all data collection will occur within your ED 4010 classroom.

What is the time commitment for participating in this study?
The cases are part of your ED 4010 coursework. There will be no additional time commitment other than the time you normally spend in class and preparing for class. Your instructor will assign six cases over a six week period of time. If you choose to participate in our research, you will allow us to read your case reflections. Once the six week period of time is over, your commitment in the study will end.

What will you be asked to do if you choose to participate in this study?
Each case will come with a set of reflection questions. In preparation for class, your ED 4010 instructor will ask you to read and reflect on the case. During class, your instructor
will facilitate a whole-class discussion. After the discussion has occurred, you will be
given the opportunity to add to your reflection. All of these activities are part of your
normal ED 4010 coursework. If you choose to participate in this study, you will allow the
researchers to view your reflections and use this data in their study. Each class discussion
may offer alternative perspectives to case situations; ones you may not have took into
consideration. Discussions are an important part of case learning and will therefore be
videotaped. The video will not single out any student, rather it will be used to record to
ideas that are being expressed in class. The video will be accessed for reference purposes,
if preservice teachers' ideas in the case reflections need clarification.

What information is being measured during the study?
We are interested in learning how the implementation of formative assessment cases in
methods instruction influence preservice elementary science teachers' knowledge of
formative assessment. In addition, we are also interested in what descriptive
characteristics change between the preservice teachers' pre-case written reflection and
post-case written reflection that would demonstrate learning had occurred.

What are the risks of participating in this study and how will these risks be
minimized?
As in all research, there may be unforeseen risks involved in this project; however, I see
no risks involved in your participation of this project other than the apprehension of
allowing other people to read your case reflections. In addition, students may feel anxious
being videotaped during class discussion. To reduce any feelings of discomfort, the video
will focus on the class as a whole during discussion and never focus in on one student. In
addition, the video will never be viewed by anyone other than the researchers.

What are the benefits of participating in this study?
Your participation in this process may help us to understand and improve further pre-
service teacher instruction at WMU.

Are there any costs associated with participating in this study?
There are no costs associated with participating in this study.

Is there any compensation for participating in this study?
Students who participate for the entire six-week period of time and turn in all six case
reflections for analysis will be automatically entered into a drawing for a $25 gift card to
either Meijer or iTunes. Six gift cards will be given out per ED 4010 section.

Who will have access to the information collected during this study?
As this is part of your ED 4010 coursework, your ED 4010 instructor will be collecting
your case reflection and facilitating a class discussion regarding each case. If you choose
to participate in our study, only the student investigator (Amy Bentz) and the principal investigator (Bill Cobern) will have access to the information collected during this study.

What if you want to stop participating in this study?
You can choose to stop participating in the study at anytime for any reason. You will not suffer any prejudice or penalty by your decision to stop your participation. You will experience NO consequences either academically or personally if you choose to withdraw from this study.

The investigator can also decide to stop your participation in the study without your consent.

Should you have any questions prior to or during the study, you can contact the primary investigator, Dr. Bill Cobern (bill.cobern@wmich.edu) or student investigator Amy Bentz (amy.e.bentz@wmich.edu). You may also contact the Chair, Human Subjects Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298 if questions arise during the course of the study.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

I have read this informed consent document. The risks and benefits have been explained to me. I agree to take part in this study.

Please Print Your Name

Participant’s signature

Date

Consent for Being Videotaped During Class:
Please check a box below that indicates whether or not you agree to be videotaped during whole-class discussions. The video will be used for research purposes only and will only be viewed by the researchers themselves. You may opt out of being videotaped during class discussions, but still participate in the study.

☐ I agree to be videotaped

☐ I do NOT agree to be videotaped
Appendix B

Pre- and Post-Case with Facilitator’s Post-Case Guide
Pre/Post Case:

Ms. Miller is starting a unit on fossils with her 4th-grade students. Over the 3-day lesson Ms. Miller plans to cover the following objectives: to introduce the idea of fossils and how fossils help scientists understand past environments, plants, and animals.

Students are seated at tables and each table has four students. Ms. Miller has placed several fossils on each table for the students to touch. She encourages the students to talk within their groups about the fossils. After the students have had an opportunity to talk in their groups, Ms. Miller describes what a fossil is and how the fossils at their desks were formed.

From past teaching experience and from the research literature, Ms. Miller knows that many students have a common misconception that all fossils were created at the same time in history. To help students understand the concept of time and space, Ms. Miller hands out a picture of animal tracks to each student:

She then asks her students to create a story that matches what they see on the track picture. After enough time is provided, Ms. Miller asks for a volunteer to describe his story. Ms. Miller’s point in doing this activity was for students to understand that animals (and plants) can exist in the same area at different times. To make sure the students really understood the point of the lesson, Ms. Miller summarizes that different events happen over time, and fossils give us clues as to which animal or plant existed, as well as what type of environments the fossil animal or plant lived.

The second day, Ms. Miller starts the science lesson with a multiple-choice question for the students to answer about fossils. The students put their heads on their desks to cover their eyes and are then asked to answer the question by raising their hand when the “correct” answer is read. Ms. Miller’s intent is to determine her students’ level of understanding based on the previous day’s lesson on fossils. Ms. Miller then continues on with the lesson.
Shoeboxes have been placed at each table. Each shoebox is filled with a few buried fossils. The students are instructed to think about the classroom as an open field in nature and each shoe box represents an area where they (a team of paleontologists) are digging for fossils. Their job is to determine what the fossils can tell them about this field’s past environment. The students are asked to use the tools they have at their desks to dig up the fossils. As they find each fossil, the students are asked to record where the fossil was found in their box and how deep in the “ground” the fossil was buried relative to the other fossils. This information is discussed in class. Ms. Miller points out that similar fossils are grouped together throughout the room. For example, a particular plant fossil is only found in the shoeboxes of students sitting in the back right corner of the classroom. She then leads a discussion about what this could tell scientists about the plants and animals that once lived in this area. Ms. Miller continues the discussion by telling students how fossils found at different depths could indicate different ages. She references back to the footprint activity from the previous day.

Before they leave for recess, Ms. Miller asks her students to reflect on the objective for the day. On a piece of paper, Ms. Miller tells her students to write down three things they have learned, two things they still have questions about, and one thing that would like to talk about during tomorrow’s lesson.

The third day the students walk into the room and find shoeboxes placed under their table, directly below the spot on the table where the shoeboxes were placed the previous day. Ms. Miller explains that the paleontologists have been hard at work all night and have dug a very deep “hole.” The students are asked to investigate their new shoeboxes filled with fossils. After digging through their boxes in the same manner they did the previous day, Ms. Miller gathers students’ data about the type and depth of fossils found around the room. Ms. Miller enters the data into a 3-D software program that allows students to visually see the different layers of fossils all around the room. Ms. Miller walks the students through the data, noting that some of the fossils from the previous day are no longer showing up. New fossils are showing up and other fossils’ features have slightly changed from the fossils found the day before. In addition, Ms. Miller points out that similar fossils are grouped together as opposed to scattered around the room. What does all this mean? In addition, Ms. Miller notes that some fossils have features that indicate they were aquatic and others have features that indicate they probably lived on land. Ms. Miller then concludes by talking about how the environment may be different from the environment investigated on the previous day when the “hole” wasn't very deep; depending on the depth, some locations were once aquatic environments and then terrestrial environments. How could this be correct? What happened to certain fossils as the students dug deeper into the “hole?”

Ms. Miller asks her students to reflect on this experience in their science journals. The students are given several questions to answers. The journals are collected at the end of the science lesson. Ms. Miller reads them after school to make sure everyone has
completed the assignment. She puts a star at the top of the page of the students who answered all of the questions and an “x” for the students who did not answer all of the questions.

As a closing activity for the day, Ms. Miller gives her students a copy of a cartoon drawing of the fossils located under the school. There are different types of fossils at different depths. Ms.

Miller asks the students to circle the fossils that are the oldest and put an “x” through the fossils that are the youngest.

The final class period for this lesson began with Ms. Miller handing back the students’ journals from the previous day. The students were asked to share their responses with their table mates before putting their journals away.

As a final wrap up from the four-day lesson and as an introduction into their new lesson on comparing how some fossils’ features change over time, Ms. Miller asked the students to address the common misconception they talked about on the first day of the lesson (fossils are created at the same time). Ms. Miller used the students’ responses as evidence of their learning throughout the lesson.

1. Are these appropriate lesson objectives for this lesson? Explain your answer.

2. Do you think this lesson provided students with a good understanding of what the teacher expected them to learn from the lesson? Explain your answer.

3. What did Ms. Miller do to help students understand the lesson objectives? What could she do to improve student understanding of the lesson objectives?

4. Over the four-day period, do you think Ms. Miller collected enough evidence that her students understood the learning objectives for this lesson? Explain your answer.

5. In what ways do the lesson activities provide an assessment of student learning based on the lesson objectives?

6. How does Ms. Miller incorporate feedback in the lesson? In what ways do you think the feedback encouraged student learning? In what ways do you think the feedback encouraged improvements in teaching?
7. When thinking about student learning throughout this lesson, what purpose did both group and individual work serve? Did these activities provide an opportunity for students to peer- and self-assess their work? Explain your answer.

8. How would you incorporate more (or perhaps better) self- and peer-assessment opportunities?

**Facilitator’s Guide (only for POST-case)**

**Goal of the Discussion:**
- To discuss how the cases used in class have impacted your thinking about the post-case
- To compare pre- and post-case reflections and discuss the differences
- To discuss how cases have influenced your understanding of formative assessment

**Purpose of the Case**

Formative assessment is a process of learning. In order to learn, one must be aware of what they know in relation to what they are asked to know. Often we see the process of formative assessment represented as three questions: Where am I now in my learning? Where do I want to go? and How am I going to get there?

The four main characteristics of formative assessment discussed in these cases include:
- Case 1: providing clear learning objectives
- Case 2: collecting appropriate evidence of learning
- Case 3: providing guided and scaffolded feedback
- Case 4: offering opportunities for self- and peer-assessment

In the pre/post case, Ms. Miller did not adequately accomplish any of the above formative assessment characteristics. There are many opportunities in which formative assessment could have been employed; however, the teacher did not take advantage of these opportunities. Below is a summary for each characteristic as it relates to the pre/post case.

1. **Providing clear learning objectives:**

   At the beginning on the case it states that Ms. Miller plans to cover two “objectives;” however, nowhere in the case does it indicate that Ms. Miller shares these objectives with her students or shares her overall learning intentions for the unit.

   In addition, the “objectives” stated in the case are not actually objectives; they are more like general topics. From the “objectives” stated (1. to introduce the idea of fossils and 2. how fossils help scientists understand past environments, plants, and animals), how could a teacher measure student understanding? What is the teacher specifically asking the
students to know? How would students demonstrate their understanding?

For an objective to be measureable it should contain a verb that describes the skill or procedure the student must demonstrate in order to show improved content knowledge (e.g. analyze, recognize, compare, etc.). In addition, the verb must be used to describe the actual product, process, or outcome the teacher wishes to see. Here is an example: After exploring different types of fossils, students will be able to describe several fossil characteristics.

2. Collecting appropriate evidence of learning:

Overall, Ms. Miller presented several opportunities to collect evidence of student learning; however, two main issues can be identified with Ms. Miller’s process of eliciting evidence. First, some of Ms. Miller’s assignments are not directly related to her “objectives.” For example, the homework assigned on the third day of class asked the students to distinguish between newer and older fossils. This is not one of the stated objectives.

Secondly, and most prominent throughout the entire case, Ms. Miller has planned several opportunities for students to learn; however, the unit is teacher-centered rather than student-centered. During the classroom activities, Ms. Miller offers the students an opportunity to interact with materials, but she rarely requires students to analyze and synthesize the information they have uncovered. Instead, Ms. Miller summarizes the learning objective for the students. This occurred throughout the unit: during the introductory exploration of the fossils, after the students were asked to examine the footprint diagram, during both shoebox fossil digs, and during the conclusion of the unit.

One example that is of perhaps great interest occurs at the very end. Ms. Miller ask the students to address the common misconception that was introduced at the beginning of the lesson and then uses the “students responses as evidence of their learning throughout the lesson.” Although this information may be indeed valuable, it cannot be used as evidence of learning the stated objectives because the misconceived topic was not actually part of the objectives for the unit.

3. Providing guided and scaffolded feedback:

We know that for feedback to be successful, feedback must be timely, understandable, specific and directive. Feedback must also include both teacher and student interaction. Most importantly, for feedback to have meaning the students must be asked to reflect and revise their work based on the feedback.

Throughout this case, Ms. Miller did very little to support student growth through feedback of student work. Many student tasks were assigned, but student input was not reviewed or commented on by Ms. Miller. At the beginning of the unit, students had an
opportunity to explore real fossils. Instead of having a discussion about the students’ thoughts, Ms. Miller provided the students with a definition of a fossil and an explanation of how they were formed. After creating stories based on the footprint diagram, Ms. Miller asked only one student to share his story and then continued by summarizing the learning activity for the students. Ms. Miller started the second class period with a multiple choice question for the students to answer, but failed to inquire or discuss student responses. Lastly, Ms. Miller collected the students’ science journals towards the end of the unit. The student responses were a great way for Ms. Miller to gather students’ evidence of learning; however, the line of communication ended there. Instead of providing guided and scaffolded feedback, Ms. Miller “graded” on completion. The students were given no feedback in which to help them learn.

4. Offering opportunities for self- and peer-assessment:

Ms. Miller offered two opportunities for student self-reflection. Keep in mind; reflection is not always the same as self-assessment. Students may be asked to reflect on a particular topic, but do not assess their own understanding of the topic during the reflection.

The first opportunity for reflection occurred at the end of the first day’s lesson when Ms. Miller asked the students to fill out an exit pass describing: what they learned, what they still have questions on, and a related topic they would like to discuss the next day. This activity is a great way for students to think about the day’s activities; however, there are several issues related to how Ms. Miller handled this activity. First, to accurately and adequately reflect on one’s learning, a person must know what the learning goal or objective is and in this particular case, the students were given assignments without the description of the overarching objective for the lesson. Secondly, nothing was done with this information. Ms. Miller didn’t use student responses to modify or justify classroom instruction. Although it was asked, Ms. Miller didn’t consider students’ interest in topics for the next class period.

The second opportunity for student reflection occurred at the end of the third day. Students were asked to reflect on the shoebox activity in their journals. Ms. Miller did not include any reflection prompts; rather she included several questions for the students to answer. These questions are more like an assignment to collect evidence of learning rather than a form of student self-reflection or assessment.

One opportunity was provided for peer-assessment during this case. This occurred during the final class period, after the journals had been returned to the students. Ms. Miller asked the students to share their journal responses with their tablemates before putting their journals away. This is a great start; however, simply sharing responses with another student doesn’t qualify the activity as peer-assessment. Ms. Miller needed to provide the students with an objective for assessing their peers’ work. This was not done.
Discussion Guide

1. **Describing the situation:** What is the problem in the case? Whose problem is it? There are many, but the idea is for students to see that there is a lack of formative assessment.

2. **Exploring contributing factors (discussion question 1-5):** It would be best to split this case into the four key characteristics of formative assessment. Perhaps split the class into four groups and have each tackle one of the four characteristics. For each characteristic, what factor(s) influenced Ms. Miller’s actions in this case? (Limited knowledge of formative assessment, decision to tell the students the answers because it saves time, etc.)

3. **Articulating the next steps (discussion questions 1-5):** Where in this unit could formative assessments occur? Would these “additional” assessments be feasible? How would students benefit from the addition of formative assessment? How would the teacher benefit? What types of assessment activities would you, as the teacher, implement and why?
Appendix C

Instructional Cases One, Two, Three, and Four
Case 1: Learning Objectives

Mr. Shah was beginning his first year of teaching 3rd grade at Hamilton Elementary School. When he was hired, Mr. Shah was given a binder with all the corresponding state objectives that the district expected him to teach during the upcoming school year.

During the first unit, Mr. Shah did not specifically tell his students what the learning objectives were because he felt they were written in language that the students would not understand. Although Mr. Shah had clear instructions for each activity, he felt that the students did not understand the overall purpose of the activities.

For the second unit, Mr. Shah decided to introduce each lesson with the corresponding learning objectives. He asked the students what they thought the objectives meant and then provided a more detailed description for his students, hoping this would offer some clarification. Students seemed to understand the purpose of the instruction; however, Mr. Shah again felt that his students were still unclear how the activities tied together throughout the unit.

In preparation for the third unit, Mr. Shah decided to implement a strategy he recently learned in a teacher workshop. This strategy included re-wording the objective into student friendly language and then breaking down these learning goals into student-friendly statements. These statements begin with the words “I can…” and were created to help students understand exactly what the teacher was asking the students to do. One particular objective Mr. Shah needed to cover during the Organization of Living Things Unit was dealing with environmental adaptations. The specific standard read,

Relate characteristics of observable parts in a variety of plants that allow them to live in their environment (for example: leaf shape, thorns, odor, color).

Mr. Shah reworded the standard into the following objective for his students.

After this lesson, you will be able to identify how plants have certain features (leaf shape, thorns, color, odor) that allow them to survive in different places.

Mr. Shah then wrote some “I can” statements. Throughout this unit, Mr. Shah provided these “I can” statements when applicable, and then repeatedly asked the students to use them as a way to self-assess their understanding of the concepts. Below are a few examples of “I can” statements Mr. Shah provided to his students.

• I can make a connection between a plant’s features and the environment in which it lives.
• I can describe how leaf shape helps a plant survive in a desert, prairie, and deciduous forest environment.
• I can describe how plants have special features that help protect them from
enemies.

• I can explain how color and scent helps plants survive.

Mr. Shah found that the “I can” statements not only provided further clarification for students, but they also offered the students an opportunity to reflect on their learning.

1. What do you think motivated Mr. Shah to change the way he used the state objectives with his students?

2. How might Mr. Shah check that each student understands what learning they will be expected to demonstrate?

3. What are some strengths of providing students with “I can” statements at the beginning of the learning episode?

4. What are some limitations of providing students with “I can” statements at the beginning of the learning episode?

5. What additional steps should Mr. Shah take to make sure his students use the “I can” statements to their full potential?
Facilitator’s Guide

Goal of the Discussion:
To discuss the importance of providing students with clear learning objectives

Purpose of the Case

Formative assessment is a process of learning. In order to learn, one must be aware of what they know in relation to what they are asked to know. Often we see the process of formative assessment represented as three questions: 1. Where am I now in my learning? 2. Where do I want to go? And 3. How am I going to get there?

Providing clear learning objectives (objectives stated in student-friendly language) is an important aspect of formative assessment. By providing students with the objectives prior to the start of the lesson, students have a clear understanding of where they “want to go” during the lesson. Instead of students wondering why they are asked to learn a certain topic, clear learning objectives provide the student with an understanding of the learning path that will be taken. Students now will have a target to aim for, which also provides them an opportunity to self-assess where they currently stand. The teacher’s job is to assist students in this journey between what they currently know and what they are being asked to understand. Assessment for student learning provides the teacher with the evidence needed to adjust instruction to meet the students’ needs. It also provides the student with an opportunity to determine what they do and do not understand, which in turn allows the student to formulate questions to help them learn.

In this particular case, Mr. Shah has noticed that simply providing his students with clear directions to each assignment didn’t give the students a full picture of what he expected them to learn. State or district standards are often worded in such a way that even teachers can interpret the meaning differently. For this reason, it is imperative that teachers provide their students with learning objectives that are stated or written in student-friendly language. This not only clarifies the learning object for the student, but also provides a distinct learning target in which the teacher can appropriately match student assessments.

Discussion Guide

4. Describing the situation: What is the problem in the case? Whose problem is it? This helps students articulate their perceptions of the problem. This also allows students to share their different perspectives on the case.

5. Exploring contributing factors (discussion question 1): What factors influenced Mr. Shah’s actions in this case? (Students not getting the full picture; students not being able to self-assess their learning because there was no common target; students not doing well because they didn’t understand how the concepts throughout the unit related to one another, influence of professional development on Mr. Shah’s teaching…)
6. Articulating the next steps (discussion questions 2, 3, and 4): What should Mr. Shah do next with the “I can” statements? What should the students be asked to do? How can he encourage students to self-assess themselves? Why is this an important skill to learn? Are there any down sides to using “I can” statements with his students?
Case 2: Evidence of Learning

Ms. Lee is teaching her first grade students about the process of sorting objects. The learning expectation for the lesson describes how students must demonstrate their ability to sort objects based on the object’s observable characteristics. This, like many learning expectations, is rather general. Ms. Lee acknowledges that she must determine a specific activity that will help her students demonstrate their level of understanding for this particular learning expectation. She decides to ask her students to demonstrate their ability to sort objects by working with a group of objects of different sizes, colors, and shapes.

Before sharing the learning expectation with her students, Ms. Lee first gathers information regarding her students’ prior knowledge. Students are encouraged to think about places they visit, such as a grocery store or the school library. How are objects organized at a grocery store or library? Ms. Lee then asks students to think about things that may be organized at home (i.e. laundry, recycling, toys, etc.). The students are asked to share their ideas in small groups. Ms. Lee then leads a whole-class discussion, writing the different sorting characteristics described by the students on the board: color, size, and shape (toys); cold vs. hot foods, breakfast foods, and dairy (grocery); and glass, cardboard, newspaper, and plastic (recycling). For each category, Ms. Lee asks each student to hold their thumb up if they agree or thumb down if they disagree with the sorting characteristics. She then asks random students to describe why they put their thumbs up or down. From the students’ responses during the class discussion, Ms. Lee feels confident that the students can verbally describe different sorting methods.

Ms. Lee then describes that this concept of organizing objects based on specific features is called sorting. Ms. Lee tells her students that they will be sorting objects based on the objects’ visible features (i.e. color, shape or size).

Now Ms. Lee would like the students to demonstrate that they can appropriately sort a group of objects. The students work together in their small groups. Every group has a box containing the same objects. As a group, Ms. Lee asks the students to talk about how they would best sort the objects prior to actually sorting them. Ms. Lee walks around to each group and listens as they share ideas about how to sort the objects. After all the groups have sorted the objects, Ms. Lee asks for the students’ attention. As a whole class, each group quickly describes their method of sorting. Many groups have sorted the objects based on different characteristics. Ms. Lee leads a class discussion about these differences, and asks her students if it was “right” or “wrong” to sort the objects based on these different characteristics. Along with feedback from Ms. Lee, the other groups are encouraged to agree or disagree with each other’s choice of groupings.

Please answer the following reflection questions. Be sure to answer all parts of the question. Refer to the attached rubric for specific grading criteria.
1. What is the teacher’s purpose for collecting evidence of student learning? What purpose does this serve for the students?

2. Based on the learning expectations for this lesson, are these activities a good measure of student learning? In other words, do these lesson activities directly relate to the learning objectives, in order to provide Ms. Lee with appropriate evidence of student learning? For each activity (i.e. thumbs up or down, listening to group discussion, group sorting, and whole class discussion), explain your reasoning.

3. Through these activities, do you think Ms. Lee has gathered enough evidence that each of her students understands the concept of sorting based on observable characteristics? Explain your reasoning.

4. How would you handle teaching this same objective? What activities would you use from this lesson and what would you change? Describe your reasoning. How would you determine if each of your students understood the concept of sorting?

5. Collecting evidence of learning may look different depending on the age of the student. In terms of collecting evidence of learning, how might the ways in which a teacher collects evidence of learning differ for older students? Why?

Facilitator’s Guide

Goal of the Discussion:
To discuss the importance of linking assessments directly to specified learning objectives so the evidence collected from students is an appropriate measure of student understanding.

Purpose of the Case

Formative assessment is a process of learning. In order to learn, one must be aware of what they know in relation to what they are asked to know. Often we see the process of formative assessment represented as three questions: 1. Where am I now in my learning? 2. Where do I want to go? And 3. How am I going to get there?

Collecting evidence of student learning is an important aspect of formative assessment because it allows the teacher to help students bridge the gap between what they know and what they are asked to understand; providing information to help answer the question, “how am I going to get there?” Assessment for student learning provides the teacher with the evidence needed to adjust instruction to meet the students’ needs. It also provides the student with an opportunity to determine what they do and do not understand, which in turn allows the student to better formulate questions to help them learn.
An issue that many new teachers face is collecting *appropriate* evidence that is directly related to the learning objectives. In other words, does the assessment ask students to share information directly related to the learning objectives for the lesson? Often times, the answer to this question is no. The assessment may be on a similar topic, but it does not provide evidence the teacher needs to determine if the students understand the specific objective. It is extremely important for teachers to always keep the learning objectives in mind when planning and executing a lesson. The teacher should always be reflecting on how well the assessment or activity matches the learning objective.

In this particular case, the learning objective was stated as “students must demonstrate their ability to sort objects based on their observable characteristics.” Ms. Lee has organized several activities to collect evidence of student learning. Note that Ms. Lee gathers this information to understand where her students are at in their learning, and will hopefully use this information to improve her teaching and student learning. This evidence is not gathered for student use. In other words, Ms. Lee is not asking her students to do any sort of self- or peer-assessment for students to improve their own learning. (This is different than in Case 4 when students use this information to improve their learning).

To begin the lesson, Ms. Lee brings in real-world context (i.e. library, grocery store, home) to introduce the idea of sorting. She gathers a general overview of her students’ understanding by asking them to use their thumbs to indicate whether they agree or disagree with their peers’ sorting characteristics. Then, Ms. Lee asks the students to demonstrate their sorting skills using a box of items. Group/peer discussion is important in the learning process. Ms. Lee monitors this discussion. A whole class discussion then occurs, in which Ms. Lee encourages students to voice their comments.

**Discussion Guide**

7. **Describing the situation**: What is the teacher attempting to do in this case? This helps students articulate their perceptions of the case. This also allows students to hear different perspectives on the case.

8. **Exploring contributing factors (discussion question 1 and 2)**: Why do you think Ms. Lee decided to run the lesson the way she did? Is this an adequate assessment of student understanding? How does the age of the student play into the types of assessments given? (More group work, less independent work?) Why do you think Ms. Lee believes this lesson is adequate in collecting evidence of learning?

9. **Articulating the next steps (discussion questions 3)**: What should Ms. Lee do with this student information? Is there anything in particular she should change? Do her assessments measure the specified learning objective? Are there better ways of gathering evidence of student understanding?
Case 3: Feedback

Westbrook Elementary is a large urban school in which each grade-level teacher-cohort has the same planning time each day. Teachers use this planning time to work collaboratively to plan quality instructional units, as well as share ideas about how to improve their teaching and their students’ learning.

There are four 5th-grade teachers at Westbrook. The 5th-graders have just started a unit on motion and have been discussing how motion can be measured and represented on a graph. Yesterday, the teachers came together to share student results from an assessment that was just completed in each of the 5th grade classrooms. A majority of the students answered the questions accurately; however, of particular interest were four students from the four different classrooms who had similar misconceptions. The teachers began to discuss this particular misconception and in doing so shared their written feedback that was given to these four students.

The student’s were asked to solve the following problem:

*The graph represents the motion of a cyclist. Describe what the cyclist is doing. Support your answer.*

The misconception common to the four students is represented by this student’s response:

*The cyclist is riding faster and faster as time goes on. I know this because the line on the graph is increasing.*

The following are the teachers’ responses to the four students.

Mr. Lopez wrote this comment on his student’s assignment:

Think about when you ride a bike. The longer you ride, the farther you move, but does your speed need to change during this time? No. The graph is only showing that as time increases so does the length you have traveled.

Ms. Bradford wrote this comment on her student’s assignment:

The x-axis is measuring time and the y-axis is measuring distance. What can you calculate using these two variables? Distance divided by time will give you the speed of the object. The cyclist is not riding faster as time goes on. Go back and calculate the speed at different points along the line.
Ms. Wu wrote this comment on her student’s assignment:

Your answer is not correct. To determine the correct answer, go back and recalculate the speed of the cyclist at different points along the graph.

Ms. Steinberg wrote this comment on her student’s assignment:

Does an increasing line always mean the cyclist is going faster? After 1 hour, how far has the cyclist traveled? After 2 hours? After 3 hours? What do you notice about the riding time and the distance traveled? Is the cyclist going faster at hour 1 than at hour 2 or 3? How could you figure this out?

All four teachers were interested in their colleagues’ feedback because they were all different from their own. This sparked a debate on what “good” feedback looks like. In particular, the teachers discussed what should be included in the feedback to promote student understanding and scaffold student learning.

1. From the teachers’ feedback responses to the student, how do you think each teacher views the purpose of feedback?

2. What are the strengths of each teacher’s feedback? Refer back to the specific comments within the student feedback to support your answers.

3. What are some areas in which each feedback response could be improved? Refer back to the specific comments within the student feedback to support your answers.

4. Which feedback response would be most beneficial for the student to use to help guide their “re-thinking” about this problem? What evidence is there to support your answer?

5. If you were a teacher in this group, what would be the next step you would ask your students to do after this feedback was provided?
Facilitator’s Guide

Goal of the Discussion
To discuss the importance of feedback as a mechanism of student-teacher communication
To discuss how feedback is used by both the teacher and student to improve teaching and learning

Purpose of the Case

Formative assessment is a process of learning. In order to learn, one must be aware of what they know in relation to what they are asked to know. Often we see the process of formative assessment represented as three questions: 1. Where am I now in my learning? 2. Where do I want to go? And 3. How am I going to get there?

Feedback is the backbone of formative assessment. Feedback is a two-way street. The teacher needs feedback from the students and the students need feedback from the teacher. What is most important to emphasize here is that for feedback to have any meaning for the student, the teacher must ask the students to “do something” with the feedback. Applying meaningful feedback encourages student learning because the students use the feedback to help guide them to the ultimate goal or objective. Without feedback, you wouldn’t be able to answer any of the three questions (1. Where am I now in my learning? 2. Where do I want to go? And 3. How am I going to get there?)

Research suggests that for feedback to be meaningful, it must have the following characteristics:
5. Timely: given back to the student soon after the work has been completed
6. Understandable: written is student-friendly language; omitting highly technical terms (if the student doesn’t understand the concept, terminology is mostly likely not helpful.
7. Specific: strengths and weaknesses of work are identified
8. Directive: guidance for how to improve identified areas

Research also suggests that feedback alone is more powerful than feedback and a grade. When the feedback is accompanied by a grade, students often focus on the grade and ignore the feedback. Again, feedback is most powerful when the teacher scaffolds her comments to help guide the student in obtaining the correct answer. The teacher must also require the student to address the feedback.

In this particular case, four very different types of feedback are given for the same problem. In the first feedback statement, Mr. Lopez does a nice job of relating the problem to a real-world context. Mr. Lopez also asks the student a question; however, he promptly answers the question. The student is not required to do any additional thinking to solve the problem. In the second feedback statement, Ms. Bradford is using highly technical terms. If the student is having an issue answering the question, the technical
terms are usually more of a hindrance than it is helpful. In addition, Ms. Bradford is
telling the student how to solve the problem; the student does not have to critically think
about ways to solve the problem. In the third feedback statement, Ms. Wu is very blunt
and offers no scaffolded guidance for the student. In the forth feedback statement, Ms.
Steinberg is asking the student scaffolded questions to help guide the student to figure out
the correct answer. Ms. Steinberg uses student-friendly language and does not provide the
answer to the student.

Discussion Guide

1. **Describing the situation:** What is the problem in the case? (Teachers view
feedback differently; students are not being given equal opportunities to learn
based on the feedback given; etc.) Whose problem is it?

2. **Exploring contributing factors** (discussion questions 2, 3, and 4): What factors
may influence each teacher’s view of feedback? (Time limitations; personal
experience as student with feedback; not understanding power of feedback;
ability of students to use feedback constructively; etc.)

3. **Articulating the next steps** (discussion question 5): What should the students
do with this feedback? How could a teacher ensure that their feedback is used
to its full potential?
Case 4: Self- and Peer-Assessment

Every year Mr. Munson looks forward to teaching his 7th grade science class about the water cycle. He feels like the activities in this unit do a nice job of getting his students involved in their own learning; a skill he tries to reinforce throughout the school year. Students are repeatedly asked to reflect on what they think they know and what they think they don’t know, and then to take action to improve their learning.

At the start of the unit, Mr. Munson asked the students to draw, label, and describe their ideas of the water cycle; more specifically, how water travels through the water cycle and what happens to the water at each point. Then in red marker, students were asked to write down areas in which they are confused or had questions. Mr. Munson used this activity to gather students’ conceptions of the water cycle prior to teaching the unit. The student work helped him adjust instruction to cater to the individuals’ needs within the class.

Over the next week, Mr. Munson led his class through several activities that helped students to understand how evaporation, transpiration, condensation, cloud formation, precipitation, infiltration, surface runoff, ground water, and absorption occur within the water cycle. Along with the assigned activities and homework, which provided Mr. Munson with a good idea of what his students understood, he also asked them to fill out exit passes that required the students to assess their own understanding by identifying three things they knew well, two things they were still struggling with, and one thing they could do that would help them better understand the concepts. Mr. Munson read the exit passes after they were handed in and based on the student responses, adjusted his instruction for the next day.

During the next week of instruction, Mr. Munson introduced the idea of a watershed and led his students in analyzing the flow of water between the components of a watershed, including surface features and groundwater. After instruction, Mr. Munson asked his students to revisit their water cycle drawings they made at the beginning of the unit. In purple marker, students were asked to add to and change their drawing based on what they now knew. Students then got into small groups and examined each other’s drawing. Mr. Munson asked that each student make comments/corrections on their peers’ drawings and then justify to their peer why they made that comment or correction. Prior to the peer-feedback session, Mr. Munson makes sure to talk to the students about what good peer feedback looks like to ensure each student receives feedback that is useful and meaningful. Mr. Munson provided an example of peer-feedback. He stressed the importance of highlighting both peer strengths and areas in which the peer can improve. Along with this information, Mr. Munson stressed the importance of helping their peers address the highlighted issues. What can they do to help their peer better understand the information? How can the feedback help the student to clarify the goals and success criteria? After peer-assessment and discussion, the drawings were turned in and Mr. Munson used this work to adjust instruction for the next class period, as well as provide feedback to each student.

449
As homework, students were then given a list of true or false statements relating to the water cycle. The purpose of these statements was to help students assess their understanding of topics already covered during the unit. Students were asked to individually mark if each statement was true or false and provide a reason for their answer. The next day the students sat with a partner and went through the list of statements. This discussion offered the students an opportunity to explain scientific concepts as well as learn from their peers. This was especially important for the students who were confused about certain topics.

Towards end of unit, prior to the unit review, Mr. Munson asked his students to go back and reflect on their drawing once again. Students were required to document what changes were made to their drawing and to justify these changes based on class experiences. Students not only commented on what they had learned, but they also were asked to raise any questions about ideas or topics that were still confusing.

Mr. Munson also facilitated a class discussion on working with peers. He specifically wanted to know how peer-assessment altered the students thinking. In addition, he wanted students to talk about how the process of peer-assessment was beneficial for both students

1. In your opinion, what was Mr. Munson’s motivation for using peer-assessment throughout this unit?
2. In your opinion, what was Mr. Munson’s motivation for using self-assessment throughout this unit?
3. What do students gain from using peer- and self-assessment that they wouldn’t gain from instruction in which this type of assessment was absent?
4. What are your thoughts about using peer- and self-assessment in your own teaching? How would you incorporate these assessment strategies into a lesson?
Goals for the Discussion

To discuss the importance of self- and peer-assessment in the process of student learning.

Purpose of the Case

Formative assessment is a process of learning. In order to learn, one must be aware of what they know in relation to what they are asked to know. Often we see the process of formative assessment represented as three questions: 1. Where am I now in my learning? 2. Where do I want to go? And 3. How am I going to get there?

Research has demonstrated that self- and peer-assessment are an important aspect of student learning. Self-assessment allows students to take a critical look at what they think they understand and what areas they may have difficulty with. To be able to self-assess, the students must have clear learning objectives and success criteria, and guided feedback to use to assess their own learning. The process of peer-assessment offers students an opportunity to critically analyze peer work based on stated success criteria. This in turn provides the students with a more detailed understanding of the learning task, which can be applied to their own work. When done well, self- and peer-assessment encourage students to take responsibility for their own learning, as well as provide opportunities for students to better understand the methods and intent of the learning episode. Self- and peer-assessment help students to answer the three questions (1. Where am I now in my learning? 2. Where do I want to go? And 3. How am I going to get there?).

In this particular case, Mr. Munson asks the student to draw their initial ideas about the water cycle. This activity not only served as a check for prior knowledge, it was used throughout the unit as a self-assessment of student learning. Again, at the end of the unit, students revisited their drawing as a final check for understanding. Mr. Munson encouraged students to pin point the changes they had made throughout the unit, which helped students connect the learning objectives to their own learning process. In addition, students shared their drawings with peers and were encouraged to learn from each other through peer-assessment. Peers commented and corrected each other’s work based on classroom learning experiences. This discussion offered opportunities for students to share their ideas and ask each other questions.

An exit pass was also used for student self-assessment. Not only were students asked to identify areas that were still unclear, the students were asked about what actions they will take to help clarify these uncertainties. This helps put student learning into the students’ hands. Lastly, Mr. Munson gave students an assignment in which they had to justify true or false statements individually and then with their peers. This served as another opportunity for open discussion about the concepts. Before concluding the unit, Mr. Munson led a class discussion about peer-assessment. This was purposefully done to explicitly highlight the benefits of using peers as a learning resource. The process of peer-assessment helps to strengthen students understanding of the concepts; when the
student is able to teach another student about a particular topic, they tend to grasp the concepts more fluidly.

Mr. Munson has asked his students to do multiple self- and peer-assessment activities. While Mr. Munson should certainly use the student feedback to help plan and modify instruction, the purpose for these activities was for students to use this information to help guide their own learning. This is different from Case 2 in which the information collected was solely for teacher use.

**Discussion Guide**

1. **Describing the situation**: What is the teacher attempting to do in this case?
   This helps students articulate their perceptions of the case, specifically their perceptions of self- and peer-assessment. This also allows students to hear different perspectives on the case.

2. **Exploring contributing factors (discussion question 1, 2, and 3)**: Why do you think Mr. Munson decided to run the lesson the way he did? Is this an adequate assessment of student understanding? How does the age of the student play into the types of assessments given? Can students be expected to self-assess themselves? Can students adequately peer-assess others? What do you think Mr. Munson believes is gained by asking students to participate in these activities?

3. **Articulating the next steps (discussion questions 4)**: How can Mr. Munson keep students accountable during self- and peer-assessment activities? Are there better ways of getting students involved in their own learning? How would you handle this in your own teaching?
Appendix D

Preliminary List of Codes
<table>
<thead>
<tr>
<th>Theme: Formative Assessment Strategies</th>
<th>Description:</th>
<th>Code:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Objectives</td>
<td>LO</td>
<td></td>
</tr>
<tr>
<td>Evidence of Learning</td>
<td>EOL</td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>FB</td>
<td></td>
</tr>
<tr>
<td>Peer-assessment</td>
<td>PA</td>
<td></td>
</tr>
<tr>
<td>Self-assessment</td>
<td>SA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Discussion and Views on Assessment Use</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Views remain the same</td>
<td>VRS</td>
<td></td>
</tr>
<tr>
<td>Views shift away from FA</td>
<td>VSAFA</td>
<td></td>
</tr>
<tr>
<td>Views shift towards FA</td>
<td>VSTFA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme: Case Reflections</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not acknowledge lack of FA</td>
<td>DNAFA</td>
<td></td>
</tr>
<tr>
<td>Incorrect use of FA</td>
<td>IUFA</td>
<td></td>
</tr>
<tr>
<td>Provided Examples of Formative Assessment Use in Classroom</td>
<td>EX</td>
<td></td>
</tr>
<tr>
<td>Description of Summative Assessment</td>
<td>SUM</td>
<td></td>
</tr>
<tr>
<td>No Evidence of PST Understanding</td>
<td>NE</td>
<td></td>
</tr>
<tr>
<td>(Strategies from) Case Discussion Mentioned</td>
<td>CD</td>
<td></td>
</tr>
</tbody>
</table>
Appendix E

Complete List of Codes
<table>
<thead>
<tr>
<th>Theme:</th>
<th>Code:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL CODES</td>
<td>VRS</td>
<td>Views remained the same from pre to post case</td>
</tr>
<tr>
<td></td>
<td>VSAFA</td>
<td>Views shifted away from FA from pre to post case</td>
</tr>
<tr>
<td></td>
<td>VSTFA</td>
<td>Views shifted towards FA from pre to post case</td>
</tr>
<tr>
<td></td>
<td>FAIU</td>
<td>Incorrect use of FA</td>
</tr>
<tr>
<td></td>
<td>FAA</td>
<td>PST has acknowledged FA</td>
</tr>
<tr>
<td></td>
<td>FADNA</td>
<td>PST has not acknowledged FA</td>
</tr>
<tr>
<td></td>
<td>EX</td>
<td>Example provided</td>
</tr>
<tr>
<td></td>
<td>SUM</td>
<td>Summative assessment</td>
</tr>
<tr>
<td></td>
<td>CD</td>
<td>Case discussion mentioned</td>
</tr>
<tr>
<td></td>
<td>MDP</td>
<td>More detail than in the pre-case</td>
</tr>
<tr>
<td></td>
<td>LDP</td>
<td>Less detail than in the pre-case</td>
</tr>
<tr>
<td></td>
<td>HL</td>
<td>Highlight</td>
</tr>
<tr>
<td></td>
<td>PST</td>
<td>Preservice teacher</td>
</tr>
<tr>
<td></td>
<td>PST DNOC</td>
<td>Did not actually occur in case</td>
</tr>
<tr>
<td></td>
<td>PST CON</td>
<td>PST contradiction</td>
</tr>
<tr>
<td></td>
<td>PST NEU</td>
<td>No evidence of PST understanding of FA</td>
</tr>
<tr>
<td></td>
<td>TC</td>
<td>Teacher-centered</td>
</tr>
<tr>
<td></td>
<td>FBDT</td>
<td>Detailed teacher FB needed</td>
</tr>
<tr>
<td>LEARNING OBJECTIVES (LO)</td>
<td>LODL</td>
<td>Lesson/activity doesn't link to LO</td>
</tr>
<tr>
<td></td>
<td>LOL</td>
<td>Lesson/activity links to LO</td>
</tr>
<tr>
<td></td>
<td>LOSF</td>
<td>LO needs to be in student friendly language</td>
</tr>
<tr>
<td></td>
<td>LOM</td>
<td>LO needs to be measurable</td>
</tr>
<tr>
<td></td>
<td>LOEX</td>
<td>LO needs to be explicit</td>
</tr>
<tr>
<td></td>
<td>LOCA</td>
<td>Completion of activities equals student understanding of LO</td>
</tr>
<tr>
<td></td>
<td>LOMC+</td>
<td>PST acknowledges misconception as part of LO</td>
</tr>
<tr>
<td></td>
<td>LOMC-</td>
<td>PST acknowledges misconception as not part of LO</td>
</tr>
<tr>
<td></td>
<td>LOCAL</td>
<td>LO clarified after the lesson</td>
</tr>
<tr>
<td>EVIDENCE OF LEARNING (EOL)</td>
<td>EOL MC-</td>
<td>Data from misconception should not be used as EOL</td>
</tr>
<tr>
<td></td>
<td>EOL MC+</td>
<td>Data from misconception used as EOL</td>
</tr>
<tr>
<td></td>
<td>EOL TL</td>
<td>EOL used to inform teaching and learning</td>
</tr>
<tr>
<td></td>
<td>EOL NTL</td>
<td>EOL not used to inform teaching and learning</td>
</tr>
<tr>
<td></td>
<td>EOL SCA</td>
<td>Successful completion of activity demonstrates EOL</td>
</tr>
<tr>
<td></td>
<td>TC</td>
<td>Teacher-centered</td>
</tr>
<tr>
<td></td>
<td>SC</td>
<td>Student-centered</td>
</tr>
</tbody>
</table>

*Note: FA = formative assessment; PST = preservice teacher; SA = self-assessment; PA = peer-assessment.*
Complete List of Codes – Continued

<table>
<thead>
<tr>
<th>Theme: Complete List of Codes – Continued</th>
<th>Code:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEEDBACK (FB)</strong></td>
<td>FB SA</td>
<td>Student addresses FB to improve learning</td>
</tr>
<tr>
<td>Question 6</td>
<td>FB SL</td>
<td>FB informs student learning</td>
</tr>
<tr>
<td></td>
<td>FB TI</td>
<td>FB informs teacher instruction</td>
</tr>
<tr>
<td></td>
<td>FB MA</td>
<td>Multiple types of FB options provided</td>
</tr>
<tr>
<td></td>
<td>FB 1A</td>
<td>One type of FB option provided</td>
</tr>
<tr>
<td></td>
<td>FB PST</td>
<td>PST provided no response to how FB affects teaching and learning</td>
</tr>
<tr>
<td></td>
<td>NRTL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FB TX</td>
<td>Teacher didn't give FB</td>
</tr>
<tr>
<td></td>
<td>FB DT</td>
<td>Detailed teacher FB needed</td>
</tr>
<tr>
<td></td>
<td>TCI</td>
<td>Teacher changes instruction</td>
</tr>
<tr>
<td><strong>SELF AND PEER-ASSESSMENT (SPA)</strong></td>
<td>SPA GW FA</td>
<td>SPA group work has FA</td>
</tr>
<tr>
<td>Questions 7-8</td>
<td>SPA IW FA</td>
<td>SPA individual work has FA</td>
</tr>
<tr>
<td></td>
<td>SPA NTLO</td>
<td>SPA not tied to LO</td>
</tr>
<tr>
<td></td>
<td>SPA TLO</td>
<td>SPA tied to LO</td>
</tr>
<tr>
<td></td>
<td>SPA PWNPA</td>
<td>Peer or group work doesn't include PA</td>
</tr>
<tr>
<td></td>
<td>SPA IWNSA</td>
<td>Individual work doesn't include SA</td>
</tr>
<tr>
<td></td>
<td>SPA DNOC</td>
<td>Did not occur in the case</td>
</tr>
<tr>
<td></td>
<td>SPA PRFA</td>
<td>Purpose of SPA relates to FA</td>
</tr>
<tr>
<td></td>
<td>SPA MFS</td>
<td>SPA needs to be modeled for students</td>
</tr>
</tbody>
</table>

Note: FA = formative assessment; PST = preservice teacher; SA = self-assessment; PA = peer-assessment.