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Reading Horizons

A Journal of Literacy and Language Arts



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**There is no more crucial or basic skill in all of
education than reading.**



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Spelling instruction in the primary grades: Teachers' beliefs, practices, and concerns

Antoinette Doyle, Memorial University of Newfoundland
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Abstract

This study examined Canadian teachers' beliefs, practices and concerns about spelling instruction in the primary grades. Data from surveys ($n = 56$) indicated that most teachers believe that spelling is important and plan for spelling instruction. For most teachers, the spelling words and activities used, and the instructional resources they chose, reflected an attempt to incorporate both holistic and traditional approaches to instruction. Teachers reported that substantial numbers of children experience difficulty with spelling. They suggested that greater emphasis be placed on defining spelling outcomes in the curriculum, as well as on teacher education and resources for teaching spelling to diverse learners.



Spelling instruction in the primary grades: Teachers' beliefs, practices, and concerns

Introduction

Early 20th century spelling instruction, based on a view that English orthography was essentially irregular, focused on rote memorization of word lists (Templeton & Morris, 2000). In the latter half of the 20th century, however, the focus of spelling instruction had shifted in response to the work of Hanna, Hanna, Hodges and Rudorf (1966) and others who found that in spite of its deep orthography, English has a high degree of regularity. Other research has focused on the developmental nature of children's acquisition of orthographic knowledge (Henderson, 1981, 1985). Since English orthography is complex but not chaotic, several researchers have argued that if the structure of English is made transparent to children through explicit instruction, they will acquire the knowledge for tackling word spellings (Carreker, 2005; Moats, 2000; Treiman, 1998). Numerous spelling resources have recently been published that connect developmental perspectives on spelling acquisition with the teaching of orthographic structure (Bear, Invernizzi, Templeton & Johnston, 1996, 2011; Gentry, 2004; Gentry & Gillet, 1993); however, even earlier examples include explicit attention to letter sounds, letter patterns, syllables and affixes (Kuska et al., 1962).

For over thirty years, other perspectives on spelling within the context of a holistic contextualized reading and writing framework emerged that led to a dramatic shift in approaches to spelling instruction in North American elementary schools (Schlagal, 2002). Approaches to spelling instruction, based on spelling textbooks (spellers) were largely abandoned (Johnston, 2001). Instead, spelling development was theorized to be best taught through instructional activities reflecting the demands of the particular context, the reading and writing activity at hand. This approach eschewed the view that spelling was best developed through a focus on predetermined lists of words. Teachers were encouraged to focus on words related to topics of study in the classroom, misspelled words, high-frequency words, and words that children indicated an interest in learning (Graham, 2000).

Concurrent with these developments, an emphasis was increasingly placed on the communicative purposes for writing. The focus of classroom writing activities shifted from an emphasis on mastery of the various forms and mechanics of writing to a focus on the message in the writing. To encourage written expression, invented spelling was advocated as an appropriate instructional approach that would allow children to put their ideas in writing without fear or hindrance due to concerns about the accuracy of their spellings (Gill, 1997). Children were encouraged to spell words inventively based on what they knew about sound-to-spelling relationships or other aspects of word knowledge. This was thought to enable the young writer to focus on what was most important, communication of the intended message (Gentry, 2000).

The benefits of invented spelling for children in the primary grades are adequately documented to support their continuing use (Ehri & Wilce, 1987; Gill, 1997; Ouellette & Sénéchal, 2008; Rieben, Ntamakiliro, Gonthier, & Fayol, 2005; Sénéchal, Ouellette, Pagan & Lever, 2012). English orthography, however, is determined by more than simple letter-sound relationships. English spelling rules and patterns are influenced by both the morphology and phonology of the many languages from which English is derived, including Anglo-Saxon, Latin and Greek (Henry, 2003). Spelling patterns in these and other languages influence the spelling of English words. Since there is not a simple relationship between how words sound and how they are spelled in English, as there is in some alphabetic languages, English is said to have a deep orthography. Thus, although letter-sound knowledge contributes to reading and spelling accuracy, many patterns in English such as *-le* in *little* or *-tion* in *motion*, defy simple translations from letter to sound (Moats, 2000; Treiman & Casar, 1997). Word-specific knowledge, such as knowing when to double letters in spelling (as in the word *rabbit* but not *habit*) is also required for acquiring a high degree of spelling competency (Holmes and Castles, 2001).

Some Canadian curriculum documents promoting the contextualized approach to spelling do, in fact, acknowledge that there is a substantial regularity in the structure of written English and suggest various types of word-study activities (e.g., Government of Newfoundland and Labrador, 1996; Government of Newfoundland and Labrador, 1998). However, they do not recommend a sequenced program of words to teach. Questions about the use of spellers as an educationally-sound practice are posed (Government of Newfoundland and Labrador, 1998). Instead, spelling instruction in response to

what writers needed to know or the errors they made were strongly advocated. Documents such as these reflect holistic approaches that became widespread in the United States and also gained prominence in Canadian curriculum documents and teaching practices. In a review of spelling instruction, however, Graham (2000) concluded there was little evidence to justify the replacement of traditional instruction with contextualized approaches. It is important to consider how disparate perspectives on spelling development and instruction across research literature and curriculum materials influence what teachers believe about spelling development and instruction, and what they do about it in their classrooms.

Studies in the U.S. in the past decade or so have queried American teachers' beliefs about spelling, and their instructional practices and concerns (Fresch, 2007; Graham et al., 2008; Johnston, 2001). Wide variation is found in the directives given to teachers about how they should teach spelling (Johnston, 2001), the sources of words teachers use (Fresch, 2007; Graham et al., 2008; Johnston, 2001), their beliefs about spelling development, their instructional practices, and if and how they modify instruction for struggling spellers (Graham et al., 2008; Johnston, 2001). In examining the issue of instructional modification for students, Graham et al., (2008) found that a sizeable minority of teachers (42%) make 0-2 modifications, while a much smaller proportion of teachers (29%) made over two-thirds of all modifications reported in their study. Fresch's (2007) study focused on teachers concerns about children's spelling development and their role in spelling instruction, noting for example that many teachers felt students' learning was temporary for "Friday Spelling Test" purposes, but it was not retained in the long term in their writing. These teachers were also concerned about their ability to meet the diverse spelling needs of their students.

Purpose of the Study

Graham et al., in 2008, noted the paucity of studies capturing the "big picture" of contemporary spelling instruction in the U.S. A search of the literature since that date did not find subsequent studies of this nature. The extant literature suggests great variability in the instructional beliefs and practices of American teachers, as well as considerable uncertainty about how to best teach spelling. Even less is known about the perspectives and practices of teachers in Canada or whether or not the issues identified in the U.S.

research literature are relevant in Canadian schools. The purpose of this study was to investigate, in one Canadian context, primary teachers' beliefs about how children develop spelling knowledge, and examine the spelling instruction practices they use to support this development. This study addressed three areas of inquiry:

1. What do teachers believe about the nature of children's spelling development?
2. What do teachers believe are the best approaches for planning spelling instruction?
3. What practices do teachers regularly engage in for teaching spelling to typically-developing students and struggling students in their classrooms?

Teachers' beliefs about the underpinnings of spelling development on children - the competencies and attitudes children possess - were of interest in this study, since these beliefs are likely to impact instructional planning and practice (Moats, 2009; Nespor, 1987). How teachers planned and implemented spelling instruction - specifically the types of spelling words, the instructional activities and the evaluation methods chosen - were also of particular interest in order to document teachers' practice in spelling instruction in grades one, two and three, which were the grades targeted in this study. The authorized and teacher-selected resources used by the teachers are considered in relation to the beliefs and practices of the teachers in the study.

Method

General Procedures

To answer the research questions, a teacher questionnaire, described in the *Measures* section, was used. Information packages were sent to principals in a large random sample of 90 schools in three school boards in the province in which instruction is provided in English. A letter to the principal explained the nature of the research and the data collection procedures. The package also contained three teacher packages – one each for teachers teaching grade one, two and three. The principals were requested to inform the teachers of the opportunity to participate in the study. Teachers could then decide if they were interested in participating. As required by the school boards as part of their permission for the study, the decision to forward the information to teachers

was left to the discretion of the principal. Many schools in the three school boards also had at least one stream of French-Immersion in which instruction in all subjects was provided in French to native English speakers; however, as outlined in the information letters to the educators, only teachers of English language arts were of interest in this study. The teacher information package contained the information letter and questionnaire. Teachers were asked to complete the anonymous questionnaire and return it by mail.

Participants

The participants were teachers who taught grade one, two or three English language arts in regular classroom settings, in three school boards in the province. In all except three cases, the teachers taught in single grade classrooms. The other three teachers taught combined grades, for example, grades one and two together in the same classroom. Respondents taught in both urban and rural settings in schools comprised of a variety of grade configurations, from primary-grade only schools, to schools comprised of all grades from kindergarten to grade twelve.

In total, the province, which is comprised of an island and a portion attached to the mainland of Canada, has just over 525,000 residents, about 500,000 of whom live on the island (Newfoundland and Labrador Statistic Agency, 2013). The three school boards participating in the study spanned the entire island portion of the province. As such, schools involved in the survey were drawn from a broad socio-economic range. According to the most recent National Household Survey, the “mother tongue” of the province in which the study was conducted is predominantly English (98%), with the remaining 2% comprised of French (Canada’s other official language), and other non-official languages (Statistics Canada, 2011).

Measures

Teacher Questionnaire. The questionnaire consisted of four sections—information about the respondents (e.g., teaching experience, grade currently taught, class size), teacher beliefs about the value of spelling and about how children learn to spell, teachers’ spelling instructional practices, and teachers’ opinions about instructional supports for the teaching of spelling. Forced choice, Likert-type rating scales and open-ended questions were utilized. This questionnaire was informed by other research literature examining spelling instructional practice (Graham et al., 2008; Johnston, 2001). Because it was

possible that some teachers would have been teaching in multi-grade settings, questions were designed to allow teachers to respond separately by grade level where answers may have varied between grades. To improve the clarity and validity of the questionnaire, a pilot study was conducted among a small number of primary teachers before finalizing the questionnaire. These teachers completed the questionnaire and provided feedback regarding the length of time required to complete it, the clarity of the questions, and the appropriateness and comprehensiveness of the questions.

Since the distribution of the questionnaire was left to the discretion of the principals it is not possible to know how many questionnaires were received by the teachers. If every teacher was made aware of the study, a maximum of 270 teachers (three for each of 90 schools) could have participated. In some schools, however, due to low enrollments necessitating multi-grade classrooms, fewer than three teachers would have been on staff teaching grades one through three. The return of 56 of these questionnaires indicates a minimum return rate of 20.7%. This is higher than anticipated return rates for mail-in surveys (Weisberg, Krosnick, & Bowen, 1996), and in other research on spelling instructional practice using mail-in surveys (Fresch, 2007).

Analyses

A mixed-method approach was used. For each open-ended question one coder examined all responses. These responses were initially categorized into emerging themes following a coding method for the open ended questions in which recurring regularities reveal patterns that can be sorted into categories such that the sorted data reveals internal homogeneity within categories and external heterogeneity among categories (Patton, 2002). Upon the assignment of all responses to the categories, the categories were reviewed and in some cases further divided or combined with others. All responses were again reviewed to ensure the categories for each open-ended question were sufficient to represent the responses of the teachers, without overgeneralizing these responses. All responses to each open-ended question were then coded according to the final categories. Using a random sample (25%) of the surveys, generated using a statistical software program, a second coder independently scored the open-ended questions using the categories created from all responses. Inter-rater agreement was 96 percent. The final number of categories for each question differed according to the variability of the responses within a

category. The categories identified for each type of open-ended question are noted in the results section and the number of responses associated with each category is presented. The respondents sometimes made multi-faceted responses to open-ended questions. In such cases their responses were then coded into more than one category. Thus, for a single question, the total number of responses indicated by category would exceed 56—the total number of respondents. These data and the responses to forced-choice questions and rating scales were entered into a database. Where appropriate, such as in reporting on class size or number of years of teacher experience, descriptive statistical techniques were employed to examine the participants' responses. Other statistical techniques such as t-tests or chi-square tests were used to identify relationships amongst participant factors and responses, for example, the relationships among grade level and the frequency of struggling spellers.

Results

The results are organized in four sections: the characteristics of the teacher participants and their students, teachers' beliefs about spelling development, teachers' planning for spelling instruction, and teachers' practice and reflections on instructional supports for teaching spelling.

Characteristics of Teacher Participants and Their Students

The 56 teachers varied greatly in their teaching experience from those in their first few years of teaching to those with over thirty years teaching experience ($M = 16.79$ years, $SD = 8.68$ years). On average, the teachers were well-experienced in teaching the grade they taught at the time of the study ($M = 6.55$ years, $SD = 5.01$ years). Fifty-three teachers taught in single grade classrooms—19 taught grade one, 20 taught grade two, and 14 taught grade three. There were no significant differences in years of teaching experience among grade levels. Three other teachers taught in multi-grade classrooms in which children in two primary grades were grouped together.

Class sizes varied considerably from 8 to 26 students ($M = 17.65$ students, $SD = 4.98$). There were many fewer multi-grade classrooms in the study to compare to single-grade classes; however, it is typical of multi-grade classrooms, by nature of being in situated in very small communities, to have substantially lower numbers of children. There were no significant differences in class size by grade among the single-grade classrooms.

Teachers were asked to estimate the percentage of children exhibiting greater than average spelling difficulty. The term *greater than average* was used to identify children who struggle persistently and substantially with spelling, since it would be expected that almost all children would exhibit some difficulty, especially with novel words or word patterns, and this would help to identify the proportion of children for whom spelling is particularly challenging. Estimates varied from 0% to 75%, $M = 28.82$, $SD = 19.51$. There was little difference in the means between grade one ($M = 25.65$) and grade two ($M = 23.32$); however, by grade three the reported difficulty in spelling was much higher ($M = 40.14$). ANOVA Post hoc tests indicated significant differences between grades one and three ($p < .05$) and grades two and three ($p < .05$).

Teachers' Beliefs about Spelling Development and Instruction

Importance attributed to spelling. Teachers' rating of the importance of spelling acquisition was gauged on a 5-point Likert-type scale from not important at all (0), to very important (4). On average the teachers considered spelling to be important ($M = 3.10$, $SD = 1.06$). There was little variance in means by grade level and no significant differences in these means. Bivariate correlational analysis also revealed no significant relationship between years of teaching experience and the importance attributed to spelling development.

Teachers were asked to explain their rating by responding to an open-ended question querying their rationale for the rating of importance they attributed to spelling. The responses were grouped into nine categories, five of which supported the importance of spelling and spelling instruction and four that were more ambivalent. Some responses were multifaceted and coded into more than one category. The frequencies associated with each type of response are indicated by the numeral within the parentheses. The most frequently-cited arguments for the importance of spelling argued for its necessity for reading one's own writing and having one's writing to be interpretable by others ($n=23$), and the importance of spelling knowledge supports reading development ($n=19$). Also cited is the argument that children who spell without difficulty engage in writing with less apprehension and frustration, allowing them to focus on higher level writing skills such as organization and expression ($n=10$). Some ($n=5$) argued that while technology is very useful, it is not fail-proof or always available; therefore independent spelling skill is needed. A few

others (n=4) focused on the “how” and the “what” of spelling, that it should be systematic and direct, with a focus on spelling patterns, rules, and strategies.

The underpinnings of spelling development. In an open-ended question, teachers were asked about what they believe to be the knowledge and skills necessary for becoming a good speller and their responses were grouped into seven categories. Knowledge of phonics and other orthographic features of English, such as silent letters, were most frequently cited (n=41). Knowledge of rules and spelling strategies was also referenced by many (n=23). Less frequently, phonological awareness (n=11), reading competency (n=11), memory skills (n=5), and attitude toward learning to spell (n=5) were mentioned.

Teachers’ goals for engaging in spelling instruction. An open ended question asked teachers what they hoped children would gain from spelling instruction. It was expected that improvement in accuracy of spelling performance would obviously be cited and this was borne out in the responses (n=26). Also of interest in this question, however, were teachers’ perceptions of *how* instruction might facilitate this improvement in spelling, and if other curriculum areas might also be positively impacted by this improvement. A number of responses suggest how teachers’ perceived the pathway to spelling improvement. Instruction was cited by many as a means for enhancing children’s confidence in spelling (n=24), and desire to spell correctly (n=3). Improvement in letter-sound knowledge (n=11) and knowledge of rules for spelling (n=7) were also cited as means of improvement. With respect to how spelling instruction might have a positive impact on other areas, 15 respondents suggested that instruction would improve reading performance, while three stated that vocabulary knowledge would also be enhanced.

Teachers’ Instructional Planning

Using forced choice responses, teachers were asked about their overall approach to planning spelling instruction (Chart 1), their main source of words for teaching (Chart 2) , the type of words chosen (Chart 3), and the resources available to them and their perceived usefulness (Chart 4). These data are considered further in the discussion section.

The Implementation of Spelling Instruction

Chart 1: *Overall approach to spelling instruction*

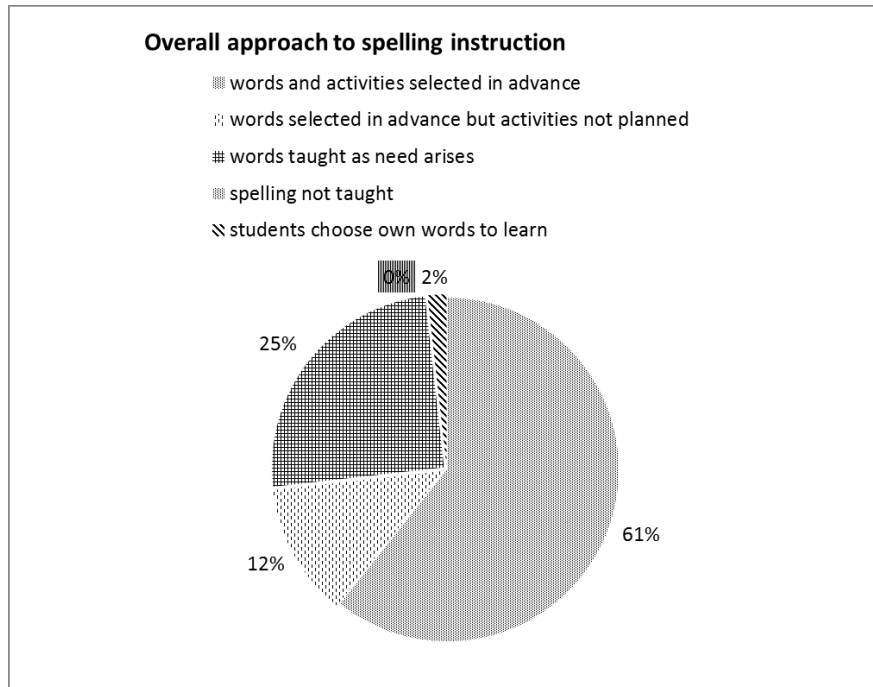


Chart 2: *Source of spelling words*

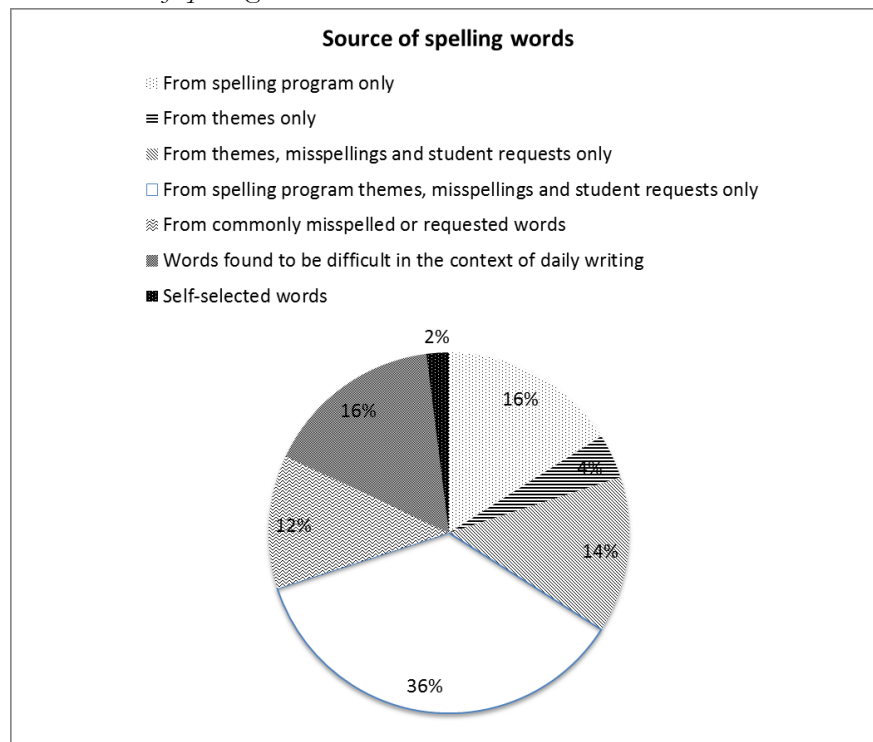


Chart 3: *Main type of spelling words taught*

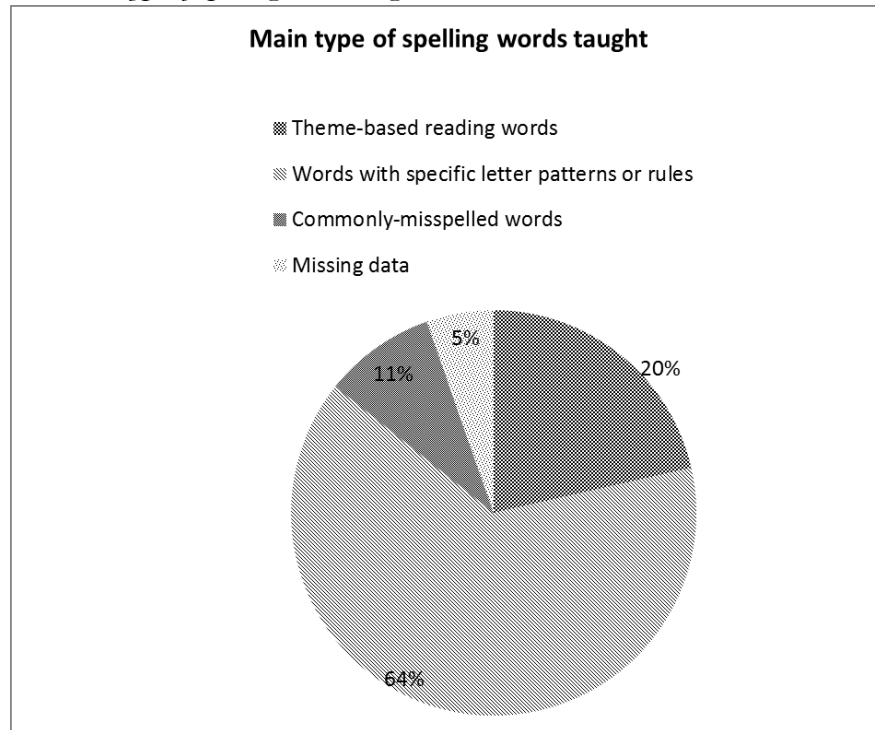
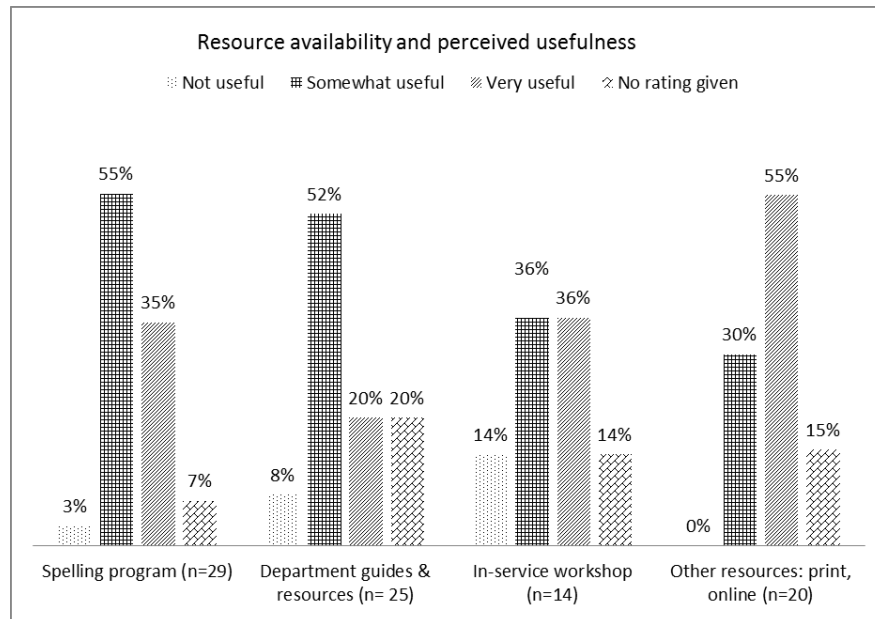


Chart 4: *Resource availability and perceived usefulness*



Numbers in parentheses refer to number of teachers possessing these resources. Percentages refer to usefulness rating of the resource.

Timing and sequencing of spelling instruction. Teachers indicated that, on average, they taught spelling about 46 minutes per week, and about 39 minutes of this time involved direct instruction. In an open-ended question, teachers were asked to describe the main instructional activities that they engage in with their students. Teachers frequently (n=28) reported discussing the orthographic features of chosen words, e.g., word families, blends, etc., as well as rules and strategies (n=7) for using these words (e.g., how to form plurals). Teachers also noted they planned word study activities for the week related to those words (n=30), and talked specifically about opportunities for practicing spellings (n=18) using a variety of forms including daily reading and writing in context, games and use of websites. Other noted instructional activities included examining word meanings in addition to word spellings (n=15) although it was not clear if the connections between roots and variant spellings were examined, assigning spelling homework (n=11), conferencing with individual students (n=10), and encouraging the use of tools for checking spelling such as word walls and personal dictionaries (n=9).

For those teachers who plan in advance to teach specific words and engage in related activities, a common sequence of instruction emerged. At the beginning of the week, these teachers typically introduced the words to be learned and many of these teachers examined the orthographic and phonological features of the words. Sometimes, the words could be categorized; for example some plural forms added “s” while other possessed “es” suffixes, and these similarities and contrasts were discussed and rules were generalized for these. During the week, teachers planned various instructional activities that allowed students to practice spelling the words, working with rules and strategies, and expanding their word knowledge by examining word and variant meanings and using these words in their reading and writing. Independent writing, paired and small-group activities using traditional games or computer games, and center-based activities were reported, indicating that children worked alone at times, while at other times they collaborated with peers. During this time teachers sought to differentiate instruction by assigning children to specific words, tasks, and/or peer-groups, and varying the amount of supervision and guidance given to each student while they were completing the assigned learning activities. Before the end of the week, teachers often held a practice quiz by calling the words and having the students or a peer correct the spellings. During the week, homework sometimes included practicing spelling

words and completing related activities. At the end of the week, or after a longer period of time, where applicable, teachers gave a final quiz of the word spellings.

Adaptations to Instruction. The teachers were asked if they adapted instruction for different students' needs and, if so, how. Most respondents (n=38) indicated they adapted instruction to meet the needs of different children in their classrooms; however, 14 indicated they did not. Chi-square tests revealed no significant differences across grade levels in the number of teachers making adaptations to instruction. In an open-ended question, teachers who indicated they did adapt instruction were asked about how they did this. Many teachers (n=34) indicated they vary the words given. Of these teachers, some assign a core set of words and vary the remaining balance of the words given, depending on the students' perceived needs. Some teachers (n=15) indicated they give fewer words to struggling spellers or allow students to choose their own words to learn (n=4). A few teachers (n=4) indicated they provided more guidance and support to struggling students when completing activities involving spelling. One teacher indicated that she does not assign spelling to students she believes are not ready to learn; these grade two students would presumably have considerable learning challenges. Finally, one teacher indicated that her classroom instruction does not vary, but she assigns words and activities for children to take home for their parents to decide if their children will do any of the activities, based on their (parents') assessment of what their children need.

Sequencing of Instruction and Assessment. Most teachers (n=42) indicated they taught a new group of words each week, while others focused on the same words for about two weeks (n=9) or less frequently (n=1). Teachers were asked to describe their assessment practices and all unique responses were noted and coded into categories. Many (n=37) teachers reported conducting pre-and-post-test written assessments of spelling performance. Meanwhile, 35 teachers stated they used children's daily writing activities (e.g., journal writing) to gauge spelling progress. Respondents did not indicate if in examining daily writing, the spelling of specific words under current or recent study were of particular scrutiny, or whether or not the "old" spelling errors of particular children had been resolved. Indeed, comprehensive assessment on children's individualized learning of specific words or orthographic pattern mastery using "free writing" samples such as journal writing, in which specific words may or

may not appear, would be quite challenging. Taken together, the prevalence of these two approaches, assessment of specific word learning through regular quizzes and monitoring of their use and retention in daily writing, indicate that most teachers aim for a systematic formal assessment of spelling, and also seek evidence that learned words transfer to writing activities.

Teachers' Reflections on the Teaching of Spelling

Teacher Confidence. Teachers were asked to indicate their confidence in teaching spelling, on a 5-point Likert-type scale which was coded from 0 (not confident at all) to 4 (very confident). Scores ranged from 2 (moderately confident) to 4 (very confident) with a mean score of 3.09 ($SD = 0.75$). There was no significant correlation between number of years teaching experience and confidence in teaching spelling.

Satisfaction with curriculum and instructional supports. When asked if spelling was adequately addressed in the curriculum, 43 teachers replied “no”. Chi-square tests revealed no significant difference in this rating between less-experienced teachers and those with more experience. When asked to evaluate the usefulness of the authorized resources on a scale of 0 (not important at all) to 3 (very important), not surprisingly, there was a significant-lower valuation ($t(21) = -2.45, p < .05$) of the authorized resources by these teachers ($M = 0.82, SD = 0.55$) than by those who believed that spelling instruction was adequately addressed in the curriculum ($M = 1.40, SD = 0.56$). Nonetheless, a series of chi-square tests indicated that regardless of overall approach to teaching spelling (planning words and activities in advance or teaching them as they arose in context), whether or not they used a supplemental spelling program, and the type of words of primary focus (theme-words, orthographic patterns, or misspelled words), teachers' dissatisfaction was not significantly different across groups.

The 43 teachers who stated they did not believe spelling was being adequately addressed in the curriculum were asked to explain their concerns and offer suggestions for improving programming. Most frequently ($n=20$) teachers suggested that a program should be made available and incorporate the scope and sequence of the English orthographic structure to ensure that children “cover the bases” of content knowledge necessary for being a competent and confident speller, and that in-service education ($n=7$) was needed. Related to this was the argument made by several teachers ($n=8$) for consistency across

grades, the district, and the province. One teacher stated that since all grade three children completed province-wide tests of language arts, consistency in the messages teachers received about how to teach spelling, and the resources provided for doing so, were important. One teacher posited that “teachers are left to their own devices” in deciding what to teach and how. Related to this concern was the concern of several teachers (n=10) that in the curriculum documents, learning outcomes for spelling were not sufficiently represented or valued.

One teacher noted that while she believed her instructional practices were perceived as “old school”, she felt that they were, nonetheless, the best approach for ensuring that her students received a thorough grounding in the principles underlying English spelling structure. Further, a number of comments (n=6) made suggesting that direct, systematic spelling instruction was frowned upon by the district administration, as well as comments (n=3) that spelling instruction too early can stifle creativity and hinder writing development, indicate that some teachers are conflicted about spelling instructional practices. These comments demonstrate that many teachers do not feel that at a district or department of education level, spelling receives sufficient attention. They also suggest that many teachers perceive a lack of clarity about what they are expected to teach and how. How can it be reconciled that teachers, overall, feel confident in teaching spelling, yet do not consider spelling to be adequately addressed in the curriculum? This is an important matter for consideration in the discussion section of this paper.

Discussion

This section is organized around the findings related to teachers’ beliefs about children’s spelling development, their instructional planning, their instructional practices, and their reflections on their teaching of spelling within their educational community. These beliefs, plans, practices, and reflections are discussed in relation to the curriculum documents and teaching resources authorized for use in the classroom.

Teachers’ Beliefs about Spelling Development and Instruction

Most teachers, regardless of grade level or years of experience, believed that spelling was important. These teachers cited practical purposes for spelling skill, such as being able to communicate ideas in writing effectively with others or for advancing one’s own reading ability. Several teachers, who rated spelling

as a skill of moderate to low importance, suggested that a focus on spelling compromised creativity. While a few studies (Gill, 1997; Ouellette & Sénéchal, 2008) suggest that encouragement of the use of invented spelling leads children to produce a greater volume of writing, it has not been demonstrated that creativity or progress in writing over the longer term is inhibited by an early introduction to conventional spelling instruction. The relationship and level of trust that children have with their teachers, not the method of spelling instruction, may be a more influential factor in children's willingness to engage in writing.

It was not entirely surprising that about 10% of respondents explicitly cited a concern that a focus on conventional spelling could be detrimental to the writing development of primary children. The provincial curriculum documents and authorized resources are strongly influenced by a holistic philosophy, and some indicate a rather tepid enthusiasm for the teaching of spelling. For example, *Spelling in Context* (1998) begins by stating, "Spelling is one of the less interesting and more laborious aspects of writing." (p.1). In another resource, *Spelling handbook for teachers* (1996) a poem entitled, *A literacy poem*, suggests that English orthography is illogical. A second poem, entitled *Why is English so hard?*, also suggests that English orthography is incomprehensible. Indeed, English has a deep orthography because it is rooted in Anglo-Saxon, Latin, Greek and other languages, and is shaped by the historical influences that have been brought to bear on these languages, over time (Moats, 2000). This leads many linguists and educators to argue, however, for the need for systematic, explicit instruction, instead of the opportunistic (as the need arises) approach (Chall, 1967, 1996; Henry, 2003; Moats, 2000; Snow, Burns & Griffin, 1998).

In *Invitations* (Routman, 1994), a provincially-approved and widely-distributed resource, however, the author argues for a holistic approach to spelling. She cautions, "Spelling should facilitate communication of written language, not limit it....The need for standard spelling should be kept in proper perspective....There should be no spelling curriculum or regular lesson sequences" (p. 238). The natural discovery method is advocated, through which children are posited to discover the rules of English orthography through their writing experiences and reflections. Teachers are advised, therefore, to conduct a mini-lesson of five to ten minutes duration if they notice several students making the same error (p.240).

Other resource documents, such as *Spelling: Sharing the Secrets* (Scott, 1993), also strongly support the discovery method, and advise against formal spelling instruction. Another resource—*First Steps Spelling Resource Book* (Rees, Kovalevs, & Dewsbury, 1994)—states, “This chapter [entitled *Teaching Graphophonics*] is based on the belief that a problem-solving approach to teaching phonics is far more powerful than teaching ‘letter’ stories and drilling ‘sounds’, because it teaches children strategies that they can use as independent learners” (p. 40). The association of phonics instruction with “drill” may indeed be rooted in the practices of the past; thus, the criticism may be a very valid one. Nonetheless, the evidence for direct instruction of letters and sounds is well documented (Adams, 1990; Chall, 1967, 1996; National Institute of Child Health and Human Development, 2000; Snow et al., 1998). Interestingly, the discovery method is also recommended by advocates of systematic instruction. However it differs markedly in that the teacher selects words in advance to highlight a specific orthographic pattern in a planned sequence of instruction with a view to the ‘big picture’ of teaching the scope of English orthography (Carreker, 2011; Moats, 2005).

Clearly, teachers believe that spelling is important, but hold differing views about its place in instruction. The mixed-messages given in the various authorized resources, as well as teachers own reflections on teaching and learning spelling, likely all play a role in the variance observed. While some teachers view formal instruction as an early foothold into higher-level writing, others view it as a potential detriment to the writing progress. For these teachers, standard spelling must be acquired, but it is not to be of major focus until the later grades. Irrespective of teachers’ views on the timing and method for teaching spelling, in this study teachers’ long-term instructional goals for spelling were similar, focusing predominantly on children’s mastery of English orthography through the acquisition of phonics knowledge, orthographic pattern recognition, and knowledge of rules and strategies and how to apply them.

Teachers’ Instructional Planning

The majority of teachers in this study chose words to be learned in advance, similar to the findings of Graham et al. (2008) and Johnston (2001). Overall, these words adhered to the criteria for selecting words that were widely recommended in the authorized resources: theme words, misspelled words, and

high-frequency words. Most of these teachers, however, also chose words from published programs. These teachers created word lists in advance, and majority of words on these lists were chosen to teach specific orthographic patterns. Thus, it is evident they were clearly striving to provide an orthographic framework for students to help demystify the complexities of English.

It is interesting to note that in the various resources provided to teachers, selection of words for ensuring comprehensive exposure to orthographic patterns in a systematic fashion is not mentioned. One resource, *Spelling in Context* (1998), does suggest the inclusion of “words that teachers know children need” (p. 24), which, presumably could include word possessing specific orthographic patterns if teachers deemed such words to be important. A later section of *Spelling in Context* on grapho-phonemics, acknowledges the role of phonics and other aspects of orthography in spelling, but provides no comprehensive list of these features or recommendations for sequencing of teaching. This may be a deliberate decision based on developmental spelling theory (Henderson, 1985) that emphasizes the individualized nature of spelling development. Problems may arise, however, when this theory is interpreted to mean that the planned teaching of spelling structure or sequence is pedagogically inappropriate.

Although the resources available to the teachers state a belief that phonics plays a role in spelling, and some offer selected examples of orthographic patterns and suggested activities, none state that phonics knowledge, and orthographic knowledge more broadly (including morphology), are central to children’s spelling progress and understanding of English orthography. Some of the recommended activities (e.g., word sorts suggested in *Spelling in Context*) are worthwhile for developing orthographic knowledge, and by extension could also be used to develop morphological and semantic awareness. Other suggestions in this resource are of questionable benefit to spelling development, such as using shape boxes to learn word spellings, and creating rebus representations of words. Morris, Blanton, Blanton, and Perney (1995) have also questioned the educational merit of some spelling activities in some context-based spelling resources for teachers.

The Implementation of Spelling Instruction

Based on their reports of the time spent engaged in teaching spelling, teachers see innumerable opportunities for teaching it, and spend what is perhaps an incalculable amount of time engaging in systematic instruction, incidental spelling instruction, or a combination of both, given the nature of teaching language arts. For those who did plan instructional time for spelling, the high proportion of planned time on average, 39 minutes per week, in relation to the overall estimated time engaged in spelling, 46 minutes per week, suggests that planned activities, whether teacher-directed, simple practice, or discovery-approach, were seen by teachers as an important component of their language arts instruction. The total instructional time is substantially less than the 90 minutes per week reported in the Graham et al. (2008) study. Both studies, however, reported very large amounts of variability of the time spent teaching spelling.

For some teachers, instruction occurred incidentally as teachers noticed that children encountered difficulty with spelling or when children asked for assistance with spelling in their writing. Most teachers, however, planned to teach specific word spellings, usually with associated planned activities beyond simply practicing spelling. The pattern of presenting words, examining their phonological and orthographic features, reviewing and applying rules, and practicing working with these words in activities and in their daily writing, suggests that teachers were striving to bring together systematic, explicit approaches and contextualized approaches.

Across the grades, teachers reported that about 29% of students experience greater-than-average struggle with spelling, similar to the literature on reports by American teachers ($M = 27\%$) across several states (Graham et al., 2008). The reported proportions of strugglers in grade one (25.65%) and grade two (23.32%) suggest that teachers, perhaps observing reasonably-phonetic but nonstandard spelling in many students, considered the majority of students to be making good progress. By grade three, however, where there was a higher average percentage of struggling spellers reported (40%), teachers may have judged spelling progress by students' ability to produce standard spellings for most words used in daily writing and on tests.

Indeed, the *English Language Arts Curriculum Guide – Primary* (1999) outcomes for transitional writers, described in the curriculum guide to typically

be children in grade three to five, state that children should spell many words conventionally and use dictionaries. The outcomes, however, for emergent writers (primarily kindergarten – grade one children) and early writers (grade one and two children) focus on having children take risks to attempt invented spellings and being able to correct a few misspellings. This difference in criteria for evidence of spelling achievement may explain why there was a significantly-higher proportion of grade-three children reported to be experiencing difficulty. Practically speaking, it is not unreasonable that grade three teachers would expect children near the end of their fourth year of education to have acquired a large corpus of words that they could correctly spell.

The similarity of teachers' level of adaptation of instruction across grade levels indicates that regardless of their estimation of how well their students were doing, most teachers' practices were rooted in helping children make progress at their individual level. The two most frequently-cited adaptations, reducing the number of words and/or varying the type of words so that simpler or fewer letter patterns are required to be studied at one time, are responsive to the developmental nature of orthographic understanding. Yet, these follow a plan that maps instructional sequence onto the orthographic structure of English. Planned instruction for struggling children that is responsive to students needs and informed by the structure of English orthography has been shown to support better progress than children in classrooms where instruction did not vary (Morris et al., 1995).

Teachers' Reflections on Spelling Instruction in Their Educational Community

The proportion of teachers dissatisfied with how spelling was addressed in the curriculum (78%) is similar to Johnston's (2001) finding that 73% of the American teachers surveyed were also dissatisfied. In the current study of Canadian teachers, the finding that teachers generally felt confident in teaching spelling is interesting in contrast to the fact that most were generally dissatisfied with how spelling is addressed in the curriculum. It may be that teachers who strongly adhered to a context-based approach, in which words were mainly taught by theme or as the need was perceived in the context of daily writing, feel affirmed by the tone and directives of the authorized curriculum documents. On the other hand, teachers who perceived a lack of instructional supports sought out additional resources, as evidenced by the finding that half of the teachers reporting using a supplemental program. Further, there was a

significantly lower valuation of the authorized resources for these teachers than for those who believed that spelling instruction was adequately addressed in the curriculum. Because these teachers cited the classification of words by patterns and the availability of worthwhile activities as two reasons why they used these resources, they likely also felt confident that spelling was being taught thoroughly. In spite of their confidence in their instruction, they identified some specific concerns including a need for increased valuation of spelling in the curriculum documents with more clearly-defined outcomes, the provision of an authorized program for spelling that teaches the structure of English words, and more in-service education to assist teachers in planning for differentiated instruction. Such concerns are also identified by American teachers (Fresch, 2007; Johnston, 2001).

Conclusion and Implications for Practice

The teachers in this study believed that spelling was important, and most planned to teach specific words often following planned activities. It was also reported that considerable numbers of children experience substantial difficulty with spelling, and that most teachers adapted instruction to help these students to learn using a wide variety of approaches. Many teachers sought to incorporate the teaching of English orthographic structure systematically in their teaching using supplementary resources in addition to following the contextualized approach as advocated in the authorized resources provided to teachers. These teachers held the view that their instruction would be more effective following a systematic approach. This makes sense in light of the research literature on learning to read. Numerous studies have shown that good readers do not rely primarily on context for accurate word reading but on knowledge of the phonological-graphemic-morphological structure of words, and that systematic instruction that focuses on teaching these structures is the most effective means of word recognition (Chall, 1967, 1996; Gough, 1983; Juel, 1991; National Reading Panel, 2000; Share & Stanovich, 1995). Many of the cognitive processes and knowledge stores utilized during reading and spelling are related (Ehri, 1997), but learning to spell is even more difficult than learning to read (Bosman & Van Orden, 1997; Frith, 1980; Invernizzi & Hayes, 2004; Joshi & Aaron, 1991).

There is little doubt that contextualized reading and writing instruction can provide engaging learning experiences to aid in the development of spelling.

Contextualized reading and writing experiences alone, however, are not sufficient for ensuring that children become good spellers; instruction that addresses the orthographic structure of English is also needed (Carreker, 2005; Graham & Santangelo, 2014; Moats, 2000). However, as Johnston (2001) reported, even when teachers were aware that their students' spelling skills were inadequate, they felt they lacked the resources and the knowledge needed to teach spelling more effectively. School districts should, thus, do more to ensure that curriculum documents be broadened to include support for explicit instruction, and that professional development in the teaching of spelling is provided. Professional development focusing explicitly on effective instructional practices has been shown to be predictive of student achievement (Wenglinsky, 2002). Teachers need to be provided with opportunities to acquire explicit knowledge of English orthography for planning instruction and for supporting the spelling development of all of their students. Professional development is often provided to teachers through "one-shot" types of workshops that then leave the classroom teacher alone thereafter to apply those ideas without any ongoing support, feedback, or avenue to discuss the implementation of those ideas in any professional manner. What is needed is for teachers to be provided on-going support, time to plan collaboratively, and the assistance from school administrators to implement effective instructional approaches (Fresch, 2003). One additional suggested approach is the use of facilitated discussion meetings specifically on the teaching of English orthography, the nature of their students' spelling errors, and how teachers might differentiate instruction for students at different levels (Fresch, 2003; Gill & Scharer, 1996).

Limitations and Directions for Future Research

Given the ethical parameters around the study, requiring that respondents be anonymous, it was not possible to contact respondents to clarify information provided or request responses to unanswered questions. It was also not possible to determine if those teachers who chose not to respond to the survey were categorically different than those who did, in ways that would impact the findings of the study. Unlike some published studies which compare respondents and non-respondents on demographic information using existing registries (Graham, Harris, Fink-Chorzempa & MacArthur, 2003), no lists of this nature are available for public access or purchase in the province in which the study was conducted.

This study, believed to be the first to examine spelling instruction practices in Canada, took a broad view of teachers' beliefs, practices and concerns about the teaching of spelling. As such, many critical topics remain to be more fully explored, especially instructional adaptations and teacher supports. This issue is particularly pertinent since, like their American counterparts, struggling students in Canada increasingly receive all or most of their instruction in the regular classroom. Future research is needed to examine how teachers can be supported in developing instructional practices for increasing students' explicit knowledge of orthographic structure and its effects on the spelling achievement of both typical and struggling students.

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Appendix A

Teacher Questionnaire about Spelling Instruction

BACKGROUND:

1. In what grade(s) do you currently teach language arts? Grade(s) Do you teach in a multi-grade classroom? Yes or No?
2. Including this year, how many years have you taught the grade(s) you currently teach?
3. Including this year, how many years of teaching experience do you have in total?
4. In what school district do you currently teach?
5. How many students do you teach? If you teach language arts in more than one grade this year, please mark your answers to note all of these grades.
6. About what percentage of students in your class(es) have greater than average spelling difficulty?

SPELLING INSTRUCTION IN YOUR CLASSROOM:

7. Circle one letter only for the statement that best describes your approach to teaching spelling:
 - a) I choose spelling words to be learned and plan activities to specifically examine the words' spellings. The students also practice spelling the words.
 - b) I choose spelling words to be learned, but do not plan activities to specifically examine the words' spelling. The students practice spelling the words.
 - c) I do not plan for specific words to be taught, but teach individual or groups of children about the spellings of the words, as the need arises.
 - d) I do not teach students to spell words.
8. Circle one letter only for the statement that best describes your main source of words for spelling instruction:
 - a) In advance, I choose words from lists in a published spelling program.
 - b) In advance, I choose words from themes under study in the classroom.

- c) In advance, I choose words from themes under study in the classroom, and words I notice that children frequently misspell or request help with.
 - d) In advance, I choose words from lists in a published spelling program and add words from themes under study in the classroom, and words I notice that children frequently misspell or request help with.
 - e) In advance, I choose words I notice that children frequently misspell or request help with.
 - f) I do not choose words in advance, but teach words to children, as the need arises.
 - g) Not applicable because I do not teach students to spell words
9. a. If you answered either b, c, d, or e for question 8 (you create your own lists of words or add words to a list from a spelling program) please answer the following question: Are there any other factors, not mentioned above that influence your choice of spelling words? Yes or No?
- b. If yes, please explain.
10. a. On average, how many minutes per week do you engage in spelling instruction?
- b. How many of these minutes involve planned direct instruction by you?
11. Which type of spelling words make up the majority of words you teach? Please circle one:
- | | | |
|----------------------|----------------------------------------------------------------|---------------------------|
| theme/reading words, | words with certain patterns/rules e.g., silent letters, blends | commonly-misspelled words |
|----------------------|----------------------------------------------------------------|---------------------------|
12. Please indicate if you have the following resources and their importance in your instructional planning:

Resources for teaching spelling	Do you have this resource? Circle one:	If yes, how important is this resource in your teaching? Circle one:	If yes, why do you think this resource is very important, somewhat important or not important?
Grade-level spelling program with units of words and activities	Yes No	Very important Somewhat important Not important	

Dept. Education guides for teaching spelling <i>Please list the title:</i>	Yes No	Very important Somewhat important Not important	
In-service on spelling that included handouts or other materials. If yes, about how long ago was it? ____ years	Yes No	Very important Somewhat important Not important	
Other resource (Describe)	Yes	Very important Somewhat important Not important	

13. If you use a published spelling program with word lists, what is the name of the program you use?
14. If you use a published spelling program with word lists do you know why that particular program was chosen?
15. If you use a published spelling program, why do you use it?
16. If you use a published spelling program do the other teachers in the primary grades in your school also use this spelling program? Please circle one:

yes
no
I don't know
some teachers use a
different published program
17. About how often do you begin studying a new group of words? Please circle one:

every week
every two-weeks
every month
less often than once a
month
18. Do you use the same words and instructional approaches for all your students? (If you teach in a multi-grade setting, this question applies to students in the same grade). Yes or No?
19. If you answered "no" to question 18, please explain what you do differently for different students.
20. Describe the main spelling instructional approaches that you use (steps and activities).
21. How often do you use to measure your students' spelling progress? Please circle one:

every week
every two-weeks
every month
less often than
once a month

22. Briefly describe how you measure your students' spelling progress.

YOUR OPINIONS ABOUT SPELLING:

23. a. On a scale of one to five (1 = very unimportant and 5 = very important) how important do you think spelling is in children's language arts development? Circle One: 1 2 3 4 5
- b. Why do you think so?
24. In your opinion, what kinds of knowledge and skills do you think are important for becoming a good speller?
25. What do you want your students to gain through spelling-related instructional activities?
26. On a scale of one to five (1 = not confident at all and 5 = very confident) how confident are you in teaching spelling? Circle One: 1 2 3 4 5
27. a. Is spelling instruction adequately addressed in the curriculum? Yes or No?
- b. If you answered no, please comment on how you would recommend improving the teaching/learning of spelling in the primary grades.

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Methodological Status and Trends in Expository Text Structure Instruction Efficacy Research

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Abstract

This systematic descriptive historical review was conducted to examine the status and trends in expository text structure instruction efficacy research for first through twelfth grade students. The analysis included sixty studies, which spanned the years 1978 to 2014. Descriptive dimensions of the research included study type, research design, treatment fidelity, school level, number of participants, service delivery settings, and comprehensiveness of demographic reporting, text structure instruction, and measurement. Researchers primarily used randomized and quasi-experimental research designs. Analysis of results revealed that (a) a relatively large number of text structure efficacy research studies have been conducted, (b) complete demographic information was difficult to ascertain for many of the participants, (c) researchers of few studies instructed students in all five expository text structures, (d) treatment fidelity data were often missing, and (e) researchers rarely used both direct and indirect measures of effects. Limitations of the analysis and future research directions are discussed.



Methodological Status and Trends in Expository Text Structure Instruction Efficacy Research

Text structure refers to the organization of information within both narrative and expository text (Kintsch, 1974; Meyer, 1975). Recognizing and understanding narrative and expository text structures helps the reader mentally organize and comprehend the story or information presented by the author (Meyer, 1987; Spires, Gallini, & Riggsbee, 1992; Wijekumar, Meyer, & Lei, 2012; Williams et al., 2005). Although there are some variations, narrative text includes a common structure centering on a setting, set of characters, problem, and resolution (Mandler & Johnson, 1977). This text structure is independent of the story; although the plot changes from story to story, the structure of narrative text remains constant.

In contrast, there are five commonly referenced expository text structures that vary and are inseparable from the content: compare/contrast, cause/effect, problem/solution, description, and sequence (Meyer, 1975, 1985). Authors use *compare/contrast* to point out similarities or differences, *cause/effect* to show a causal relationship, *problem/solution* to organize the text into a problem part and an attempted solution to the problem, *description* to state attributes or specify setting information, and *sequence* to group ideas on the basis of order or time. Depending upon the information being conveyed, authors of expository text may use multiple expository text structures in the same passage, switch abruptly from one structure to the next, or embed one text structure within another text structure (Englert & Hiebert, 1984).

Students who approach text without an awareness of these five structures, are less likely to recognize and recall important information (Meyer, Brandt, & Bluth, 1980; Snow, 2002). Further, research indicates that teaching strategies for identifying features of expository text structures are effective for improving reading comprehension (Gersten, Fuchs, Williams, & Baker 2001; Williams & Pao, 2011). However, without a structured review of the literature, the generalizability of this research is unclear. Knowing more about the history of text structure intervention research (e.g., types of designs, number and school level of participants, service delivery setting, and comprehensiveness of instruction) can guide practitioners and future research. Thus, it is of educational significance and interest to conduct a historical analysis of the

methodological status and trends in expository text structure instruction efficacy research. Efficacy research considered were those studies in which researchers used a randomized control trial, quasi-experimental, or single subject design to assess the effects of text structure instruction on the reading comprehension of students.

To date, it appears that four unsystematic narrative reviews of expository text structure instruction efficacy research have been completed (Meyer, 1979, 1987; Meyer & Ray, 2011; Slater, 1988). Meyer (1979) conducted the first review of expository text structure instruction efficacy research. This review was restricted to her work on expository text base analyses that led to her identification of the five expository text structures (i.e., compare/contrast, cause/effect, problem/solution, description, sequence), as well as her efficacy research on text structure instruction. She summarized several of her observational text structure studies and her students' experimental dissertation efficacy studies. The primary conclusion she drew was that teaching students expository text structures significantly improves both immediate and delayed recall of informational text for most students.

In a second review, Meyer (1987) updated her first review by including additional studies conducted during the interim time period. She summarized multiple studies on readers' understanding and use of text structures and described text structures as an additional schema in which to place newly learned information. She also reported that some text structures (i.e., compare/contrast, cause/effect, problem/solution) are more complex than others and may assist comprehension to a greater degree. The primary conclusion she drew was that text structure instruction improves comprehension of expository text and that it appears skilled readers use text structures more effectively than poor readers.

Slater (1988) provided a broader picture of expository text structure research by widening the scope beyond studies conducted by Meyer and colleagues. In his review, he included a discussion of the elements of good expository text, as well as a narrative summary of the research on expository text structure instruction. He stated five findings specific to expository text structure instruction research. First, as a student's age increases, so does their ability to use expository text structures to comprehend text. Second, students who use expository text structures remember more of what they read than

those who do not. Third, students can be taught to effectively identify expository text structures. Fourth, students who learn to use expository text structures are better able to comprehend informational text. Fifth, students who fail to use expository text structures do not perform as well on unfamiliar topics as they do on familiar topics.

Meyer and Ray (2011) built on and extended Meyer's two previous narrative reviews (1979, 1987) by providing a selective review of efficacy research on expository text structure instruction conducted by herself and other researchers. They drew two primary conclusions regarding expository text structure instruction efficacy research. First, expository text structure instruction aids comprehension of informational text. Second, the positive effects of expository text structure instruction extend to elementary-aged students and English language learners. Although these conclusions are important, a more systematic look at the methods and samples used in previous research efforts is needed to fully understand the generalizability of text structure instruction and guide future research.

It appears that no systematic analysis of the expository text structure efficacy research has been conducted to date. Therefore, the purpose of this review was to conduct a systematic descriptive historical analysis of the methodological trends of expository text structure instruction efficacy research. We conducted this analysis to inform researchers about the status and trends in the research methodologies used to assess the efficacy of text structure instruction on student reading comprehension (e.g., type of experimental designs, characteristics of participants, service delivery setting, the type and number of text structures taught, dependent measures). The findings from this review can be used to guide future expository text structure instruction efficacy research. The following questions guided this descriptive historical analysis:

1. What number and types (i.e., peer reviewed, non-peer reviewed) of studies were described in the literature?
2. What types of experimental designs (i.e., randomized control trial, quasi-experimental, single subject) were used to assess the efficacy of text structure instruction?
3. Was treatment fidelity reported?
4. What was the total number and school level (i.e., elementary,

middle, high school) of participants?

5. What was the service delivery setting (i.e., instruction in regular or support classrooms)?
6. Was comprehensive demographic information reported (i.e., reported gender, socioeconomic status (SES), ethnicity, student status)?
7. Was comprehensive text structure instruction provided to students (i.e., all five text structures were taught; compare/contrast, cause/effect, problem/solution, description, and sequence)?
8. Was a comprehensive approach to measurement used to assess expository reading comprehension (i.e., researchers used both direct and indirect measures)?

Method

Definition of Database and Search Procedures

We conducted this database search simultaneously with a search for studies for a related meta-analysis (Hebert, Bohaty, Nelson, & Brown, 2015). Different inclusion criteria were used for each study, but the search terms and procedures were identical. Two authors identified articles through computer database and reference list searches from the earliest dates available through January 2014. Specifically, a computer search using key words related to text structure instruction and reading comprehension was conducted from six databases. These included ERIC, PsychINFO, Academic Search Premier, ProQuest (including Dissertation Abstracts International), Education Index Retrospective, and Web of Science (which includes 3 searchable databases: Science Citation Index Expanded, Social Science Citation Index, and Arts and Humanities Citation Index). Initially, keywords used in the computer searches were text structure, expository, informational, nonfiction, reading comprehension, compare contrast, sequence, problem solution, and cause and effect. Following the documentation of several relevant studies, additional keywords were identified. Keywords used in subsequent searches included top-level structure, structure strategy, attribution, adversative, enumeration, enumerative, covariance, matrix, generalization, explanatory, response, collection, claim-counterclaim, claim-support-conclusion, simple listing, ordered

listing, topical net, hierarchy, linear string, falling dominos, and branching tree.

The computer searches yielded 3,121 articles. The authors reviewed the titles and abstracts for these articles. Articles that appeared to match the targeted area based on their title and/or abstract were obtained for further review. A title search using the obtained articles' reference lists served to identify additional potential studies. The abstracts of these papers were then reviewed. A total of 337 potential articles were identified through this process. Three authors independently read each article to determine if the study met the pre-identified inclusion criteria (see below). The authors then met and discussed the decisions. The percentage of total agreement was 95 %. Three disagreements were resolved through discussion.

Duplicate studies published or unpublished in multiple formats (e.g., dissertations that were later published in a peer-reviewed journal) were identified during the search. In these cases, both reports were used to make determinations for inclusion and results. For citation purposes, the original work was cited when non-peer reviewed studies were later presented in another non-peer reviewed format. For coding purposes, non-peer-reviewed studies were coded as peer-reviewed when they were later published in a peer-reviewed scholarly journal. For example, a dissertation study (e.g., Alvermann, 1980) later published in a peer-reviewed journal (e.g., Alvermann, 1981) was designated as peer-reviewed. We identified 18 duplicate studies.

Inclusion and Exclusion Criteria

We included articles published in both peer reviewed scholarly journals and non-peer reviewed outlets (e.g., dissertations, book chapters), as well as studies involving text structure instruction in reading, writing, or both reading and writing. Otherwise, studies were required to meet our inclusion and exclusion criteria.

Studies were included in the review if:

1. The study was an original efficacy trial.
2. The researchers employed a randomized control trial, quasi-experimental, or single subject design. Randomized control trials included experiments with randomization at the student level as well as cluster-randomized designs. Quasi-experiments included nonequivalent control group designs and counterbalanced

designs. Single subject designs included reversal (ABAB) and multiple-probe across participants.

3. Study participants were in the first through twelfth grades.
4. Treatments involved instruction in expository text structures as operationalized by Meyer (1975, 1985). These five text structures included: compare/contrast, cause/effect, problem/solution, description, and sequence.
5. Text structure instruction took place in regular education or support classrooms (e.g., special education, Title I, literacy support, English learner).
6. At least one outcome measure assessed expository reading comprehension (the measures could be researcher created or norm-referenced).

Studies were excluded from the review for the following reasons:

1. Other conceptualizations of writing structure were used (e.g., hierarchical structure of text, Taylor, 1982; argumentative structure of text, Haria, 2010).
2. Study used a qualitative design or presented only qualitative data (e.g., Bellows, 1994).

Sixty journal articles, dissertations, book chapters, technical reports, research series, and conference papers met the criteria for inclusion in this analysis. Each study is noted with an asterisk in the References section.

Coding Procedures

Operational definitions and an associated coding form were developed to record information contained in the articles. Articles were coded using the following criteria:

- *Type of study.* Study Type was categorized as either peer reviewed or non-peer reviewed.
- *Type of experimental design.* Experimental design was categorized as randomized control trial, quasi-experimental, or single subject.
- *Treatment fidelity reported.* Treatment fidelity was categorized as reported or not reported. We coded fidelity as being reported if

researchers reported, gave qualitative information about, or simply stated that they collected fidelity data. Not reported referred to no evidence presented of teachers being observed during instruction.

- *Total number and school level of participants.* The total number of students was recorded. School level was categorized as elementary, middle, or high school. Elementary referred to the number of participants in grades 1-5, middle school referred to the number of participants in grades 6-8, and high school referred to the number of participants in grades 9-12 who completed the study.
- *Service Delivery setting.* Service delivery setting was categorized as regular education or support setting (e.g., special education, Title I, literacy support, English learner).
- *Comprehensive demographic reporting.* Demographic reporting was categorized as comprehensive if researchers reported the gender, SES, ethnicity, and student status of the specific participants in the study. Demographics were classified as not comprehensive if only three or fewer demographic characteristics were reported. Demographic characteristics were considered to be reported if they met the following criteria:
 - *Gender:* The number or percentage of males and females was reported.
 - *SES of Participants:* The number or percentage of participants receiving free or reduced lunch was reported.
 - *Ethnicity:* The number or percentage of participants from ethnic groups was reported.
 - *Student status.* The number or percentage of participants in regular education, special education, English learner, and/or Title 1 was reported.
- *Comprehensive text structure instruction.* Text structure instruction was categorized as comprehensive or not comprehensive. Comprehensive referred to instruction that taught students all five

expository text structures (i.e., compare/contrast, cause/effect, problem/solution, description, and sequence) conceptualized by Meyer (1975, 1985). Not comprehensive referred to instruction that taught students four or fewer of the text structures.

- *Comprehensive approach to measurement.* Approach to measurement was categorized as comprehensive or not comprehensive. Comprehensive measurement referred to those studies in which researchers used both direct (i.e., researcher developed measures aligned directly with the intervention effects) and indirect (i.e., norm-referenced measures not aligned directly with the intervention effects) outcome measures. Not comprehensive measurement referred to those studies in which researchers used either direct or indirect outcome measures, but not both.

Following the development of the criteria and coding forms, two coders recorded data independently on 41 (68%) of the articles. Inter-observer agreement for each category on the coding form was calculated by dividing the number of agreements by the total number of possible agreements and multiplying by 100. Agreement by category was 100% for study type, 95% for experimental design, 95% for treatment fidelity reported, 98% for school level of participants, 88% for service delivery setting, 100% for demographic reporting, 85% for text structure instruction, and 99% for approach to measurement. The two coders reconciled disagreements through discussion.

Time Periods

Publication years for the 60 identified articles ranged from 1978 to 2014. The authors chose 1978 as a starting point because this was the earliest study found. For comparison purposes, we decided to report data in terms of three equal time periods of 12 years. However, one study with an advanced online publication in 2013 (Williams et al., 2014) was published in a journal in 2014. Also, following a conference poster presentation at the Society for the Scientific Study of Reading, 2014, we were contacted about an additional study that was in press (Wijekumar et al., 2014), which was included. Thus, the final time period spanned an additional year relative to the first two time periods. The three time periods for this historical review were 1978-1989, 1990-2001, and 2002-2014.

Although these three time periods were somewhat arbitrarily chosen to

establish comparative time lengths, these dates coincide with two policy and practice changes that were likely to impact literacy research. The advent of Reading First in early 2000 caused an emphasis in the use of decoding based reading practices within multi-tiered models of instruction. As a result, we anticipated that the focus of researchers would shift to the development of basic reading skill interventions and less of an emphasis on comprehension of informational text. Additionally, the Education Sciences Reform act of 2002 had an effect on methodological quality. Thus, we expected the quality of educational research to improve with the establishment of the Institute of Education Sciences (IES).

Results

The eight guiding questions were used to organize the results. The results across the three time periods for each question are summarized in Table 1 and described below.

1. What Number and Types of Studies were Described in the Literature?

A total of 60 efficacy studies were conducted between 1978 and 2014. A majority of the studies (80%) were completed during the 1978-1989 ($n=23$) and 2002-2014 ($n=25$) time periods. The remaining 12 studies were conducted during the 1990-2001 time period. Twenty-seven (45%) of the 60 studies were peer reviewed; whereas, the remaining 33 studies were not peer reviewed. The relative ratio of peer reviewed to non-peer reviewed studies within each of the time periods increased across the 1978-1989 (8 of 23), 1990-2001 (5 of 12), and 2002-2014 (14 of 25) time periods.

2. What Types of Experimental Designs were Used to Assess the Efficacy of Text Structure Instruction?

Researchers of 28 (47%) of the 60 efficacy studies used randomized experimental designs, 30 (50%) used quasi-experimental designs, and 2 (3%) used single subject designs. The relative ratio of randomized experimental to quasi-experimental designs within each of the time periods remained relatively stable across the 1978-1989 (10 of 23), 1990-2001 (6 of 12), and 2002-2014 (12 of 25) time periods. The two single-subject design studies (Carnahan & Williamson, 2013; Nealy, 2003), were conducted during the 2002-2014 time period.

3. Was Treatment Fidelity Reported?

Table 1. Study Characteristics for the 1978-1989, 1990-2001, and 2002-2014 Time Periods

1978-1989									
Comprehensive									
Citation	Study Type	Design	Treatment Fidelity Reported	School Level	Number of Participants	Delivery Setting	Demographic Reporting	Text Structure Instruction	Approach to Measurement
Alvermann, 1981	PR	Rand.	No	HS	24	SS	No	No ₂	No
Alvermann, 1982	PR	Rand.	No	HS	30	NR	No	No ₁	No
Alvermann & Boothby, 1986	PR	Rand.	Yes	E	24	RE	No	No ₁	No
Armbruster & Anderson, 1980	NPR	Quasi	No	HS	54	NR	No	No ₄	No
Armbruster et al., 1987	PR	Quasi	No	E	82	RE	No	No ₁	No
Bartlett, 1978	NPR	Quasi	No	HS	102	RE	No	No ₄	No
Bartlett et al., 1981	NPR	Quasi	No	E	54	RE	No	No ₄	No
Boothby & Alvermann, 1984	PR	Quasi	No	E	38	RE	No	No ₂	No
Clewell, 1981	NPR	Rand.	Yes	MS	60	NR	No	No ₁	No
Coleman, 1983	NPR	Rand.	No	HS	116	SS	No	No ₂	No
Duffy, 1985	NPR	Rand.	No	MS	45	SS	No	Yes	No

Table 1 (cont'd.)

Comprehensive									
Citation	Study Type	Design	Treatment Fidelity Reported	School Level	Number of Participants	Delivery Setting	Demographic Reporting	Text Structure Instruction	Approach to Measurement
Gould, 1987	NPR	Quasi	No	E & MS	74 & 119	RE	No	No ₄	No
Hickerson, 1986	NPR	Quasi	No	MS & HS	60 & 60	RE	No	Yes	No
Raphael et al., 1986	NPR	Quasi	No	*E	159	RE	No	No ₂	No
Raphael & Kirschner, 1985	NPR	Quasi	No	MS	45	RE	No	No ₁	No
Reasor, 1988	NPR	Quasi	No	E	56	RE	No	No ₃	No
Reese, 1988	NPR	Rand.	No	HS	32	RE	No	Yes	No
Richgels & McGee, 1989	NPR	Rand.	No	E	58	RE	No	No ₂	No
Samson, 1982	NPR	Quasi	No	HS	61	RE	No	No ₂	No
Slater et al., 1985	PR	Rand.	No	HS	224	RE	No	No ₂	No
Smith & Friend, 1986	PR	Quasi	No	HS	54	SS	No	Yes	No
Taylor, 1985	PR	Rand.	No	MS	93	RE	No	No ₁	No
Weisberg & Balajthy, 1989	NPR	Quasi	No	HS	32	SS	No	No ₁	No

Table 1 (cont'd.)

1990-2001									
Comprehensive									
Citation	Study Type	Design	Treatment Fidelity Reported	School Level	Number of Participants	Delivery Setting	Demographic Reporting	Text Structure Instruction	Approach to Measurement
Armbruster et al., 1991	PR	Quasi	No	E	365	RE	No	Yes	No
Bakken et al., 1997	PR	Rand.	No	MS	54	NR	No	No ₂	No
Dickson, 1994	NPR	Quasi	Yes	MS	96	RE	No	No ₁	No
Englert et al., 1991	PR	Rand.	Yes	E	183	RE	No	No ₂	No
León & Carretero, 1995	PR	Rand.	No	HS	72	RE	No	No ₃	No
McDermott, 1990	NPR	Quasi	No	E	66	RE	No	No ₂	No
McLaughlin, 1990	NPR	Rand.	No	E	68	NR	No	No ₁	No
Moore, 1996	NPR	Quasi	No	MS	77	RE	No	No ₂	No
Spires et al., 1992	PR	Rand.	No	E	74	RE	No	No ₂	No
Troyer, 1994	NPR	Rand.	No	E & MS	123 & 50	RE	No	No ₂	No
Walker, 1991	NPR	Quasi	No	E	92	RE	No	Yes	No
Whittaker, 1992	NPR	Quasi	No	MS	48	RE	No	No ₂	No

Table 1 (cont'd.)

2002-2014									
Comprehensive									
Citation	Study Type	Design	Treatment Fidelity Reported	School Level	Number of Participants	Delivery Setting	Demographic Reporting	Text Structure Instruction	Approach to Measurement
Brimmer, 2004	NPR	Quasi	No	MS	57	RE	No	Yes	No
Broer et al., 2002	PR	Quasi	No	MS	354	RE	No	No ₁	No
Carnahan & Williamson, 2013	PR	Single	Yes	MS	3	RE	No	No ₁	No
Gentry, 2006	NPR	Rand.	Yes	E	57	SS	No	Yes	No
Hall et al., 2005	PR	Rand.	Yes	E	72	RE	No	No ₁	No
Hammann & Stevens, 2003	PR	Quasi	No	MS	63	RE	No	No ₁	No
Hoffmann, 2010	NPR	Quasi	No	E	162	RE	No	No ₁	Yes
McCormick, 2006	NPR	Rand.	Yes	MS	96	RE	No	No ₂	No
Meyer et al., 2002	PR	Rand.	No	E	60	RE	No	No ₂	No
Meyer et al., 2011	PR	Rand.	No	E	131	RE	No	No ₂	Yes
Meyer et al., 2010	PR	Rand.	No	E & MS	56 & 55	RE	No	No ₂	Yes
Nealy, 2003	NPR	Single	Yes	MS	4	SS	No	Yes	No
Newman, 2007	NPR	Quasi	Yes	E	77	RE	No	No ₃	No

Table 1 (cont'd.)

Comprehensive									
Citation	Study Type	Design	Treatment Fidelity Reported	School Level	Number of Participants	Delivery Setting	Demographic Reporting	Text Structure Instruction	Approach to Measurement
Ocasio, 2006	NPR	Quasi	No	E	58	SS	No	No ₄	No
Reynolds & Perin, 2009	PR	Quasi	Yes	MS	121	RE	No	No ₁	No
Russell, 2005	NPR	Quasi	Yes	HS	40	RE	No	No ₄	No
Scott, 2011	NPR	Quasi	No	MS	205	RE	No	No ₃	No
Ulper & Akkok, 2010	NPR	Quasi	No	MS	28	NR	No	No ₁	No
Wijekumar et al., in press	PR	Rand.	Yes	E	2173	RE	No	Yes	Yes
Wijekumar et al., 2012	PR	Rand.	Yes	E	1900	RE	No	Yes	Yes
Wilkins, 2007	NPR	Quasi	No	MS	30	SS	No	No ₁	No
Williams et al., 2005	PR	Rand.	Yes	E	128	RE	No	No ₁	No
Williams et al., 2007	PR	Rand.	Yes	E	35	RE	No	No ₁	No
Williams et al., 2014	PR	Rand.	Yes	E	197	RE	No	No ₁	No
Williams et al., 2009	PR	Rand.	Yes	E	215	RE	No	No ₁	No

Treatment fidelity was reported in 18 (30%) of the 60 studies. The relative proportion of studies that reported treatment fidelity increased across the 1978-1989 (2 of 23), 1990-2001 (2 of 12), and 2002-2014 (14 of 25) time periods.

4. What was the Total Number and School Level of Participants?

A total of 9,501 K-12 students served as participants in the 60 efficacy studies. Of these, 1,756 (19%), 1368 (14%), and 6,377 (67%) served as participants during the 1978-1989, 1990-2001, and 2002-2014 time periods, respectively. It is important to note that two studies conducted during the 2002-2014 time periods were comprised of 1,900 4th grade students and 2,173 5th grade students (See Table 1). These two studies account for a relatively large proportion of the participants during this time period. Of the 9,501 total participants, 6,861 (72%) were enrolled in 1st-5th grades, 1,763 (19%) in the 6th-8th grades, and 877 (9%) in the 9th-12th grades.

There were noticeable changes in the grade levels of participants across the three time periods. A majority (69%) of the participants were enrolled in the 6th-12th grades during the 1978-1989 time period. In contrast, a majority of the students were enrolled in 1st-5th grades during the 1990-2001 (71%) and 2002-2014 (83%) time periods. Note that eliminating the 1,900 4th grade students and the 2,173 5th grade students who participated in the two studies conducted by Wijekumar and colleagues (2012, 2014, respectively), would result in similar percentages of 1st-5th (54%) and 6-12th (46%) grade participants during the 2002-2014 time period. Additionally, the percentage of students enrolled in the 6th-8th grade during the 1978-1989, 1990-2001, and 2002-2014 time periods was 24%, 24% and 16%, respectively.

5. What was the Service Delivery Setting?

Researchers of six studies did not report the service delivery setting. Of the remaining 54 studies, researchers of 45 studies reported instruction was delivered in general education settings; while, 9 reported instruction was delivered in support settings (e.g., special education, literacy support). Based on the 54 studies in which setting was reported, it did not appear there were substantive changes in the relative proportion of studies in which instruction was delivered in general education or support settings over time. The ratio of studies in which instruction was provided in a general education setting across

the 1978-1989, 1990-2001, and 2002-2014 time periods were 15 of 20, 10 of 10, and 20 of 24, respectively.

6. Was Comprehensive Demographic Information Reported?

Comprehensive demographic reporting was not provided by any researchers of the 60 studies. Few researchers reported substantial demographic information on even the most rudimentary characteristics of the participants. For example, the percentage of studies in which researchers reported the gender of participants across the 1978-1989, 1990-2001, and 2002-2014 time periods was 26%, 50%, and 48%, respectively. Across all studies, researchers reported gender in 24 studies (40%), SES in 3 studies (5%), ethnicity in 11 studies (18%), and student status in only 2 studies (3%). Thus, we could not provide detailed information about participant demographics.

7. Was Comprehensive Text Structure Instruction Provided to Students?

Researchers of 11 of the 60 studies (18%) examined the effects of comprehensive text structure instruction (i.e., taught students all five text structures). Four of these studies were conducted during the 1978-1989 time period, two during the 1990-2001 time period, and five during the 2002-2014 time period. Researchers taught four or fewer text structures in the remaining 49 studies. Of these 49 studies, researchers examined the effects of teaching one ($n=21$, 35%), two ($n=18$, 30%), three ($n=4$, 7%), or four ($n=6$, 10%) text structures.

8. Was a Comprehensive Approach to Measurement Used to Assess Expository Reading Comprehension?

Overall, researchers of 5 of the 60 studies (8%) used a comprehensive approach to measurement (i.e., used both direct and indirect outcome measures). All of these studies were conducted during the 2002-2014 time period. Researchers of three studies (5%) used only indirect (standardized) outcome measures of comprehension. One of these studies was conducted in the 1978-1989 time period, while the remaining two were conducted during the 2002-2014 time period. Only direct outcome measures were used by researchers of the remaining 52 studies.

Discussion

Reading is a crucial skill used to gain content knowledge and

information (National Reading Panel, National Institute of Child Health, & Human Development, 2000). The multiple and varied uses of text structures by authors within a section, chapter, or book presents a challenge to readers' comprehension of expository text (Englert, Okolo, & Mariage, 2009). Expository text structure instruction is recommended to enhance the abilities of readers to comprehend expository text (Dickson, Simmons, & Kameenui, 1998; Duke & Pearson 2008; Ehren, 2005). Meyer (1975, 1985) identified and described five text structures commonly used by authors of expository text: compare/contrast, cause/effect, problem/solution, description, and sequence. Researchers in the literacy field have conducted research on the effects of teaching expository text structures using students' comprehension of informational text for over three decades. This systematic descriptive historical analysis was undertaken to investigate the methodological status and trends in the expository text structure instruction efficacy research. This analysis revealed three positive findings related to the number of efficacy studies and associated participants and four problem areas related to demographic reporting, comprehensive instruction, treatment fidelity, and measurement.

Number of Studies and Associated Participants

Positive findings that emerged from this historical analysis center on the number of efficacy studies conducted to date and the number of participants and varied school levels included in each. A total of 60 diverse expository text structure instruction efficacy studies conducted since 1978 were identified. These studies included 9,501 first through twelfth grade students. These groups of students were comprised of a somewhat balanced number of elementary, middle, and high school students. Although there appears to be no established metric for assessing comprehensiveness of a body of research, our sense is that this body of work on a specific approach to enhancing expository reading comprehension is relatively large.

Comprehensive Demographic Information

A problematic finding of importance that emerged from our analysis is how little we know about the participants in these studies. Knowing the characteristics of the participant sample is necessary to generalize to a target population (Campbell & Stanley, 1963; Cook & Campbell, 1979; Gersten et al., 2005). As noted previously, researchers generally reported very little

information on the sample characteristics. In some cases, researchers only provided demographic information about the school(s) in which the study was being conducted but not for the study sample. For example, Williams, Stafford, Lauer, Hall, & Pollini (2009) reported demographic information on the free and/or reduced lunch status, special education status and ethnic make-up of the schools in which the study was conducted. However, this information was not provided for the study sample.

Comprehensive Text Structure Instruction

Another problematic finding from this historical analysis is that researchers of only a few studies assessed the effects of comprehensive text structure instruction (i.e., taught all five text structures). Authors of expository text use multiple text structures to communicate information (Meyer, 1975) and often quickly switch from text organized in one structure, to another structure in adjoining sections of the text (Englert et al., 2009). Thus, we believe that expository text structure instruction should be comprehensive in nature if we are to provide students with a complete understanding of how to comprehend expository text. Researchers of only 11 of the 60 studies reviewed provided students comprehensive text structure analysis. Researchers of a majority of the studies ($n=39$) taught only one or two text structures.

Treatment Fidelity

Another finding we view as problematic is how few researchers reported any form of qualitative or quantitative treatment fidelity data. Without treatment fidelity, no understanding of the effect of the treatment on the dependent measures can be made (Gresham, MacMillan, Beebe-Frankenberger, & Bocian, 2000; Hagermoser Sanetti & Kratochwill, 2009). In this analysis, the overall percentage of studies in which researchers reported treatment fidelity (30%) was low. Although the reporting of treatment fidelity increased during the most recent 2002-2014 time period, over 40% of researchers still did not report treatment fidelity. This is surprising given the interest in and requirement to provide information on treatment fidelity (Martella, Nelson, Morgan, & Marchand-Martella, 2013).

Comprehensive Approach to Measurement

A final problematic finding of this historical analysis is the low number

of studies in which researchers used both direct and indirect comprehension outcome measures. Direct measures are typically developed by the researcher to align directly with the text structure instruction effects; whereas, indirect measures are typically norm-referenced and not aligned directly with the treatment effects. Including both direct and indirect outcome measures is an essential indicator of the quality of the study outcomes (Gersten et al., 2005). Furthermore, the Institute of Education Sciences “What works procedures and standards manual” (What Works Clearinghouse, 2009) cautions against studies that rely solely on measures that are overly aligned with treatment effects. In this analysis, researchers of only five studies used both direct and indirect comprehension outcome measures. Researchers tended to rely primarily on direct outcome measures, aligned with the expository text structure instruction being assessed.

Limitations, Implications, and Future Research

There are a variety of limitations in this study. First, our historical analysis was based on the expository text structures articulated by Meyer (1975, 1985). Although the results of our search suggest that her conceptualizations of five common expository text structures have been used to guide a majority of the efficacy research of expository text structure instruction, the use of a different conceptualization may have resulted in different search results. For example, Chambliss and Calfee (1998) identified three purposes for expository writing: to inform, argue, and explain. Several rhetorical patterns are associated with each purpose (e.g., informative texts can be organized according to descriptive or sequential patterns.) Related to this matter, various terms are often used for each text structure (e.g., adversative for compare/contrast, falling dominoes for cause/effect). Although we were as comprehensive as possible, we may have inadvertently excluded terms like those that would have yielded different search results. Second, by using only studies that included a reading comprehension measure rather than including writing quality, identification of text structures, or qualitative data, we may have missed important information about students’ understanding and use of expository text structures related to other vital components of literacy. Finally, the data presented should be considered within the strictly descriptive parameters that comprised the methodology.

Despite the aforementioned limitations, there were some noteworthy

observations regarding expository text structure instruction efficacy research that act as an impetus for increased attention in future efficacy research in this area. Based on the findings of this historical analysis, we make the following suggestions:

- Increase and improve reporting of participant demographics (e.g., ethnicity, gender, subsidized lunch status; English language learner status, special education status).
- Include participants of more varied backgrounds (e.g., students with learning disabilities, English language learners).
- Incorporate both direct and indirect outcome measures (i.e., studies in which measures aligned directly and indirectly with the intervention are used to assess intervention effects).
- Conduct more comprehensive expository text structure instruction efficacy research (i.e., assess the effects of teaching five expository text structures: compare/contrast, cause/effect, problem/solution, description, and sequence).
- Increase reporting and use of treatment fidelity in data analysis plans (e.g., direct observations of implementation).

A close review of the 60 studies included in this historical analysis of the literature suggests that 48 would meet the requirements (e.g., design, data for computing an effect size) for a meta-analysis. This number of studies would enable a systematic or meta-analytic review of the effects of expository text structure instruction on students' comprehension of informational text.

We believe that this historical analysis suggests that significant opportunities exist for researchers to apply proven research methods to an important area of efficacy research. There is a clear need for high quality research to provide guidance to educators seeking to provide students expository text structure instruction. Based on the lack of studies providing comprehensive demographics information and fidelity, this is especially important for improving the generalizability of the findings of this literature.

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Enhancing Nonfiction Reading Comprehension Through Online Book Discussions

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Abstract

The introduction of Common Core State Standards has many middle grade school teachers concerned with implementing standards while retaining student reading engagement and motivation strategies. This study analyzes the effectiveness of providing social networking strategies in online book discussion groups on enhancing middle grade student reading engagement and motivation. Additionally, this study reaffirmed that offering students a choice fostered more autonomous learning habits. Finally, as a result of facilitating these online book discussions, graduate students were able to learn and develop more effective strategies and skills for engaging and motivating middle grade student reading. It is hoped that this study will not only assist middle grade teachers in providing learning strategies to effectively implement Common Core State Standards, but also assist teacher education students as a result of direct experience in facilitating online book discussion groups.



As a teacher educator, I'm sometimes asked to assist teachers who are struggling or frustrated. Often these situations involve a teacher who has a desire to learn effective, new strategies, as well as requests for incorporating the Common Core State Standards (CCSS). Jeri (all names are pseudonyms) contacted me to assist in implementing the CCSS's call for increased emphasis in the use of informational text. She was also looking for new, engaging methods in doing so.

As a result of Jeri's invitation, she and I decided to investigate the outcomes of scaffolded online book discussions of her seventh grade students facilitated by graduate students. Specifically, we examined whether her students' participation in online book discussions would improve the comprehension of informational text, and whether it would improve their use of reading strategies. This article describes the online book discussions she used with her seventh grade reading classes and our findings as a result of data collection and analysis.

Literature Review

Close Reading

According to Goodwin & Miller (2013), quantity is not the only factor all that matters in reading, the quality of what students read is also important. Students need to read and comprehend nonfiction texts as often as they do narrative texts. Typically, students reading nonfiction cannot simply glide over unfamiliar words as it may cause a loss in ongoing meaning. Reading nonfiction text typically requires careful attention and deeper thought while students grapple with new understandings.

Close reading is a type of guided instruction in which students explore a complex and worthy text, mining it for information and actively exploring meaning on various levels is referred to as close reading (Shanahan, 2014). According to Owocki (2014), "Close reading is the practice of carefully and thoroughly attending to what an author is saying and of working to uncover the layers of meaning that are so often embedded within complex text" (p. 3). It is taking a mindful, meticulous look, making connections while reading. Close reading suggests careful attention to the text, the relevant experience, the thought and memory of the reader, and attention to the responses and

interpretations of other readers (Beers & Probst, 2013).

Close reading did not evolve from the CCSS. While the CCSS emphasize close reading of nonfiction texts (Burke, 2013), close reading is not a new concept. According to Akhavan (2014), close reading should be utilized when we want to make a critical analysis of what we read. It should be used when teachers want students to examine purpose, determine deep meaning, and tackle texts that might be above students' current reading level.

Nonfiction Text

The call for nonfiction text in the CCSS comes, in part, from knowledge that most of the reading engaged in by students in secondary education and beyond is nonfiction text. Carefully examining the CCSS, however, one learns the purpose of increasing attention to nonfiction texts is not just for students to have a greater appreciation of and facility with a range of text genres; it is also meant to ensure that students build knowledge and are prepared to read and write in all content areas (Cervetti & Heibert, 2014).

As students move through the grade levels, students' ability to read and obtain information from nonfiction becomes more and more essential to their academic success. Text, whose primary purpose is to convey information, surrounds students in the upper grades. Achievement in schooling, the workplace, and society depends on one's ability to comprehend informational material (Duke, 2004).

According to Fisher and Frey (2013), the reasons for increasing nonfiction text include the need to improve content knowledge, meet demands of digital environments, and improve the fourth-grade slump. Additionally, the National Assessment of Education Progress (NAEP) has steadily increased the use of informational passages on its assessments. Furthermore, the CCSS calls for a major investment in the time teachers spend instructing students to raise their ability to comprehend information (Fisher & Frey, 2013). Integrating nonfiction literacy experiences can help students understand complex concepts, analyze data, and think logically. It allows students to have access to various literacy experiences.

The specific expectation for students in grades 6-8 is that they will cite evidence to support analysis of what the text says explicitly as well as inferences drawn from the text (Owocki, 2014). Students are expected to cite from both

fiction and nonfiction texts. Citing evidence from nonfiction text is useful to middle school students as they engage in reasoning about concepts in various subject areas, use text-based information to justify answers and solve problems, and evaluate point of view or argument (Owocki, 2014). Attending closely and critically to text can build a knowledge base to help make thoughtful and substantive contributions to the many different conversations of their lives.

According to Miller (2013), the quality and diversity of nonfiction have improved dramatically over the years. Lacking exposure, access, or experience with reading nonfiction in their classes, older students read fewer nonfiction books. When students have access and exposure to engaging informational texts, their motivation and interest in reading nonfiction improves (Moss & Hendershot, 2002).

Nonfiction texts typically incorporate information from an array of subject areas, including math, science, social studies, technology, art, music, and writing. Nonfiction texts often include text structures that differ greatly from narrative texts. Therefore, according to Blachowicz & Ogle (2001), students must learn to read expository texts (e.g., texts that emphasize cause and effect) as these texts differ structurally and organizationally from narrative texts. Ensuring that students can understand informational text is essential; nonfiction constitutes much of adult reading and writing and is an integral part of the literacies in today's society (Stead, 2014).

Teachers can foster students' growing interest and reading of informational texts by positioning students to navigate the affordances of difficulty, graphics, and content (Zapata & Maloch, 2014). When creating lessons and activities for students, teachers should include informational texts, which improves students' expository writing and increases their awareness of nonfiction texts. When teachers offer more informational texts and use nonfiction in meaningful ways, students become better nonfiction readers and find greater significance (Miller, 2013).

According to Miller (2013), reading informational texts can help students build background knowledge, increase their confidence, and discover authors and topics that feed further reading. Students are quite capable of learning about, and from, informational texts when given opportunities. When working with informational texts, students grow in their comprehension of the texts and in their use of these genres, strategies, and structures in their own

writing (Zapata & Maloch, 2014). According to Duke (2004), teachers should put informational texts in the hands of students, guide them to and through authentic activities with those texts, engage the students in active dialogue around those texts, and be explicit about comprehension strategies, text structures, and features as warranted by students' developing understandings and performance in those texts.

Informational texts provide students with authentic models for organizing and presenting information in writing. They can also provide rich examples of descriptive writing, figurative language, and imagery concepts traditionally taught by teachers using fiction (Miller, 2013). In a recent review of research about informational texts in classrooms, Maloch and Bomer (2013) identified four important principles: making informational texts available and accessible to students, providing authentic opportunities for engagement, engaging students through interactive reading opportunities, and being explicit when necessary.

Online Discussions

Students reading and participating in discussions are catalysts to independent thinking, understanding, and decision making (Harvey & Goudvis, 2013). Discussion is critical to the process of helping students learn to comprehend and construct meaning. Studies have shown that discussions support understanding and learning from text because they offer occasions for students to share information. When sharing information from text, students typically include prior knowledge as well as what was understood and recalled from the text, which contributes to more coherent understandings (Cervetti & Hiebert, 2014). Discussion groups allow students to react personally in an authentic literacy experience (Cooper, Kiger, Robinson, & Slansky, 2014).

When students consistently interact with each other, discussions of both specific texts and content seem more thoughtful (Harvey & Goudvis, 2013). According to Scharber (2009), online book clubs feed on students' interest in new literacy practices while complementing traditional reading practices. Traditionally, literature circles were held in class as face-to-face interactions among several small groups of students; however, with Internet access becoming more widespread, moving traditional literature circles online can help meet the needs of today's students. The basic idea is to adapt the book discussions from the physical classroom to the online classroom. As stated by

Day and Kroon (2010), "Online literature circles are very similar to face-to-face ones, except students talk about the books they have read in small virtual groups using online programs..." (p. 19). The online literature circle encourages digital interaction, fosters student participation, and meets a variety of student needs.

According to Latendresse (2004), literature circles are beneficial for students in the middle grades since adolescents enjoy participating in small groups and having the freedom to interpret texts in light of their experiences. When discussing texts in online literature circles, students' conversations also appear to be less forced and more natural (Barack, 2011). Utilizing online literature circles provides students with opportunities to collaborate with classmates while incorporating digital literacies.

Sociocultural Perspectives

Sociocultural theory largely supports the use of online book discussions in education. These perspectives of literacy also emphasize the role of the larger environment in the shaping of literacy practices (Coombs, 2013). Sociocultural theories focus on what people do with the texts, the ways in which literacy is used in one's real-world contexts. Conceptualizing literacy as something one does, as opposed to one's skills or abilities, shows authentic ways people engage with texts (Perry, 2012). Viewing literacy as a socially contextualized practice demonstrates that practices may vary and be dynamic.

Scaffolding

Lev Vygotsky (1978) believed that social interactions played a crucial role in child development. Vygotsky asserted that social learning allowed for more knowledgeable people to share their expertise with others. Vygotsky's beliefs illustrate that more knowledgeable individuals can play a critical role in the information learned by students. If such individuals become involved in the educational process, they can share experiences and knowledge that the students may not receive otherwise.

Vygotsky (1962) introduced the concept of the Zone of Proximal Development (ZPD). ZPD describes the difference between what a learner can do on one's own and what learners can do with the help and guidance of a more capable other. As learners are supported for a period of time, they become more capable of completing educational tasks independently as

supports are gradually removed. This theory is directly linked to online book discussions as student discussion may be guided or subject to scaffolding by a more capable adult or student. As students begin to understand how to keep their conversations moving, the scaffolds can slowly be removed. Similarly, Barack (2011) explains that students participating in online book clubs are coached on how to engage in digital discussions and how to use appropriate language and avoid slang and “text speak.”

Technology to Motivate

Motivation also plays a large factor in the use of online discussions. As discussed by Scharber (2009), “Despite technology’s purported role in the decrease of pleasure reading, online book clubs may offer a motivating and convenient environment to encourage voluntary book reading” (p. 433). Often times, students are involved in technological experiences outside of school because they are interested in technology and its uses. As educators, it is our hope to find mediums that intrinsically motivate students to learn and engage in independent reading. When discussing students who participated in an online literature circle, Larson (2009) says, “...excitement about using technology transferred to literacy and the books the students were reading...and [h]earing about other books and reading conversations about the other novels motivated some sixth graders to seek out other titles and read more books” (p. 22).

Context of the Study

The Common Core State Standards (2010) call for building knowledge through content-rich nonfiction (Cervetti & Hiebert, 2014; Fisher & Frey, 2013; Pennington, Obenchain & Brock, 2014; Miller, 2013). Informational texts play an important part in developing students’ content knowledge. In grades 6-12, ELA programs shift the balance of texts and instructional time toward reading substantially more literary nonfiction. This literary nonfiction includes speeches, essays, biographies, and opinion pieces, as well as historical, technical, and scientific documents (Coleman & Pimental, 2012).

Jeri (all names are pseudonyms), a frustrated seventh grade reading teacher, contacted me in the fall for help in meeting the requirements of the CCSS, specifically the incorporation of nonfiction. Together we sat down to discuss, debate, and determine how she could successfully include nonfiction while helping her students comprehend text, and ultimately the content they would read. Additionally, Jeri wanted her students to learn more about the

literacy strategies of establishing connections and making inferences, since she had determined these to be weak areas for many of her students.

At one point in our initial meeting, Jeri joked that whereas the CCSS call for nonfiction to be read, and at new levels, her seventh graders were not interested in mandates at any level; they were “social creatures” only interested in talking with peers and in social networking! Her comment turned our discussion to many questions: Could she somehow use social networking to get her students reading nonfiction? Could social networking allow her students talk to each other and discuss nonfiction? How could students learn needed reading strategies? Could my contacts at the university be utilized somehow to help her students? After additional research, meetings, and discussions, we came to the conclusion of trying online book discussion groups with her seventh grade students, facilitated by graduate students from my university who were all licensed teachers taking a semester-long graduate course on methods of teaching reading. We decided to use Maloch and Bomer’s (2013) principles which included making informational texts available, having authentic opportunities for engagement, providing interactive reading opportunities, and being explicit when necessary.

Site & Participants

Bayside Middle School is a public school located in a small city in the Midwest. It serves approximately 425 students in grades six, seven, and eight. Of the student body, 47% of students received free or reduced lunches and are classified as economically disadvantaged. In 2012, students moved into a brand new, state-of-the-art, technology advanced school building. This district’s operating spending per pupil is \$9,219, which is approximately \$1,400 above the state average.

Sixty-three seventh graders obtained parental permission to participate in this study, which was approved by the university’s institutional review board. Ninety percent of these participants were Caucasian, 6% Hispanic, and 4% African American; their ages ranged from 12-14 years old. According to data gathered by the school district from a STAR reading assessment, the study participants’ reading levels ranged from third grade to eighth grade.

The 19 facilitators were graduate-level students who had earned their Bachelor’s degrees and were licensed teachers pursuing a Masters of Arts in Reading at a large state university located in the Midwest. They ranged in age

from 22-36 with one male and 18 females. Three of the graduate students were full time teachers with their own classrooms, whereas the other 16 were full time graduate students who had completed student teaching but did not yet have their first teaching positions. Jeri, the seventh graders' reading teacher, was in her fourth year of teaching.

Procedures

Jeri was most comfortable with the content area of social studies, therefore, we went to speak with the seventh grade social studies teacher at Bayside Middle to see what topics and areas of social studies the students would be learning about that next semester; collecting that information helped us identify appropriate books. We turned to titlewave.com to locate good books to use. We first searched for appropriate reading levels, interest levels, and topics. We then narrowed this down by copyright date and, ultimately, cost to purchase the titles we could not obtain through for free through a library. In the end we made a list of 20 nonfiction titles covering social studies topics, and the school principal ordered 3-4 copies of each title so that students would each have their own book for this project.

In December, Jeri took one class period to conduct brief book talks about each of the 20 titles. She had her students rank-order their first through fourth choice of book and was able to assign each of her students to one of four choices. Meanwhile, the graduate students were randomly assigned books. Via email they were told the title and author and that they needed to obtain the text prior to the start of classes in January.

Jeri had 21 students in each of her three sections of seventh grade reading. Each section met for 50 minutes, Monday through Friday. In my graduate-level reading methods course beginning the next semester, I was to have a total of 19 students, meeting face- to- face once a week for three hours. Jeri and I decided to use mixed-ability groups; we randomly put the small groups of seventh grade students with each graduate student facilitator. In the end, each group had 3-4 student members.

Obtaining computer access was not difficult since the students attended a technology-advanced school. Students had six desktop computers available in their classroom. They also had a class set of computers on a cart that could be brought into the classroom, access to a technology lab of 30 computers, as well as a library with 10 computers.

Schoology is an online learning management system that teachers and schools use to create accounts and build courses or display materials such as files, assignments, and quizzes online for their students to access wherever they are able to log into the Internet. This free, secure social networking site was selected as the platform for the online book discussions as they were already using in their school. Students had previously set up accounts and were required to submit some of their assignments to their reading teacher via Schoology.

Schoology also allows users to share content, collaborate, and have discussions. The sharing can occur with all users, in a one-on-one private manner, or with small groups. Groups can also be created so that only the group members can read each other's posts and respond, which was done in order to help students feel more comfortable in knowing that only group members would be reading what they wrote. The seventh graders were told they could also send private posts directly to their graduate student if they did not want group members to read their comments. Jeri and I were also registered members of every group, however, we only read the students' posts and never posted ourselves.

Prior to the seventh graders and the graduate-level students communicating with each other in Schoology, the graduate students were instructed on using higher-level questioning to encourage deeper thinking and to improve comprehension. They were also taught about incorporating in their online posts the teaching of the strategies Jeri requested (establishing connections and making inferences) and how to scaffold student learning. Finally, graduate students were taught methods to motivate early adolescents to read, including developing rapport in a professional manner.

While participating in this online book discussion study, the graduate students met with me six times over six weeks. We discussed problems, concerns, or issues they were having facilitating their small groups such as not knowing if their online students were struggling with the text, what to do if students were only briefly answering questions, or if students were posting questions that were off-topic. From the early discussions in class, I quickly learned we needed to set up a "side-bar discussion" for comments that were off topic, such as, "What is it like to be a college student?", "What do you like to do when you are not teaching?", and "Are you teaching your own class and

facilitating our groups too?” These questions were of sincere interest to the seventh graders, yet were not related to the content in their texts. Soon after, I realized the seventh graders’ monitoring strategies were lacking, so I coached my students on ways to teach students to monitor what they are reading. The graduate-level students also shared instructional ideas and strategies with their peers. These ideas included including using audio files of graduate students reading to the students, attaching pictures or video links of the topic being discussed, posing a focus question, asking student to write about the topic before they start reading, and connecting their content to real world events by sharing recent newspaper articles and other media.

Since the book discussion groups contained seventh grade students from three different reading classes, and the graduate students’ university course met in the evenings (which was not a convenient time for the seventh grade students) establishing a set time to be online for this work could not occur; therefore, they could not have real-time chats. As a result, asynchronous discussions took place, allowing the students to share on their own, outside the constraints of time and place.

When the seventh grade students first logged into their Schoology accounts, they watched a brief video clip that their assigned graduate student posted, introducing themselves and the book that the group would be reading. The book was introduced in a cliffhanger style to enhance students’ interest in reading it. The seventh grade students responded by introducing themselves to their group’s facilitator. Next, the graduate students replied and included a required amount of text to read and a prescribed due date, which was always a week in length. On or before the due date, the seventh graders logged back in and keyed in their responses to the questions posted by the graduate student in their group. Additionally, the seventh grade students posted questions for the graduate student facilitator and their small group peers. Each participant was required to make at least 24 posts or responses during this six-week project.

Although Jeri periodically checked in face- to- face with her students regarding this work and gave reminders, the students were responsible for doing the online literature circle work independently. Due to her students’ busy lives outside of school, she allowed 10 minutes of silent reading in class each day just for this project. Computer time was also offered (at least briefly) each day in case the students needed to be online for this project. For all students,

especially for those who did not have online access at home, Jeri allowed use of the classroom computers before and after school, during lunch, study hall, or free time in the students' schedules.

While facilitating the discussions, the graduate-level students posed questions to build rapport and develop the seventh graders' use of reading strategies to improve comprehension of the informational text. The questions were designed to foster discussion, critical thinking, and extension beyond the book. The graduate-level students attempted to engage the seventh graders in dialogue to guide and prompt students' abilities to monitor, make connections, and infer while reading and thinking about the text.

Methods

This study utilizes a pre-post (without control group), quasi-experimental, intrinsic case study design. Quasi-experimental designs are used to study outcome comparison of an intervention without using randomization of participants into control and intervention groups. Specifically, a pre-post without control group quasi-experimental design investigates the outcomes of interest within the same participants, both before and after an intervention, to see if the intervention impacted the outcomes of interest (Cook & Campbell, 1979). In this study, the online book discussion groups facilitated by graduate students are the intervention. Participants studied, pre-and post-study, are seventh grade students. The student outcomes of interest, being compared before and after intervention, are their perceived abilities to comprehend nonfiction text and to utilize reading strategies of inferring, monitoring, and making connections. In this case study, the focus of research is to develop a deeper understanding and assess the impact this specific case (the online book discussion intervention) itself (Baxter & Jack, 2008).

Instrumentation

Qualitative research methods were utilized in this study to gain a more holistic portrayal of the seventh grade students' online book discussion experience. An interview was conducted with the reading teacher before and after the project to obtain a more in-depth understanding of the seventh graders' engagement and motivation, as well as their levels of comprehension and use of reading strategies. The seventh grade participants completed a pre- and a post-survey, and selected students participated in pre- and post-focus group interviews. The data collection and analysis also included all of the

online discussion posts.

Interviews

A research assistant conducted two open-ended interviews with the reading teacher as a way to obtain, supplement, and extend knowledge of Jeri's thoughts and interpretations regarding the online project and its effect on the students' comprehension and motivation. The semi-structured interview format (Flick, 2014) was selected so the teacher could provide more detailed information to set questions, while allowing for some spontaneous questions or comments. The questions focused on the students' participation in the online book discussions, and included questions about the learning of three strategies often used when exploring nonfiction: inferring, monitoring, and making connections (e.g., "Describe what you saw your students experience while participating in their online book discussions compared to what you previously witnessed with your traditional way of teaching reading strategies"). Each interview was digitally recorded and later transcribed for analysis. The teacher was probed to provide detailed responses to the research questions and how the online book discussions helped students learn. Deeper meanings were sought in the teacher's answers by asking for examples and explanations of any comments that were not specific.

Focus Group Interviews

To explore participant perspectives, the study began and ended with semi-structured focus groups (Robinson, 2012), which were conducted by a research assistant. Sociocultural perspectives assume that readers negotiate meaning through participation in social interactions, therefore, a pre- and a post-focus group interview was conducted with two sets of students to capture their perspectives about the online book discussion experience, and their ability to comprehend nonfiction and use strategies. Six students were randomly selected to participate in focus group A, and six students were again randomly selected to participate in focus group B; the four focus group meetings lasted between 30 and 40 minutes. A researcher used an empty classroom to conduct the group interviews during the students' study hall or lunch without adults present. During the focus groups, participants were promoted with four questions in a semi-structured format. Each focus group interview was also digitally recorded and later transcribed for analysis.

Online Posts

All of the online discussion posts of the participants, as well as the graduate-level university facilitators, were examined on Schoology in order to learn the specific “conversation” of each small group.

Surveys

To obtain knowledge from the students, all seventh grade participants used Qualtrics, an online survey program, to complete a survey at two time points: before they started working with their university graduate student facilitator, and after their book discussions were completed. This survey was made up of open-ended questions about their perceptions about comprehending text and participating in online book discussions. Items on the pre-survey were identical to items on the post-survey with the exception of facilitator focus. Specifically, pre-survey items asked seventh grade students about their perceptions of online book discussions pertaining to any previous experiences or thoughts, whereas post-survey items were about online book discussion interactions with the graduate-level student facilitating them in this project. Questions also focused on student thoughts about their comprehension as a result of participating in the online book discussions and how teachers could make their experience more educational.

Data Analysis

To control for researcher bias and to help make sense of the data, I enlisted in the help of another researcher to help conduct the data analysis. We established intercoder agreement through an analysis of discordance. Before getting started on this study’s official analysis, we both independently coded and discussed random samples of posts and transcriptions until 85% agreement was researched. This exceeds the acceptable level of 80% agreement between coders (Miles & Huberman, 2014).

We first worked independently with each set of data, using selective coding to highlight the most common categories and to explain themes (Creswell, 2007). Data sets were analyzed and salient themes were devised and integrated to support assertions. Manual coding for salient themes were informed by strategies recommended by Dyson and Genishi (2005) and Saldana (2013). Additionally, a research assistant entered the same data and used the computer software QSR NVivo9 to create categories and codes. Finally, we all

three met together to discuss our results. Three dominant themes emerged: choice of text (66 statements), social networking (99 statements), and scaffolding strategies (82 statements). The data analysis allowed us to develop the assertions described in the following section.

Outcomes from the Intervention

The online informational book discussion findings were two-fold: there were findings related to students and to teachers. The findings related to students revealed that text choice and social networking engage and motivate adolescents, which contribute to productivity in online- book discussions. The findings related to teachers revealed that scaffolded strategies are effective. In this section, each of the identified themes are examined, and the spoken words of the seventh graders are used to further illuminate these ideas.

Choice of Text

One practice contributing to the students' productivity was the process of selecting books. The teacher allowing the students to select their own book, after introducing them through book talks, was an important factor in the students reading the text. One student said, "This is the first time we've ever been allowed to pick our own reading in this class and this is the first time I've ever read in this class." Another student said, "I didn't get my first choice of book, but I got one of my choices. That was huge because I liked my book and probably wouldn't have read it otherwise."

Social Networking

Another important practice involved the students collaboratively interacting with each other on the internet through Schoology. Students reported valuing their book discussion groups for providing them with insightful explanations and knowledge that led to constructing new understandings. One student reported about the quality, "Discussing online was more helpful because I had time to think about what I was going to say and ask. I can't do that in class because I feel like I have to hurry up and speak before I lose my turn." Another seventh grader talked about accountability, "I didn't want to let anyone down. If someone posted a question, I actually felt responsible for figuring it out and getting back to them."

Scaffolding Strategies

Students responded that there were always questions and comments

The screenshot shows a web-based discussion forum. On the left is a sidebar with a book cover for '10 DAYS' by David Colbert, featuring a portrait of Martin Luther King Jr. and the text 'MARTIN LUTHER KING JR. LIVED 14,325 DAYS. THESE 10 SHOW HIS WORLDVIEW AND VALUES'. Below the cover are links for 'Updates', 'Discussions', 'Albums', 'Members (4)', and 'Resources', along with a 'Leave this group' link. The main area is titled 'Online Book Discussion Group 5' and contains a text input box with a 'Post' button. Below the box is a list of four posts from group members, each with a profile picture, name, and text. The posts discuss the book's content, including Rosa Parks, the author's perspective on white people, and a movie trailer about Rosa Parks. On the right, there is a section for 'Upcoming' assignments and a '4 Members' section with profile pictures.

10 DAYS
MARTIN LUTHER KING JR.
LIVED 14,325 DAYS. THESE 10 SHOW HIS WORLDVIEW AND VALUES.
DAVID COLBERT
AUTHOR OF EYEWITNESS TO AMERICA

Online Book Discussion Group 5

Updates
Discussions
Albums
Members (4)
Resources
Leave this group

Group Member 4
Why was it important that Rosa got her picture taken on the same bus she was arrested on?
Comment · Like

Group Member 3
To make an inference think about the facts, including what you know outside of reading this book and just make an educated guess. But I have a question now too. Why does the book talk about the white people that were nice to Rosa and her family? Doesn't that go against how the rest of this book is written?
Comment · Like

Group Member 1
I too thought that was contradictory! The book talks about how no one was nice to the black people, and then on page 13, it talks about the white people that were nice to Rosa and her family.
Comment · Like

Group Member 3
I feel it's like when the author explains the differences between Pine Level and Montgomery. You learn that even though things are similar, there are differences. It's not that one is better than the other – they are just different. But I agree the author should have been more specific and not so confusing there.
Comment · Like

Group Member 4
I found a movie trailer about Rosa Parks. <http://www.imdb.com/video/screenplay/vi1660485913> It's pretty good, but my favorite person who fought for African American rights was Mary McLeod Bethune. Check out this video: http://youtu.be/kkM_YcJXF7g Let me know what you think and what do you think Mary & Rosa have in common? (Not just surface level here! Kick it up a notch!)

Upcoming
No upcoming assignments or e

4 Members

Figure 1. Online Book Discussion. This figure illustrates typical communication within a group.

posted in their group, which kept them focused on the reading, and that they could get help right away when they were baffled. (Figure 1 depicts typical communication within a group.) Students reported receiving helpful, individualized assistance when they were confused. For example, one student posted, “I don’t know what our author means when he is talking about the exploits and the tirades of the emperors. Can someone help me?” Often times help came back in the form of a simple question or statement such as, “Do you remember last year in social studies when Mr. Lanten brought in those art museum pictures?” or “Watch this video clip. It shows you more and explains it better.” Not only did this intervention come from the graduate students, but also from peers, which is a testimony to the value of the online small group book discussions. (Figure 2 shows students using scaffolding in their group discussion.) This outcome of scaffolding suggests the importance of mentoring and supporting students while they are reading so that they don’t give up, but continue to think deeply about what they are reading.

Implications

In general, children enter school with high levels of motivation; however, that motivation tends to decline as they progress throughout their school years. Therefore, instruction and strategies must in turn be modified to meet the rigorous demands of middle school students. Whereas prior research and literature explicitly informs us that providing students with high-quality feedback (Fisher & Frey, 2013), choice of reading materials (Fisher & Frey, 2012; Ivey & Broadbudd, 2001; Mackey, 2014; Morgan & Wagner, 2013), and allowing interaction with others (Johnson, Johnson, & Holubec, 2009; Kagan & Kagan, 2009) are critical for student growth in learning; this has also become vital components of student motivation and engagement. Additionally, much of the conversation around twenty-first-century literacies emphasizes the importance of collaboration (Gainer, 2014), which is illuminated in this study.

The screenshot displays the Schoology interface for an online book discussion group. The group is titled "Online Book Discussion Group 7" and features a cover image of a book titled "KIDS EVERYTHING ANCIENT EGYPT". The interface includes a sidebar on the left with options like "Group Options", "Updates", "Discussions", "Albums", "Members (4)", and "Resources". The main area shows a post from "Graduate-Student Facilitator #8" discussing the book "Death And The Afterlife" and encouraging students to read pages 20-30. Below the post, two student responses are visible. "Group Member 3" shares interesting facts about ancient Egypt and Nefertiti. "Group Member 1" discusses the value of belongings in tombs and shares a website link. The interface also includes a "Post" button and a "Comment - Like" link.

Figure 2. Student Facilitation. This figure illustrates students utilizing scaffolding in their group discussion.

Implementing new literacies in schools requires a change in instruction (Hagood, Provost, Skinner, & Egelson, 2008); this was evident for Jeri, who tried a new method. This case study demonstrates this situation and offers a scaffolded, guided-instruction approach that allows students to work together online to foster improved productivity as well as to elicit seventh grade students' perceived improved comprehension of informational text. Whereas not all of the participants reported a positive experience (twelve percent of the students said this simply replicated face-to-face book discussions), the vast majority (88%) found the online discussions to be revolutionary, and preferred them for having improved their productivity as well as comprehension of nonfiction text.

Teacher Training Implications

If we want our teachers to be successful in providing students with effective strategies that can be used to move learning forward, we must offer guided instruction that models best practices and allow time to practice these skills in real-world contexts. It has been said that teachers often teach the way they were taught (Cruickshank, Metcalf, & Bainer Jenkins, 2009).;there are, of course, other factors that influence the way someone teaches (i.e., experiences in teacher education programs). If there are not alternate ways of teaching presented, or motivation to do this differently, teachers often rely on what they have seen in the past.

To facilitate a change in teaching practices, scaffolded, online instruction proved to be an effective method. Rather than simply lecturing to graduate-level students about best practices, the students were shown best practices by providing them with opportunities to practice teaching in real-world situations with an instructor providing guidance along the way, providing the graduate-level students a safe environment to learn and grow. These graduate students had continued support and guidance from their university instructor during this field experience, which is a critical feature required for change to effectively take place (Fullan, 2006).

Middle Grades Student Learning Implications

If our goal is to help graduate-level students develop into effective educators, then we must examine how these graduate students are impacting the students they are teaching. Too often, teacher research stops at drawing inferences about what the pre-service teachers learned from our work

with them. To truly know if our teacher education programs are making a difference, it is critical to investigate the impact of this intervention on PK-12 student learning. Through this study, we are able to see seventh grade students' perceptions about their experience participating and learning in online book discussions facilitated by graduate students.

The seventh grade students' comments inform us that they believe the scaffolding they received was specific, constructive, and timely. They stated receiving help in building background knowledge and in developing their reading strategies for nonfiction text. They perceived the scaffolding helped them improve their learning because both the graduate students, and their peers, encouraged group members to share knowledge and experiences, which was essential to fostering the seventh graders' interpretations of books. Additionally, they self-reported that help was tailored to their unique and individual needs, and was received in the midst of the learning process; Receiving this feedback throughout the learning process was helpful.

Fisher & Frey (2012) inform us that it is critical for students to be provided with time to read, self-selection of texts, and to read without having a lot of adult interferences. Whereas the seventh grade students overall did not report about having time in class to read, they did state they believe their comprehension was improved due to being allowed to have choice of text; Choice allows students to have control (Guthrie & Wigfield, 2000) and is an important factor for motivation and engagement (Guthrie & Humenick, 2004). In this study, the main focus of the "choice" was in the nonfiction topic of study, not the reading level. Students reported making their selection according to the content in the books, not the challenge of the text itself.

According to Hagood (2012), teachers understand the need to invigorate their instruction with new literacies. Teachers are compelled by the rewards of engagement, learning, and changing relationships; One sees those rewards in the outcomes. The seventh graders reported that incorporating the online social networking piece of the book discussions was helpful in motivating them to read and think deeply. Ultimately, they believed they better understood the content. They also reported feeling accountable and responsible for their own learning as well as for the learning of their group mates, which they found to be empowering.

Teachers should consider the fact that middle school students are social

creatures and typically like to be with others. Participating in online book discussions can incorporate students' desire to be with others. Learning is a social activity; Vygotsky (1978) informs us that learning requires student interaction and engagement in classroom activities. As noted in this study, engaged students can be motivated to learn. According to Falter Thomas (2014), online book discussion groups can be an effective instructional strategy for middle school students who desire social interaction. This study further suggests the influence of scaffolded guided-online instruction facilitated by the graduate students in book discussions is effective for improved learning.

Conclusion

The CCSS, calling for the inclusion of more nonfiction reading, have cast informational text in a new light in today's classrooms. As always, middle school students crave socialization and opportunities to interact with others (2010).

We cannot assume that teachers in training will develop skills in best practices without deliberate, scaffolded, and guided instruction. Additionally, time to practice these skills is needed in both low-stakes, simulated learning environments, as well as within real-world contexts with students. To deliver a teacher education course that fosters providing students with high-quality feedback and scaffolding and interacting with students online (rather than simply "teaching" how to do this) takes intentional planning and instructional modeling of best practices, as well as a field experience component, to be most effective.

Allowing students to text choice and working online with other group members enhanced student motivation by providing social networking opportunities, and ultimately engaged and motivated seventh graders to contribute productively and to understand the context in their nonfiction texts. Finally, the scaffolded assistance they received from both the graduate-level student facilitator as well as their peers was helpful in enhancing understanding and retention of the texts. The analysis of this online book discussion study reaffirms that scaffolded instruction, social networking, and autonomy of learning are practices that engage and motivate middle grade students to become more productive in readings, book discussion, and understanding.

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Successfully Promoting 21st Century Online Research Skills: Interventions in 5th-Grade Classrooms

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Abstract

This quantitative study was developed to explore the ability to impact elementary student 21st Century online research skills with a planned classroom intervention curriculum. The repeated measures quasi-experimental study randomly assigned all 5th grade classes in a Midwestern, suburban school (n=418) to a 12-week intervention or control condition. Analyses of the ORCA Elementary-Revised performance prior to intervention revealed significant correlations with traditional measures of reading achievement as well as limited influence from demographic variables. In the primary research question, results demonstrated that the intervention group showed significantly higher gains from pretest to posttest on the measure of online research skills. Focused analyses of the subskills in the online reading performance measure revealed these differences were durable in locating and synthesizing skills, but not critical evaluation of websites. We discuss both theoretical and instructional implications generated from this study.



Successfully Promoting 21st Century Online Research Skills: Interventions in 5th-Grade Classrooms

The 21st Century skills and strategies needed to read and do research online are multifaceted, and require sophisticated and complex application in online environments (Afflerbach & Cho, 2009; Leu, Kinzer, Coiro, Castek, & Henry, 2013). Informational communication technologies present additional complexities because they are deictic, or continually changing, and require teachers to reassess what it even means to be literate (Leu, 2000, p. 745). Despite the fact that online literacy skills are deictic, our educational systems are slow to change practice to meet the needs of today's learners. In fact, few studies exist on the effects of teaching online research skills in classroom settings.

Twenty-first Century literacy skills were not “invented” with the Internet; competent readers use many of the same offline text strategies as those they use with online texts (Coiro & Dobler, 2007). However, digital literacy has made the standards for literacy broader, often requiring higher levels of thinking and problem solving skills than are associated with traditional print (Castek, 2008; Coiro, 2009; Eagleton & Guinee, 2002; Kuiper, Volman, & Terwel, 2008). With online texts, students need new sources of prior knowledge, higher levels of inferential reasoning, and advanced, self-regulated, navigation strategies (Afflerbach & Cho, 2009; Coiro & Dobler, 2007). The complex space of the Internet requires flexible and strategic application of skills that enable readers to negotiate the constantly changing landscape of a hypertext reading environment (Cho, 2014). Internet-based reading requires learners to use self-regulatory strategies that include locating, critically evaluating, and synthesizing information from a multiplicity of sources, a complex process including monitoring and self-explanation when done by better learners (Goldman, 2012; Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012). This process has been termed “realizing and processing potential texts” by Cho and Afflerbach (2015, p. 500) because of the many choices readers must make in hyperlinked environments, the metacognitive strategies they must enact, and the texts that are constructed as a results of

these strategic decisions and actions.

Readers who struggle with offline texts show these same patterns with online texts where the strategic and flexible application of strategies for constructing intertextual meaning is required. In online contexts, less skilled readers showed greater difficulty in appropriately and effectively applying strategies needed for comprehension, searching for task-relevant information and images, determining the relevance of information, making decisions about the credibility of information, and acting on those decisions (Chen, 2009; Cho, 2014; Dee-Lucas, 1999; Goldman, Braasch, et al., 2012; Lawless & Kulikowich, 1996; Pei-Lan, Lin, & Chuen-Tsai, 2013; Wilder & Dressman, 2006).

Curriculum reform initiatives are also changing the shape and nature of 21st century learning and assessment. The Common Core State Standards (CCSS), a noteworthy educational reform, showcases an increased focus on literacy, information and communication technologies, and the use of increasingly complex expository text, including Internet text (National Governors Association Center for Best Practices [NGA Center] & The Council of Chief State School Officers [CCSSO], 2010). In fact, the CCSS calls for expository text to account for 50% of total instruction by fourth grade, recognizing that most of our knowledge base as adults stems from informational text. Neglecting the use of expository, Internet-based text in classrooms is a cause for concern, which is perpetuated simultaneously by the limiting view that technology is merely a supplement to the curriculum, teachers' inexperience in incorporating authentic online materials in their lessons, and insufficient classroom curriculum materials that direct learning through online resources (Dreher & Zelinke, 2010; Hutchison & Reinking, 2011).

21st Century Online Research Skills

This study builds upon the need to teach 21st Century literacy skills to upper elementary readers. We centered our study on the following three subskills necessary to conduct 21st century online research: 1) locating information, 2) evaluating information, and 3) synthesizing information. We strengthen the rationale for 21st Century online research skills with relevant literature and perspectives that justify instruction in each of the three subskills.

Locating Information

Locating, or searching for information, has been noted as a “gatekeeper” skill (Henry, 2006) and is a fundamental component of online research. Students, however, often approach the Internet with a “snatch and grab” philosophy (Sutherland-Smith, 2002, p. 664) with the expectation of finding information quickly and often preferring to seek information through browsing rather than strategic searching (Schacter, Chung, & Dorr, 1998). Kuiper and her colleagues (2008) characterized 5th grade students as impulsive Internet searchers who tend to get lost in the searching process. While the results of another study (Rouet, Ros, Goumi, Macedo-Rouet, & Dinet, 2011) determined that young students had difficulties using relevant cues to select appropriate Internet sites. Seventy-six percent of teachers in a survey by Pew indicated they believed that middle and high-school students expect to be successful finding information quickly and easily with search engines (Purcell et al., 2012); yet, children and teenagers have trouble narrowing the search terms and self-regulating the search process (Pritchard & Cartwright, 2004; Quintana & Pujol, 2010), often becoming easily distracted, frustrated, or anxious when searching for information (Colwell, Hunt-Barron, & Reinking, 2013; Hill & Hannafin, 1999).

Central to locating information is the ability to generate questions when working in online environments (Leu, Forzani, et al., 2013) because online research regularly begins with a question to ask or problem to solve (Leu, Zawilinski, et al., 2007). In fact, students who self-generate research questions in online environments have increased motivation and increased success in the searching process (Dwyer, 2010; Kuiper et al., 2008). The need to embed questioning instruction within the teaching of locating information is indubitable as students typically begin research without formulating a question (Eagleton & Dobler, 2007).

Critically Evaluating Information

Since the Internet is an unfiltered environment, allowing anyone to publish information at will critical evaluation is a central requirement for effective online research (Leu, Kinzer, et al., 2013). Past research has confirmed that higher order thinking and critical evaluation skills are difficult processes for intermediate-grade students (Castek, 2008; Chen, 2009; Kuiper, 2007; Kuiper et al., 2008), and teachers recognize students struggle with this

concept. Only 1% of middle and high school teachers considered students as highly skilled at determining bias in Internet content, yet teachers believe that judging the quality of information found on the Internet is essential (Purcell et al., 2012). Students typically do not take a critical stance towards Internet-based text; furthermore, they consider the Internet the most credible source of information, over and above books (Kiili, Laurinen, & Marttunen, 2008; Kuiper, Volman, & Terwel, 2005; MacArthur Foundation, 2010). Research-tested frameworks, such as the WWWDOT examining: 1) **W**ho wrote this?, 2) **W**hy was it written?, 3) **W**hen was it written?, 4) **D**oes it help meet my needs?, **O**rganization of the site?, and 5) **T**o-do list for the future (Zhang & Duke, 2011) showed students receiving instruction within the framework demonstrated improved web evaluation skills and attentiveness to the necessity of evaluating online text. Students need to be taught specifically how to critically evaluate Internet-based text, think critically, and question content before assuming it is trustworthy information.

Synthesizing Information

A third subskill, synthesizing information found on the Internet, is also a difficult feat for students who must continuously evaluate and summarize across multiple Internet sites (Coiro & Dobler, 2007; Eagleton, Guinee, & Langlais, 2003; Kuiper et al., 2005). Furthermore, synthesis is an internal process, which makes this online research skill possibly the most difficult to examine and measure (Leu, Zawilinski, et al., 2007). Past studies have examined the effect of synthesis instruction and summarizing instruction with online text, noting students who received direct instruction on synthesis improved performance on this subskill (Castek, 2008). Conversely, Dwyer (2010) found that students, in general, struggle to summarize Internet information, even after instruction and practice. Goldman and her colleagues' work with multiple source comprehension found the majority of students in grades five through eight (77%) could be categorized as "selectors" who produced essays primarily by blocking or selecting information sequentially from each text, without revising or synthesizing inferences (Goldman, Lawless, et al., 2012, p. 200). This "copy-delete" strategy (Dwyer, 2010) not only exists with Internet-based text, but traditional text as well (Hidi & Anderson, 1986). Internet text can make copying information effortless (Eagleton & Dobler, 2007). Limited teacher knowledge in assisting students with the demands of text synthesis is troublesome, as future assessments will be representative of this skill (Goldman,

Lawless, et al., 2012).

Internet Reciprocal Teaching Model

The Internet Reciprocal Teaching (IRT) Model, selected as the instructional framework for this study, stands as an effective model for promoting online research skills for adolescents (Leu et al., 2005; Leu & Reinking, 2010) and elementary students (Castek, 2008). IRT is based on the well-established and widely used Reciprocal Teaching (RT) Model (Palincsar & Brown, 1984), which promotes strategies for reading comprehension using printed text. Within their meta-analysis of 16 quantitative RT studies, Rosenshine and Meister (1994), found RT to have a consistent and substantial effect size (.86) when implementing comprehension assessments in intervention settings. This indicates RT as a favorable method for reading strategy instruction.

The adjustment of the standard print-literacy RT practices to develop the IRT model was designed explicitly to support reading comprehension in online environments. Core values within both models center on instructional scaffolding within the Zone of Proximal Development (ZPD) which is the developmental range of achievement between what the learner has mastered independently and what the learner can do with adult or peer assistance (Vygotsky, 1978, p. 86). The give-and-take between teachers and students produces a scaffolding support system. The balance between modeling, instruction, and guided practice provides the learners the experiences needed to independently implement comprehension strategies with text (Palincsar & Brown, 1986).

Additionally, both models support the use of metacognitive strategies to self-regulate learning. Metacognition is commonly defined as *thinking about one's thinking*. Through a gradual release of responsibility, the practice of RT supports the learner in applying taught comprehension strategies in new reading contexts (Brown & Palincsar, 1989). When considering Internet-based texts, additional meta-cognitive strategies to navigate online texts are required by strategic readers—requiring the reader to flexibly integrate active self-regulated reading strategies (Cho & Afflerbach, 2015; Coiro, Castek, Henry, & Malloy, 2007).

Differences between RT and IRT certainly include a shift in texts (print to online), narrowing of text genre (solely expository with text determined by

the individual's learning path), and strategy skills. Another notable difference between RT and IRT is the shift in grouping. RT typically occurs in small groups, where the teacher first models before having students model strategy use to each other. IRT, on the other hand, occurs within a self-contained classroom and with a larger number of students (Leu et al., 2008).

Although both RT and IRT provide a gradual release of responsibility, IRT places this gradual release within a 3 phrase model where tasks progress from simple to more complex. The teacher first models online research strategies as a whole group (phase 1) followed by students collaborating to practice strategies within partners or small groups, preferably with 1:1 computing devices, and centered around common tasks (phase 2). Lastly (phase 3), students engage in an independent inquiry to apply knowledge of the online research skills to authentic learning situations. As learning progresses, students choose an inquiry topic of interest, often relating to existing curriculum, to practice strategies during online research tasks. Table 1 presents a thumbnail sketch comparison between RT and IRT strategy instruction as presented by Leu (2008).

Previous research with IRT has shown this model effective with supporting struggling traditional readers (Castek, Zawilinski, McVerry, O'Byrne, & Leu, 2011; Henry, Castek, O'Byrne, & Zawilinski, 2012; Leu et al., 2008). Leu & Reinking (2010) found IRT significantly increased online reading comprehension with middle grade learners when compared to students in control classrooms. Additionally, IRT instruction with online text has been demonstrated to promote positive results regarding peer collaboration as students shift to the role of the "expert"—taking control of their learning (Castek, 2008; Henry et al., 2012). Colwell and his colleagues (2013) investigated IRT as a means to developing digital literacy in middle school science instruction with 16 consecutive, weekly lessons. Lessons embedded digital literacy skills within student inquiry projects and found that open-ended inquiry projects with moderate structure provided the best context for practicing strategies related to locating and evaluating Internet-based text; however, the students in their study struggled to internalize strategies, often abandoning these strategies when working independently.

Purpose of the Study

The impetus for this research study was prompted by the confluence of

Table 1. Comparison between Reciprocal Teaching (RT) and Internet Reciprocal Teaching (IRT)

	RT	IRT
Strategies	<ul style="list-style-type: none"> • Predictiong • Questioning • Clarifying • Summarizing 	<ul style="list-style-type: none"> • Generating Questions • Locating Information • Evaluating Sources • Synthesizing Information • Communicating Information to Others (e.g. blogs or e-mail)
Setting	Small Groups	1:1 Laptops
Modeling	Emphasis on teacher modeling reading comprehension strategies	Emphasis on teacher modeling and peer modeling of comprehension strategies with online text
Gradual Release of Responsibility	Teacher scaffolds students through continued practice to develop a range of self-regulated metacognitive strategies	Instructional scheme occurs within three distinct phases, scaffolding students from direct instruction to independent inquiry.

several factors in education and educational research. First, there is an increase in the use of Internet-based expository texts in schools due to the guidelines driven by the CCSS, which naturally heightens the need to build greater instructional support for teachers using expository text (NGA & CCSO, 2010) . Second, research has illustrated that students need to develop more sophisticated online research strategies to be successful in constructing meaning with Internet-based text (Cho & Afflerbach, 2015; Coiro, 2011; Coiro & Dobler, 2007; Leu & Reinking, 2010). Third, while efficacy outcomes within IRT have been mixed, in general, three factors (teacher modeling, systematic instruction, collaborative work) appear to be important to the successful translation of the strategy training to successful online research.

This study was designed to continue to refine our understanding of 21st

Century online research skills for children in traditional classroom settings. Our first research question was: Which variables best predict performance (prior to program instruction) on 21st Century online research skills assessment for all learners? This question was centered on identifying the relationships among traditional and online reading assessments, as well as individual differences among the learners as sources of variance. The second research question was: Do students in classes where teachers use scripted lessons focused on promoting 21st century online research skills show significantly greater gains than a randomly assigned comparison sample in locating, evaluating, and synthesizing online content over the course of an academic semester.

Methods

Overview

This quasi-experimental research study was developed to (a) identify effective predictors of 21st Century online research skills for students in standard 5th grade classrooms and (b) test the impact of scripted instructional materials on student outcomes in a standard intermediate school over a 12-week period. To identify predictors for the 21st Century online research skills, regression analyses predicting performance of all 5th grade students on a pretest were conducted. To test the effect of the intervention, teachers were randomly assigned to the treatment or comparison conditions (see following section on instructional activities for more details). The 12 weeks involved two weeks of pretesting for all participants, eight consecutive weeks of intervention for the treatment group (which consisted of classroom teachers providing scripted lessons in 21st Century online research) and two weeks of posttesting for all participants. Over the course of the intervention, teachers in the treatment condition delivered 13 lessons focused on improving 21st Century online research skills (approximately 10 instructional hours) while control group teachers maintained their standard instructional practices.

Participants

Participants in this study were 418 fifth grade students (48% boys, 52% girls) from a suburban intermediate school that serves students in grades five and six (total of 1,015 students, average class size of 27 students). At this school, there were 12 teachers who instructed fifth-grade language arts classes (average of nine years teaching experience, over half holding a masters degree in elementary education). Collectively, the 12 teachers instructed 19 sections of

Language Arts courses (five of which were identified as advanced classes). All 12 teachers volunteered to participate in the study with the understanding that assignment to the experimental and comparison conditions would be handled through stratified random selection (Gall, Gall, & Borg, 2005) to ensure that there was reasonable distribution of the five Advanced Language Arts sections to the two conditions. This was accomplished by first randomly assigning two sections of Advanced Language Arts to each condition. The remaining Advanced Language Arts class and all regular sections in the school were subsequently assigned to the control or experimental group through randomized cluster sampling conducted at the teacher level. That is, assignment to condition was confined to the teacher level to ensure that each teacher taught only one condition (for those teachers with two sections of Language Arts classes). The end result was ten Language Arts classes in the experimental group (5 teachers, 218 students) and nine Language Arts classes in the control group (7 teachers, 200 students), with two out of the five advanced Language Arts classes participating in the experimental group.

School records indicated 16% percent of students participating in the study received free and reduced lunch. Demographic data showed 74% of participants were White, 8% Black, 2% Hispanic, 8% Asian/Pacific, 7% Multiracial, and less than 1% American Indian. Comparisons between the treatment and control groups demonstrated equitable distribution of gender, ethnicity, and socioeconomic status across the two conditions. Although all fifth grade students participated in the instructional activities consistent with their teachers' randomly assigned condition, students identified with special needs were excluded from the current analyses to limit the impact of confounding effects imposed by individualized instructional interventions.

Measures

Several performance-based assessments of reading comprehension and research in open, networked environments have previously been developed (Castek, 2008; Coiro, 2011; Leu et al., 2005; Leu & Reinking, 2010; New Literacies Research Team, 2005) with additional assessments being developed by the Online Research and Comprehension Assessment (ORCA) Project to assess online research (Leu, Kulikowich, Sedransk, & Coiro, 2009). Models have been created to help educators understand and assess multiple-source comprehension (Goldman, Braasch, et al., 2012; Goldman, Lawless, et al.,

2012). ORCA performance-based measures including ORCA-Blog, ORCA-Instant Message (New Literacies Research Team, 2005), ORCA-Iditarod (Leu et al., 2005), ORCA Scenarios I and II (Coiro, 2011), and the ORCA-Elementary (Castek, 2008) take students through a series of online information tasks incorporating a variety of Internet resources. Rubrics for each Internet task evaluate students on their ability to search, locate, evaluate, synthesize, and communicate information.

21st Century online research performance. For this study, an adapted version of the ORCA-Elementary was used to measure 21st Century online research skills. The ORCA-Elementary assesses online research skills with 4th and 5th grade students through five tasks (i.e., ask questions, search, critically evaluate, synthesize, and communicate information) posed as informational problems (Castek, 2008). Validation for the ORCA-Elementary was established through iterative reviews with expert review panels, a participating teacher, and the original author (Castek, 2008) and found to be valid and reliable (Cronbach's Alpha = .79) for that initial study with a single classroom.

To enable a school-wide implementation, we modified the ORCA-Elementary to fit within a 60-minute time frame. In the end, the ORCA Elementary-Revised used in this study included four tasks that measured three discrete subskills (locate, evaluate, synthesize; see <http://tinyurl.com/ORCAELEM-REVISED> to access the full assessment). This revision to the ORCA-Elementary also allowed for more consistent scoring as we prescribed the content of the online research activities within a secure web-based assessment environment.

Student responses were analyzed and scored by the first author, who was blind to participant condition, according to the ORCA Elementary-Revised rubrics to evaluate performance of 21st Century online research skills (see: <http://tinyurl.com/ORCAELEM-REVISED-RUBRICS>). Reliability of the coding process was determined through a 10% validation check conducted with a second coder who was an elementary school teacher with a Master's degree and ten years teaching experience. Review of the independent codes for the primary and second coding demonstrated a high degree of consistency across the two ratings ($r = .94$). Questions for this assessment measure were categorized within three subskills, including locating information, synthesis, and evaluation, which were equally weighted. A sample of student open-ended

responses for each subskill coded according to the assessment rubric can be found in Tables 2-4. Assessment criteria for each subskill are included below.

1. *Locating Information:* Participants generated and revised questions to begin the query process. Tasks 1-3 required students to locate a specific website based on a description posed by fictitious students in the question stem. Partial credit was awarded to students who found similar sites or listed the site's URL through the domain name (i.e. news.bbs.co.uk). To earn full credit, students needed to correctly post the full URL for the requested website (i.e. news.bbc.co.uk/cbbcnews/hi/static/guides/animals). Locating additionally involved students answering question prompts using information posted within the correct website. Only partial credit was awarded to students who answered question stems using related prior knowledge or information posted on a similar website. Within task 4, direct links were instead provided, as used in previous online measures (Castek, 2008; Coiro, 2011), to eliminate the need to first locate the required information before synthesizing and evaluating content.
2. *Evaluating Information.* Within tasks 2-4, students employed critical evaluation skills to explain reliability of information. Tasks involved evaluating the author's credentials (*Are the maker's experts? How do you know?*), verifying content with additional websites, and determining which, if any, websites were deceptive or unreliable by listing specifics from the website to justify their conclusions. Full credit for evaluation tasks were awarded to students who provided justification for the author's/website's credibility based on something learned through exploration of the website or implementation of a strategy to verify content (i.e. *I googled it and learned it was a hoax*).
3. *Synthesizing Information.* Students synthesized within and across websites on the ORCA Elementary-Revised. In task 1, students explored a website's animated interactive before providing information as to why animals become endangered. Responses needed to include reasons presented from multiple pages within

the interactive. The fourth task on the ORCA Elementary-Revised required students to explore three similar sites on a related topic, dog friendly vacations. After viewing all three sites, students were asked to synthesize across the websites by providing specific examples as to how these locations would work to keep dogs safe. To earn full credit on this task, students had to collect and provide information from more than one site in their

Table 2. Sample of Student Open-Ended Responses for Locating Subskill Coded According to the ORCA-Elementary Revised Rubric

Task Question: Locate number of otter species and locate a second site where this information could be verified.		
Score	Rubric Criteria	Sample Student Response
0	<i>Task not successfully completed.</i> No answer is given for this part of the question or “I didn’t find it,” or didn’t give a URL at all.	www.sea interactive.com
1	<i>Too general.</i> Located a webpage related to sea otters but it was NOT made by correct organization. They must give a URL in to order to get credit.	animals.nationalgeographic.com/ animals/mammals/sea-otter/
2	<i>Partially correct.</i> Found the information about sea otters on the correct organization, but did not locate the interactive.	www.montereybayaquarium.org/...otter/otter_resources.aspx
3	<i>Task successfully completed.</i> Located the Sea Otter Interactive with in the correct organization and gave the correct URL.	http:// www.montereybayaquarium.org/ media/all_about_otters /whatsanotter01.html

response.

Traditional reading achievement. To measure reading achievement through traditional approaches, scores from two standardized assessments were collected from school records. First, the statewide English/Language Arts

Table 3. Sample of Student Open-Ended Responses for Synthesizing Subskill Coded According to the ORCA-Elementary Revised Rubric

Task Question: What are some ways these places will make sure my dog is safe?		
Score	Rubric Criteria	Sample Student Response
0	Task not successfully completed. No answer was given for this part of the question OR response does not answer the question correctly by providing a way dogs can stay safe.	It sounds safe.
1	Response wasn't based on the results of a synthesis from the websites. Students talked about ways dogs can be safe on vacation from their own prior knowledge.	They will make sure that there are good people there who like dogs.
2	Partially correct. Student collected information on ways dogs can stay safe but only included ideas from one of the websites.	Have the dogs and you wear a life jacket, and always have an experienced boater in the canoe.
3	Response was correct and complete. Student collected information from more than one site and provided at least two ways dogs could be kept safe based on information from given websites.	Even though your dog is off it's leash, Dog Paddling Adventures will make sure your dog is in a close distance. All dogs will be seen. If needed, you can put your dog on a leash for the hikes. Camp Winnaribbun does the same thing. These places are most reliable and I think your dogs will have fun at these resorts.

(ELA) proficiency test (State of Indiana Department of Education, 2010) was gathered. The ELA measures a collection of literacy skills including vocabulary, reading comprehension, and writing applications for grades three through ten. Analyses of the ELA conducted by the Department of Education demonstrated reasonable reliability (with internal consistency estimates across grade levels reported at Cronbachs alpha = .91) and construct validity established through confirmatory factor analysis (State of Indiana Department of Education, 2012).

Table 4. Sample of Student Open-Ended Responses for Evaluating Subskill Coded According to the ORCA-Elementary Revised Rubric

Task Question: What are some ways these places will make sure my dog is safe?		
Score	Rubric Criteria	Sample Student Response
0	Task not successfully completed. No answer is given for this part of the question. Misunderstood question: response did not state or explain reasons why the sites were real or not. Incorrect Answer: Student explained reasons why Dog Island is a real place. May also mention the other(s).	They [dog island] have two different sides one for huge dogs and one for small dogs and meg med dogs. Each dog is given a Dog Island Dog Tag, which allows us to know by use of GPS where he or she is at all times. They
1	Partially correct. Student implied the sites were real/fake but reasoning wasn't based on any info. They addressed (i.e. they drew a conclusion but did not provide ANY evidence as to why they felt that way). Mentioned a strategy for how they could check whether it was false or not.	They will make sure that there are good people there who like dogs
2	Correct but incomplete. Student reasoned that the sites were real./fake prior knowledge (domestic dogs can't live without people, dogs don't behave that way, etc.)	Because dog island's FAQ didn't seem serious
3	Task successfully completed. Provided a logical a reason based on learning something about the author and/or the information or the author's contact information. Ask for references, etc. (ex: I googled it and learned it was a hoax, the authors made the site look real, but they are playing a trick to make people laugh, etc.) Mentioned a strategy for how they could check whether it was false or not.	I know because dog island has a disclaimer saying it is not real.

The second traditional reading assessment used in this study was the Scholastic Reading Inventory (SRI), a computer adaptive reading assessment program that measures reading comprehension using the Lexile Framework® for Reading (Scholastic Inc., 1999). As students are presented with questions,

the questions progressively increase or decrease in difficulty until the student's reading ability has been determined. Scholastic (2007) provides extensive documentation in its technical manual demonstrating scale reliability and validity procedures used during the creation of the SRI using Research modeling techniques. In addition, repeated third party objective confirmations of the scale have demonstrated criterion and construct validity that demonstrates significant correspondence to learning gains over time and reading proficiency development effectively captured with the SRI adaptive testing procedure (e.g. Hewes, Mielke, & Johnson, 2006, January; Pearson & White, 2004, June; Williamson, Thompson, & Baker, 2006, March).

Treatment Condition: Online Research Instructional Activities

We developed a stand-alone 21st Century online research unit that included 13 scripted lessons complete with lesson plans, supporting PowerPoint materials, learning modules, interactive materials for students, and video tutorials for the teachers. The teachers assigned to the experimental group attended an overview meeting of IRT and the provided curriculum. These teachers then agreed to deliver the 13 lessons over an 8-week period using a combination of one computer lab with 30 computers and a mobile pod of 25 laptops with wireless connectivity that were used in the classrooms. This setup allowed each student to have independent and equal access to computers during the instructional period of the study. Teachers also had access to Liquid Crystal Display (LCD) projectors where online information as well as presentation documents was projected onto a classroom screen for all students to view.

The lessons created for this study provided explicit instruction on the three 21st Century online research skills (locating, evaluating, synthesis) employing an instructional process consistent with IRT as previously described in this paper. As shown in Table 5, for each 21st Century online research skill, all three phases of IRT (teacher modeling, guided practice, independent inquiry) were addressed during at least one lesson. The lessons were representative of the skills measured within the assessment (ORCA Elementary-Revised) and anchored within the school's standard-based curriculum; however, there was no overlap in content between the topics in the assessments and the topics in the IRT lesson or student inquiry projects. Lessons within each skill progressed from simple to more complex Internet tasks, allowing students to build greater competence before engaging in the final IRT phase (independent inquiry). For

example, critical evaluation lessons seven through ten incorporated teacher modeling and guided practice in preparation of students completing their own critical evaluation of online text during independent inquiry (see Table 5; lesson 11). In the following sections, we provide description snapshots of the curriculum arranged by each of the assessed skills

Locating information. The first lesson, titled “Nuts & Bolts,” began by teaching students the basic skills needed to effectively locate information and understand the tools available to support researching in online environments.

Table 5. *Timeline of Online Reading Comprehension Sessions*

Session	Skill/Lesson	IRT ^a Phase ^b		
1	Basic Skills <i>Nuts & Bolts</i>	Phase 1	Phase 2	Phase 3
2	Questioning/Locating <i>What is Your Question</i>	Phase 1	Phase 2	Phase 3
3	Locating <i>Key It In</i>	Phase 1	Phase 2	Phase 3
4	Locating <i>Search Box Strategy</i>	Phase 1	Phase 2	Phase 3
5-6	Locating <i>Inquiry Searching</i>	Phase 1	Phase 2	Phase 3
7	Critical Evaluation <i>Who is the Author?</i>	Phase 1	Phase 2	Phase 3
8	Critical Evaluation <i>Is it Accurate?</i>	Phase 1	Phase 2	Phase 3
9	Critical Evaluation <i>Cite the Copyright!</i>	Phase 1	Phase 2	Phase 3
10	Critical Evaluation <i>Bias, It's Everywhere</i>	Phase 1	Phase 2	Phase 3
11	Critical Evaluation <i>Evaluation Wizard</i>	Phase 1	Phase 2	Phase 3
12	Synthesis <i>Synthesizing Information?</i>	Phase 1	Phase 2	Phase 3
13	Synthesis <i>Synthesis Response</i>	Phase 1	Phase 2	Phase 3

^aInternet Reciprocal Teaching

^b**Phase 1:** Teacher Modeling; **Phase 2:** Guided Practice; **Phase 3:** Independent Inquiry

Students engaged in lessons on how to open and navigate within websites, discover shortcuts, utilize online tools such as edit-find, learn Internet-specific vocabulary, troubleshoot problems, and understand the basic layout of an Internet page. We developed short video tutorials to showcase these skills (teacher-led demonstration) followed by guided partner practice and discussion. For example, after a demonstration of the difference between a domain and universal resource locator (URL) using a website relevant to student interests (i.e. espn.go.com), students divided up the components of a URL and examined the purpose of a domain name (.com, .edu, .gov, etc). Guided practice afforded students the opportunity to examine the effect of a domain suffix after a given name (i.e. www.indiana.edu versus www.indiana.gov) to aid in determining a website's purpose and credibility. A full collection of these “Nuts & Bolts” lessons, utilized within this study, including researcher-developed scripted lesson plans, tutorials, and PowerPoint's, can be accessed at the following link: <http://tinyurl.com/nuts-boltslessons>.

Next, instruction centered on teaching students how to self-generate questions to form an Internet search query, as this has been shown to significantly impact reading comprehension with traditional texts, even after controlling the variance for prior knowledge (Taboada & Guthrie, 2006). Meeting grade-level standards such as *conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic* (CCSS.ELA-Literacy.W.5.7), or *write informative/explanatory texts to examine a topic and convey ideas and information clearly* (CCSS.ELA-Literacy.W.5.2), participating teachers worked with students to develop inquiry topics under teacher-selected umbrella themes (i.e. notable people or countries) to provide moderate structure, as previously shown effective (Colwell et al., 2013) within the inquiry projects. Intervention lessons involved students grouping questions into categories before selecting focus areas to narrow search queries.

Once topics were selected and focus areas established, students worked to brainstorm, sort, and narrow their query to two, researchable questions within their selected topics (i.e. Martin Luther King). Within lessons three and four, students were taught how to conduct a search query and locate information in online environments through guided practice (phases 1-2 of IRT). Students first learned how to generate effective key words for their query searches, followed by the implementation of the Search Box Strategy (see 21cif.com/tutorials/micro/mm/searchbox) to revise keywords, check results,

and repeat the search until relevant information was located. Lessons five and six afforded students the opportunity to practice this recursive process through independent inquiry (phase 3 of IRT) as students researched their chosen inquiry topics, continually reflecting on their queries using effective key words and practicing taught Internet proficiencies to locate information.

Critical evaluation. As shown in Table 5, a considerable amount of attention during the online lessons was devoted to the development of critical Internet evaluation skills, as past studies imply this is an area of substantial difficulty for students (Castek, 2008; Colwell et al., 2013; Dwyer, 2010; Kuiper et al., 2008; Zhang & Duke, 2011). Students spent five of the 13 lessons working on critical evaluation through questioning the author, checking the accuracy of information, exploring the relevance of copyright, and learning to detect bias within an Internet site. For example, within intervention lesson eight, students investigated the reliability of content by triangulating data with three additional sources. After finding the author of a preselected website, participating teachers modeled how to place the author's name into a search engine to verify the author's legitimacy and qualifications. As such, critical evaluation notability builds on the need to first locate information within the research process. Students worked through challenge tasks within each evaluation lesson to practice, peer-teach, and discuss results and implications. During IRT phase 3, application of this knowledge occurred independently with a systematic evaluation of a student-selected website related to his or her inquiry topic.

Synthesis. To synthesize information from their inquiry research, students utilized online concept mapping (see bubbl.us) to establish relationships between main concepts, subtopics, and details within hierarchical system. Within lessons 12-13, students were taught how to copy/paste categorical information and appropriately cite the reference to later paraphrase into a synthesis response (IRT phases 1-3). Web 2.0 technologies within the school's learning management systems were integrated into the intervention lessons to communicate learned information. For example, students utilized a class blog to post synthesis responses over researched queries and comment on their peers' research findings.

Control Condition: Typical Instructional Activities

To ensure that treatment effects could not merely be driven by level of exposure to technology, students in the control group also utilized the lab or laptops regularly (approximately 60 minutes per week) throughout the duration of this study. The weekly use of the computer labs was comparable to the time afforded to the treatment group. The teachers in the control group were asked to maintain a “business as usual” use of the lab time, implementing typical instructional activities (e.g., typing documents, exploring content websites, playing educational games). As such, students in control classrooms continued to experience standard instruction using computer-based learning consistent with the school’s standards-based curriculum. Although the types of computer activities implemented in the control group varied by teacher preference and curriculum needs, computer access activities did not involve any intervention instruction on the 21st Century online researching skills of locating, evaluating, and synthesizing information.

Treatment Fidelity

A significant concern in field-based intervention research is naturally establishing treatment fidelity for the intervention group. To ensure that the students in the treatment condition were receiving the target content as scripted in the 13 lessons, the first author made weekly checks of the intervention group teacher logs regarding the delivery of the instructional units. In addition to being able to track that the teachers were implementing the programmed instructional modules, the logs provided an opportunity for the teachers to document any problems, concerns, or issues that arose during their instruction. In addition to the printed logs, teachers in the treatment condition had technological support available for using the lab resources and materials that were necessary to display content included in the scripted lessons. Furthermore, the teachers in the treatment condition were asked to provide feedback on their ability enact the instructional materials in the scripted lessons. All teachers (who were randomly assigned to the treatment condition) claimed they were able to implement the lessons using only the provided materials. Overall teachers maintained a high degree of uniform delivery of the online research activity lessons. This was largely promoted by the logistical need to keep the lessons to a specific time frame given tight computer lab scheduling.

Results

To address the two research questions undertaken in this study, we first conducted preliminary analyses examining group differences on the reading performance measures to identify any pre-existing group differences that were not controlled for by the clustered random assignment strategy. Next, regression analysis was employed to identify which variables best predicted performance on the pretest version of the ORCA Elementary-Revised for all participants. Finally, a repeated measures analysis of covariance was employed to explore differential rates of growth for the two conditions on 21st Century online research performance growth, controlling for the influence of traditional reading skills.

Preliminary Analyses

Because complete randomization of assignment to groups was unrealistic in a standard school setting (using only stratified cluster random assignment), an initial examination to determine that equivalent group distribution was achieved was conducted. Exploration of group membership regarding gender, ethnicity, and free/reduced lunch status demonstrated equivalent distribution across the two groups (see Table 6). As such, no further controls for the primary research question related to student demographics were warranted.

To identify group equivalence on the traditional measures of reading and the ORCA Elementary-Revised, another series of one-way ANOVAs was conducted. These analyses indicated the control group outperformed the treatment group on both measures of traditional reading: ELA Proficiency Test, $F(1, 407) = 18.33, p < .0001, d = -.42$; and SRI, $F(1, 415) = 12.23, p < .001, d = -.34$. Furthermore, the control group demonstrated superior performance at pretest on the ORCA Elementary-Revised, $F(1, 415) = 5.68, p < .017, d = -.23$ (see Table 7). Naturally, having disparate literacy skills at the outset of the study posed a significant challenge to the validity of our analyses. To account for these group differences at the outset, we included the two traditional reading measures (SRI and ELA Proficiency Test) as covariates for the primary analyses. This statistical control accounts for pre-existing variance between the groups attributed to the traditional reading measures. As for the pre-intervention differences observed on ORCA Elementary-Revised Pretest, the use of a repeated measures design (which examines both the pretest and posttest values and examines within-subject changes directly) enabled

Table 6. Participant Demographic Information and Pre-Intervention Performances

	N	ELA STATE ^a M (SD)	SRI ^b M (SD)	Pretest ORCA ^c Elementary Revised M (SD)
Gender				
Male	198	503.73 (51.44)	908.86 (225.03)	13.04 (4.89)
Female	219	510.27 (58.51)	911.18 (197.08)	14.24 (5.18)
SES				
Free or Reduced Lunch	67	486.94 (50.34)	833.69 (211.73)	12.73 (4.56)
Paid Lunch	350	510.99 (55.43)	924.70 (207.45)	13.85 (5.15)
Group Status				
Experimental	218	496.12 (43.66)	875.91 (191.92)	13.11 (4.45)
Control	200	519.06 (63.55)	947.15 (223.72)	14.29 (5.63)
Ethnicity				
White/Non Hispanic	310	509.06 (52.48)	924.39 (212.29)	13.36 (4.98)
Black/Non Hispanic	34	472.66 (43.49)	780.88 (174.29)	11.53 (4.45)
Hispanic	10	497.70 (46.77)	807.90 (200.42)	13.30 (4.57)
Asian Pacific Islander	33	521.88 (63.21)	956.94 (198.14)	15.42 (5.65)
Multiracial	31	511.80 (74.98)	884.57 (195.93)	14.50 (5.66)
American Indian	1	523 (0)	979.00 (0)	18 (0)

Note. ^aEnglish/Language Arts Statewide Assessment

^bScholastic Reading Inventory

^cOnline Reading Comprehension Assessment

exploration of the primary research question, which is to identify if the intervention program led to higher levels of growth from pretest to posttest on the ORCA Elementary-Revised as compared to the growth observed in the comparison condition.

Table 7. *Group Means on Traditional and Online Reading Measures*

	Experimental		Control	
	N	Mean (SD)	N	Mean (SD)
ELA ISTEP+ ^a	212	496.12 (43.659)	197	519.06 (63.552)
SRI ^b	217	875.91 (191.916)	200	947.15 (223.721)
Pretest ORCA ^c Elementary Revised	218	13.11 (4.452)	199	14.29 (5.627)
Posttest ORCA Elementary Revised	212	18.17 (5.384)	197	17.83 (5.528)

English/Language Arts Indiana Statewide Assessment Preparation Plus

^bScholastic Reading Inventory

^cOnline Reading Comprehension Assessment

RQ1) Predictors of Initial 21st Century Online Research Performance

The first research question was focused on identifying predictors for 21st Century online research skills, essentially to explore the relevance of these skills in relation to traditional language arts skills and to identify personal difference factors related to noted differences on this measure. To identify which variables predicted students' initial abilities (prior to intervention) in these tasks, we examined the pretest values on the ORCA Elementary-Revised for all participants with linear regression analysis. As these data were all collected prior to the intervention, a single analysis was conducted on the full sample ($n = 418$). The independent variables serving as predictors for ORCA

Elementary-Revised pretest were the two traditional reading measures (State ELA & SRI) and student demographic characteristics (i.e., gender, ethnicity, and socioeconomic status). The results (see Table 8) demonstrated that 21st Century online research performance was reliably predicted by the norm-referenced traditional measures of English/Language Arts ability (State ELA & SRI) as well as student gender and ethnicity. Overall, the variables accounted for 28% of the variance in the ORCA Elementary-Revised pretest values, with the greatest percent of variance explained by the standardized reading measures. While statistically significant, the effects of gender and ethnicity are not strong enough to warrant meaningful attention. However, the results indicated that girls outperformed boys, and students identified as White/Non-Hispanic had higher initial online research skills. These results support the expectation that the 21st Century online research skills are affiliated with standard language arts skills (e.g., reading comprehension, analysis) which provide limited but necessary confirmatory construct validity support for the ORCA Elementary-Revised.

The results of the hierarchical regression analysis identified that gender and ethnicity were weak but statistically significant predictors of 21st Century online research performance. While these effects were weak (and likely only statistical significant due to the power gained from a large sample size), we

Table 8. Regression Analysis Summary for Predicting ORCA Elementary-Revised Pretest

	B	SE B	β	t	p
ELA STATE ^a	.028	.005	.304	5.38	.000
SRI ^b	.006	.001	.259	4.62	.000
Gender	.891	.432	.088	2.06	.040
Free and reduced lunch status	-.065	.586	-.005	-.111	.912
Ethnicity	.352	.168	.090	2.10	.037

^aEnglish/Language Arts Statewide Assessment

^bScholastic Reading Inventory

determined it important to ensure that gender and ethnicity did not significantly influence the success of the instructional program. To test this, we ran a multivariate repeated measures analysis of covariance (MANCOVA) that tested the main effects and interactions for treatment condition, gender, and ethnicity on the pretest and posttest values for the ORCA Elementary-Revised while controlling for initial differences demonstrated on the traditional reading measures. The results of this analysis demonstrated that while gender and ethnicity were weak predictors for the ORCA Elementary-Revised pretest scores, neither gender nor ethnicity were associated with changes in performance over the course of the intervention. As such, for simplicity we have presented subsequent analyses without including gender and ethnicity in the model.

RQ2: Effect of 21st Century Online Research Intervention on Student Performance

The second research question addressed the utility of the classroom-based intervention in promoting 21st Century online research skill development. To test the efficacy of the programmed instruction materials, we used a repeated measures analysis of covariance (ANCOVA) to test (a) the main effect of participating in the intervention (21st Century online research lessons for the treatment group, standard curriculum for the comparison group), (b) the main effect examining differences in performance at pretest and posttest (not change scores), and (c) the interaction of growth rates over time and the treatment condition. Thus, the repeated measures ANCOVA allows us to examine the rates of change for the two groups to identify if there are differences in growth rates for the treatment and comparison samples. The use of the covariate (traditional reading ability) also removes the pre-existing differences of general reading aptitude prior to testing the group growth trend differences. Preliminary checks were conducted to ensure there were no violations of assumptions of normality and linearity, homogeneity of regression slopes, and reliable measurement of the covariates. Levene's Test of Equality of Error Variances indicated equal variances for the ORCA Elementary-Revised Pretest ($F=3.38$, $p=.071$) and unequal variances on the ORCA Elementary-Revised Posttest ($F=5.50$, $p=.019$). The large sample size found within this data set increases the power of this study and accounts for the detection of unequal variances (Tabachnick & Fidell, 2007).

The results of the repeated measures ANCOVA demonstrate several findings of importance. First, examination of the covariates revealed that traditional reading achievement was an important factor to be included in order to isolate the effects of the intervention: time x ELA, $F(1, 405) = 2.96$, $p = .086$, $d = .17$, and time x SRI, $F(1, 405) = 9.35$, $p = .002$, $d = .30$. This result demonstrates that the covariates (traditional reading measures) influenced individual student growth on 21st Century online research skills (regardless of group). This essentially demonstrates that students with higher skills in traditional reading activities were able to demonstrate greater gains on the ORCA Elementary-Revised, likely due to applying their advanced skills in reading or a general higher degree of overall academic ability.

Second, the results demonstrated a significant main effect for the repeated factor (time), $F(1, 405) = 5.12$, $p = .024$. This weak but statistically significant effect merely demonstrates that as a whole (comparison and experimental groups combined), students demonstrated gains from pretest to posttest on the ORCA Elementary-Revised. This small positive gain is likely

Table 9. *Unadjusted and Estimated Marginal Means for ORCA Elementary-Revised Total and Subtests*

		Experimental (N=212)		Control (N=196)	
		Pretest	Posttest	Pretest	Posttest
ORCA Elementary- Revised Total	Unadjusted means	13.13	18.17	14.32	17.83
	Estimated marginal means ^a	13.65	18.74	13.76	17.23
Locate	Unadjusted means	4.81	6.56	5.55	6.45
	Estimated marginal means ^a	5.051	6.830	5.296	6.157
Evaluate	Unadjusted means	4.59	5.95	4.49	5.67
	Estimated marginal means ^a	4.738	6.100	4.327	5.511
Synthesize	Unadjusted means	3.81	5.75	4.29	5.67
	Estimated marginal means ^a	3.950	5.898	4.140	5.506

^aCovariates appearing in the model are evaluated at the following values: ISTEP = 507.17, SRI = 911.98

due to a testing effect, general gains in research skills supported by the standard curriculum, or simple maturation effects.

Finally, the primary statistic of interest in this study is the interaction of the experimental condition (treatment vs. control) and the repeated factor of time. This test identifies if the growth from pretest to posttest for the two groups varied, while controlling for the initial differences in ability on the traditional measures of reading. The result demonstrated significantly greater growth for students in the experimental group from pretest to posttest on the ORCA Elementary-Revised, $F(1, 405) = 11.58, p = .001, d = .29$. This outcome is best illustrated through examination of the estimated marginal means displayed in Table 9, which have been adjusted for the pre-existing reading skills measured by SRI and State ELA measures, isolating the effects of the intervention. As such, this analysis demonstrates that the classroom based instruction for 21st Century online research was effective at promoting student skills measured on the ORCA Elementary-Revised during the intervention period, above the expected level of growth that was observed for the comparison group who were engaged in traditional reading instruction activities.

To further explore the performance patterns on the three component parts of the ORCA Elementary-Revised, a repeated measures multivariate analysis of covariance (MANCOVA) was also conducted. Following Castek's (2008) description of tasks embedded within the ORCA-Elementary, three subscales for the ORCA Elementary-Revised were explored (locating, evaluating, synthesizing). Similar to the initial ANCOVA, results demonstrated that students in the treatment group demonstrated significantly greater gains than their control group counterparts from pretest to posttest on the online skills of locating, $F = (1, 405) = 16.50, p < .001, d = .34$, and synthesizing $F = (1, 405) = 5.48, p < .02, d = .23$. No group differences in the gains observed for growth in the domain of evaluating were observed, $F(1, 405) = .597, p < .44, d = .10$ (see Table 9 for means and estimated marginal means).

Discussion

Predicting Student 21st Century Online Research Skills

Our initial research question examined which factors predict ability on the ORCA Elementary-Revised prior to intervention activities. The importance of this analysis is to identify the factors that best predict student differences in

21st Century online research in a standard student population. The results of the regression analysis revealed that prior academic achievement on norm-referenced traditional measures of reading (State ELA and SRI), gender, and ethnicity accounted for 28% of the variance. Examination of the data demonstrates that the standardized measures of reading were the most reliable predictors of students' initial 21st Century online research skills. Put simply, students with strong English-Language arts and reading skills were better prepared to perform on the ORCA Elementary-Revised. This provides some evidence of validation that the 21st Century online research activities are related to standard literacy measures, as well as identifying key factors that predict success in this new literacy domain. This conclusion was bolstered by the results of the ANCOVA that showed significant impact of the traditional reading measures on the growth rates from pretest to posttest on the ORCA Elementary-Revised, demonstrating that students with higher traditional reading skills enjoyed greater gains over the course of the study.

These findings are consistent with prior research that shows traditional and online reading performances were not necessarily isomorphic, but rather require both similar and more complex skills (Afflerbach & Cho, 2010; Coiro, 2011; Coiro & Dobler, 2007). However, there are differential findings in the literature on the relationships among traditional and online reading measures. For instance, Coiro (2011) found a significant correlation between prior reading achievement on standardized reading assessments and her online reading comprehension measures (ORCA-Scenario I and II). Alternatively, a second study reported no relationship between online reading and standardized reading ability assessments (Leu et al., 2005). We believe the discrepancy in the online reading assessment tasks are likely at the base of these differences. For example, an assessment asking students to locate *any website* (ORCA-BLOG; Leu et al., 2005) versus asking students to locate a *specific website* for task questions in the current study may account for divergent findings.

21st Century Online Research Performance Gains

In the primary research question, statistical analyses revealed significant differences between the experimental and control groups in 21st Century online research performance growth. Results of the repeated measures ANCOVA demonstrated significantly greater gains for the treatment group on the overall 21st Century online research measure from pretest to posttest after controlling

for standard reading proficiency. Furthermore, the treatment group advantage was evident in the ORCA Elementary-Revised subskills of locating and synthesizing, with no detectable difference in growth for the skill of evaluation when comparing the treatment and comparison groups' performances on the pre and posttests.

These results make clear that when a standard classroom of students is provided with classroom-based instructional activities that develop online research skills, their 21st Century online research abilities are improved. This significantly greater gain over their randomly assigned comparison peers demonstrates that the growth observed in this intervention is not due to maturation or history effects, and the superior growth for the experimental group can be attributed to the intervention activities. What is important to note for this particular study is that the intervention materials were stand-alone curriculum materials that teachers implemented without ongoing professional development. This ability to impact student performance in 21st Century online research without the need for intensive training or ongoing technical support for teachers is a promising finding for promoting competence in online research skills for all learners.

Locating Information. The difference noted in gains over time for the experimental group in the locating tasks is particularly important to demonstrating the impact of 21st Century online research instruction. Students in the experimental group were more accomplished at locating information within the limited time frame. Experimental group gains in locating were likely attributed to the searching proficiencies taught within the "Nuts & Bolts" lessons. Because each task on the ORCA Elementary-Revised was limited to only 15 minutes, a solid understanding of how to navigate a website was essential. For example, students were asked to communicate the Internet address in three of the four tasks. Understanding a universal resource locator (URL), where to find the URL on a webpage, and how to copy and paste the URL into their responses would greatly increase performance on the locating subskill. Students (e.g., those without the experiences gained in the intervention) who either wrote out the often lengthy URL by hand, toggled between windows to type the URL, or spent time searching for a *contact* address rather than a *website* address, may have dwindled away a substantial amount of task time.

Synthesizing Information. Our findings help add to the limited research in the field on synthesizing as a 21st Century online research skill. The skills assessed in our synthesis measure required students to integrate multiple points of information from a variety of pre-selected websites. Our procedure in Task 4 of our assessment provided a scaffolded process that focused specifically on the task at hand (synthesis), without requiring the students to also locate the websites. While this targeted strategy is more decontextualized than a natural Internet reading situation, it does allow more direct assessment of the primary task (synthesis skill) without the confounding effects of a failure or limitation in locating the information.

Instruction leading up to synthesis, consistent with the IRT model, moved progressively from simple to more complex tasks. As Churches suggests, perhaps synthesis instruction with online text first requires a fundamental understanding of questioning and locating (2009). From choosing an appropriate search engine to developing a researchable question, students utilized basic “Nuts & Bolts” knowledge to locate relevant information (i.e. using the edit-find tool). Students in our study worked to find relationships among resources, create meaning, and craft a written post to a classroom blog. Knowing to first locate and organize appropriate resources may have placed an important role in synthesis performance for experimental group participants.

Critically Evaluating Information. There are a number of possibilities as to why students in this study struggled with higher-level critical evaluation skills. One possible explanation may be the limited amount of time available to critically evaluate Internet information on the ORCA Elementary-Revised. Within the five evaluation lessons, students were taught to evaluate the reliability of Internet content by triangulating the data with three outside sources, investigating the author’s credentials, and screening the site’s content for bias. In Task 4, students had to evaluate three different Internet sites for accuracy and believability. Expecting students to evaluate all three Internet sites within the 15-minute time limit may have been unrealistic for this population of fifth-grade students. A second explanation could relate to a lack of proficiency with gatekeeper skills (Henry, 2006) as well as the notion that online reading skills and strategies are interrelated, recursive, and greatly dependent on each other (Coiro, 2011; Coiro & Dobler, 2007). Because there is a high degree of overlap, the inability to develop effective key terms or decipher search engine results may subsequently hinder critical evaluation. It appears that higher-level

skills are difficult to acquire, and more explicit, direct instruction from the teacher may be needed to increase proficiency in this area (Kingsley & Tancock, 2014).

Implications

The results of this study provide implications for instructional practice as well as add to the growing body of literature regarding 21st Century online research with upper elementary students. Specifically, the findings support prior investigations that identify connections between traditional and online reading processes. Given the growing use of online instructional and informational content for both formal and informal learning, it is imperative to continue to address 21st Century online research skills in standard reading curricula. In addition, our results identified select instructional activities and priorities that were efficiently integrated into a standard curriculum by teachers with limited external support. We offer suggestions based on these observations.

21st Century Online Research Skills as Part of Existing Curriculum

While our study demonstrated that basic 21st Century online research skills (prior to intervention) are related to standard measures of reading performance, the results also clearly identify that explicit instruction of 21st Century online research skills promotes learning and skill development. This illustrates the need to incorporate Internet reading skills into existing content curricula (Coiro, 2003; Leu, Zawilinski, et al., 2007). The definition of text must include both print and online text (Coiro, 2008; Dalton & Proctor, 2008) as online texts include new complexities (Coiro & Dobler, 2007) and amplify the literacy skills an individual needs to comprehend (International Reading Association, 2009; RAND Reading Research Study Group, 2002). For example, instead of using a table of contents, sidebars help students link to alternate concepts. Bookmarking sites and using the “back” button is similar to bookmarking printed text and will prevent students from losing sight of important content (Malloy & Gambrell, 2006). National Education Technology Standards (NETS; International Society for Technology in Education, 2007) have been developed to support effective technology integration in today’s schools. Instructional support, professional development, and indeed even ideas about what curriculum integration means are needed now to help teachers understand and effectively implement these

standards in educational settings (Hutchison & Reinking, 2011; Karchmer, 2001).

IRT as an Effective Instructional Framework

The use of IRT (Leu et al., 2008) as an effective instructional framework for teaching 21st Century online research skills contributes to existing research on RT. Viewing IRT as an updated model of RT may provide an accomplished framework-- supporting both student metacognition and strategic reading of online text. Additionally, placing instruction within a three-phase model can be considered effective for scaffolding students through the Zone of Proximal Development, which is essential to RT (Castek, 2008; Kingsley & Tancock, 2014; Leu & Reinking, 2010). This promotes the use of meta-cognitive strategies specific to online texts (e.g. inferring before opening a hyperlink, triangulating data to critically evaluate Internet-based text). Furthermore, phase two within IRT supports student collaboration to solve online tasks. As noted earlier, students have natural tendencies to collaborate in online environments (Castek, 2008; Henry et al., 2012), and placing the instructor in a facilitator role within Phase 2 and Phase 3 can allow participating students to collaborate and establish active roles in their learning. As one-to-one computing becomes increasingly standard in today's classrooms, contributing research on IRT, such as the data from this study, provides insight on expected outcomes of IRT as a framework to support 21st Century online research skills.

Successful 21st Century Online Research Instruction

Lessons used in this study, were shown effective for improving 21st Century online research for this population of students. Results indicate that teachers could effectively teach 21st Century online research skills in a classroom setting, and that students who received this instruction experienced greater success with these skills than students who did not. The significance of students succeeding with the intervention becomes especially important as this study is the first of its kind, demonstrating that an instructional model accompanied by standardized lessons can promote learning with a large sample of students within an important new area of instruction. Segmenting instruction into a three-phase model, including teacher modeling, guided practice, and Internet inquiry, with instruction progressing from simpler to more complex online tasks can serve as a foundational model for teaching 21st Century online research to today's students. Guided practice and independent

inquiry, incorporated into phases two and three of IRT, may have provided students with a sense of ownership, increased independence, and in turn, maximized learning for this population of students.

Our results indicate that students need more instruction on Internet evaluation, not in isolation, but rather continuously integrated within the IRT model. Indeed, critical evaluation skills may be more effective if lessons are based on a “slow drip” method where discussions and lessons related to the importance of critical Internet evaluation could occur frequently, across all content areas, and throughout the entire school year. This need for a “healthy skepticism” (Leu, Reinking, et al., 2007) when reading online text must become instilled in today’s students to recognize that anyone has the capability to author information on the Internet. Undoubtedly, more research is needed to examine how to best teach and assess the subskill of Internet evaluation. Future studies can help teachers understand not only how to teach critical evaluation successfully but also how best to integrate this instruction to impact student understanding.

Limitations and Future Research

Despite these encouraging results, potential limitations to this study may have impacted the results to a degree. First, the length of study was its greatest limitation. The 12-week continuous duration of the study with eight weeks of intervention lessons may have limited potential achievement gains. Measuring 21st Century online research proficiencies throughout the course of a school year almost certainly would have led to greater opportunity for the initial significant effects we observed to be more solidified. It is believed that a longer intervention period would have enabled the non-significant change in the Evaluation tasks to develop and demonstrate group differences favoring the experimental group. Secondly, the large sample size of predominantly White middle-class students obtained from a single geographic location limits the external validity of this study. Findings may have been different with a more diverse population of students, which was not possible in the context of this study.

Continued attention is warranted for the development of optimal assessments for 21st Century online research. Performance-based measures such as the ORCA Elementary-Revised are difficult to develop due to the inconsistent nature of Internet text, and they are time-consuming to score.

While switching to a multiple-choice assessment would speed up the scoring process and make the use by classroom teachers more viable, such a process would likely lead to limited interpretation of online research ability due to the decontextualized nature of assessment (Castek & Coiro, 2010). However, it is important to recognize that this difficulty is not reserved for online reading and research assessment.

Critics of standardized measures of reading commonly point to the limitations of multiple-choice items typically used to identify student proficiencies. Alternative approaches to assessment in this domain provide meaningful comparisons for consideration and future direction. For instance, the ORCA Elementary-Revised focused on discrete tasks, requiring website specific details to reach full or partial credit. More open-ended approaches to assessing these skills in greater depth provide students with a wider array of possible outcomes, as well as take on additional Internet skills to assess. For instance, measuring synthesis involves an application of a variety of skills. Requiring a more sophisticated definition of synthesis where readers compare and contrast consistent and conflicting information to determine next steps (Goldman, Lawless, et al., 2012) would more authentically assess student performance of this skill. Additionally, incorporating an authentic online communication tool, such as a blog, wiki, or discussion board into the ORCA Elementary-Revised, would provide a definitive examination of communication, a skill students are likely to utilize outside of the classroom and in their future workplaces (Castek & Coiro, 2010; Coiro, 2010; Coiro & Castek, 2010).

Established performance-based measures such as the ORCA-Blog and ORCA-IM (Leu et al., 2005; New Literacies Research Team, 2005), ORCA-Iditarod (Leu & Reinking, 2010), ORCA-Scenario I and II (Coiro, 2011), ORCA-Elementary (Castek, 2008), and the ORCA Elementary-Revised used in this study have only begun to investigate numerous possibilities for online research assessment. Designers of online research measures must consider the age level, reliability of text, and the classroom time constraints teachers face in on a daily basis. More work is needed to determine how to best measure the complexities of online research and expand measures to assess a wide variety of age groups.

While these limitations pose useful domains for future development, the considerable degree of ecological validity that is captured in this study suggests

that the findings in our results are durable and replicable. All intervention efforts were conducted by regular classroom teachers with only minimal curricular guidance through the study materials. Given that these gains were observed relative to a randomly assigned comparison sample from the same school, it is clearly established that the study could be conducted in other educational settings (provided the students had access to online materials), and gains would be expected for all classes participating in the intervention lessons.

Final Thoughts

In sum, this study revealed interventions lessons on 21st Century online research improved performance with a population of fifth-grade students. This is one of the few experimental studies, with perhaps the largest sample of participants, to test the effect of 21st Century online research lessons on online research performance using a complete curriculum designed to support all teachers. There is still much to be learned about the effect of 21st Century online research instruction. While researchers and teachers may not all agree on exactly how literacy is impacted by Internet-based reading, it remains that the Internet is redefining what it means to be literate. National standards and curriculum reform initiatives are calling for an acceleration of students' literacy achievement, focusing on assessment as well as instruction within new contexts such as the Internet. These standards and future assessments raise the bar on education investing in *all* of our nation's youth who must be prepared to effectively use new literacies to compete in an increasingly global and technology-driven future.

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