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Evaluating the Affective Impact of a Place-Based Learning Course Project in the Geosciences

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EVALUATING THE AFFECTIVE IMPACT OF A PLACE-BASED LEARNING COURSE PROJECT IN THE GEOSCIENCES

by

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Coping with issues such as climate change and depletion of natural resources demands a scientifically literate public. For many students, the only exposure to earth science comes in a college-level general education geoscience course. One way to engender positive attitudes toward and interest in earth science among these students (the future public) is to connect learning to actual places to which students have a personal attachment.

This study seeks to evaluate the impact of a place-based learning project (MyPlace) currently in use in an introductory geosciences general education course at Western Michigan University. Students in the MyPlace project select a physical place that has personal meaning to them. Each student prepares a PowerPoint slide that relates course content to their personal place weekly. Then at the end of the semester, the students give a brief presentation of the key geologic features of their place and describe how human activity impacts their place. This study used an explanatory mixed method design to examine the MyPlace project's impact on students' attitude toward and interest in earth science

This study was conducted in nine sections of the GEOS 1000 (Dynamic Earth) laboratory during spring 2015, using quantitative and qualitative data from three sources: (1) a pre- and post-course content test, (2) a written MyPlace project evaluation survey, and (3) interviews with a subset of students at the end of the semester. Student work was also collected to provide

examples of how students completed the assignment. The pre/posttest consisted of multiple choice items designed to measure content gains in the course overall. The MyPlace project evaluation survey provided data exploring the impacts of the project on students' attitude toward and interest in learning earth science. Likert-type questions on the survey were analyzed statistically, and open-ended items were thematically coded. A subset of volunteers was selected to participate in interviews, which further explored how students viewed the project, its strengths and weaknesses, and how it may have affected their interest in earth science. Interview data were emergently coded and used to support and explain the survey results.

The major finding of this study shows a clear overall enhancement and engagement of the affective domain within the context of this introductory course for non-science majors. This place-based project was successful in enhancing the participating students' appreciation for, awareness of, and motivation to learn about the earth sciences. Students report that their attitude toward the geosciences was strengthened as they were able to apply the course weekly topics to their personal location. This study also demonstrated that students preferred this place-based project to other classroom projects. Through working with a location that was special to them, students report that their understanding of various topics in the geosciences was increased. Using a place-based approach such as the MyPlace project demonstrates each student's ability to utilize the geologic content they are learning in an authentic and engaging assessment demonstrating critical skills that colleges strive to build. Place-based education is an approach to learning that takes advantage of the earth sciences to create authentic, meaningful and engaging personalized learning for students.

ACKNOWLEDGMENTS

I would like to begin by thanking my thesis committee Dr. Heather Petcovic, Dr. Robb Gillespie, and Dr. Sadredin "Dean" Moosavi for their continued support, patience, and sincere interest in this project. Their enthusiasm for and support of academic work in geoscience education inspired me to pursue and finish the work contained in this thesis.

Secondly, I would like to thank the students, teaching assistants, geoscience education focus group, and instructors of GEOS 1000 at Western Michigan University. I am fortunate to have led and been a part of this important non-science major course, and wouldn't have a thesis to write about it without them. The students' help with our surveys and interviews were paramount to this study, and the abundance of support from them was great.

Lastly, I want to thank my family and wife for their patience and support in seeing me through two graduate schools and one undergraduate university. It has been a long and winding road in academia, and I would not be here at the end without them.

Nathan Charlton

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CHAPTER 1

INTRODUCTION

It is increasingly important in today's society that the general public become scientifically literate and able to understand the earth science issues that are part of our everyday lives. Environmental problems such as climate change, scarcity of water and other limited resources, and natural hazards are but a few examples of the issues that require understanding of the natural world around us. It is important for society to understand, manage, and appreciate the earth and its resources; therefore earth science must be taught and understood by the public in a way that is meaningful to each individual. It is imperative to focus on what can be done in earth science courses that would help reach the goal of public earth science literacy, and to find ways we can improve both student learning about earth science and improve their attitude toward the field.

Decades of science education research have provided us with a variety of tools to identify and support the cognitive processes behind our students' learning. However, we have placed much less attention on student affect: the feelings, attitudes, emotions, and values that can encourage or discourage the adoption of effective learning behaviors (McConnell et al, 2015)). This has occurred despite the affective domain's demonstrated influence on student learning. Increasing an awareness played by the role of the affective domain in the sciences has the potential to improve student learning, boost recruitment of majors, and reduce student attrition (van der Hoeven Kraft et al, 2015). Student motivation is part of the affective domain, which also addresses student emotion and regulation of learning. One survey of geoscience teaching faculty at a major research institution (Markley et al., 2009) recently reported that 69% of

respondents believed that student motivation had a major impact on learning. The geoscience education research community would benefit from giving greater consideration to the role of the affective domain as a key component of the learning process (van der Hoeven Kraft et al, 2015).

Placed-based learning can be utilized in the classroom as a means of deliberately engaging the affective domain. “While some prior studies have attempted to comprehend place-based learning’s effectiveness with student’s cognitive understanding, there is a need to better understand how this teaching technique impacts student affective learning, and to fill in this gap in our understanding of geoscience education, the affective domain - emotion, attitude, and motivation - must be engaged to motivate student learning” (McConnell et al, 2015). When all three of these components (motivation, emotion, and connections with Earth) are combined in the classroom, students may experience greater interest in and connection to the content. “This interest and connection may lead to greater motivation to learn and value the content” (van der Hoeven Kraft et al, 2015). Putting the issue in the context of Earth science education, a place-based approach engages students with Earth features, processes, and history that can be observed in their surroundings; draws connections between geoscience and local resources, hazards, and environmental issues (such as water and air quality); and prepares them for subsequent studies of the Earth system at global scales. Any place-based learning approach can be used within the earth sciences curriculum as an effective means of providing earth literacy, appreciation, motivation, awareness, and care for the world around us.

The purpose of this study was to explore how a place-based project (MyPlace) impacts students’ attitude toward, and interest in, learning about the geosciences in an introductory

course for non-science majors taught at Western Michigan University (WMU). This work compliments ongoing work by our external collaborator, Dr. Sadredin Moosavi. The MyPlace project is a modified version of the "Special Place" project developed by Moosavi and implemented in several two-year and four-year colleges. Moosavi's evaluation efforts thus far have focused on students' cognitive gains through completing the place-based learning project (Moosavi, 2004). Hence our focus on changes in attitude and interest, although these data sources also consider students' gains in content knowledge in the overall course. The overall goal of this work is to understand how the place-based approach impacts affective dimensions of learning (specifically attitude, motivation, appreciation, incentive, and overall care), and to improve the MyPlace curriculum for dissemination and use beyond WMU.

CHAPTER 2

LITERATURE REVIEW

Place-Based Learning in Geoscience Education

This study sought to better understand how "placed-based learning" has been used before and evaluate its value within the context of an earth science course. When we affix meaning to any physical locality—by naming it, building a home there, exploring its geology as this project seeks to do—we make it a place. Place-making is in human nature, and people are naturally interested in places, often forming intellectual and emotional ties to places that are particularly meaningful to them (Semken & Freeman, 2008). Although *sense of place* has different meanings in different contexts, it basically describes a physical location that is imbued with constructed meaning (e.g., Tuan, 1977). The meaning may be spiritual, aesthetic, economic, familial, political, historical, or scientific (Semken & Freeman, 2008). The term "placed-based learning has only been in wide use since the 1990's, place-based teaching philosophy and subsequently through environmental and outdoor teaching and learning. Given that traditional ways of teaching practiced by indigenous groups such as Native Americans have always been strongly place-based, the provenance of the approach on the North American continent actually dates back many millennia (Semken & Freeman, 2008).

It has been shown that place-based teaching encourages trans-disciplinary thinking, and is intended to foster environmental and cultural sustainability of the places and regions under study (Semken & Freeman, 2010). Place-based teaching and learning are by design situated in places, which are spatial or physical localities that are given meaning by human experience in them or

relating to them. Place-based teaching is cross-disciplinary and intercultural, informed and contextualized by the natural, cultural, and socioeconomic attributes of the places that are studied. Place-based curriculum and instruction is primarily intended to motivate students through humanistic and scientific engagement with their surroundings and to promote sustainability of local environments and communities (Gruenewald and Smith 2008), and only secondarily to meet specific disciplinary standards or achievement tests (Ault 2008; Smith and Sobel 2010).

Because places are defined culturally as well as physiographically, authentic place-based earth science teaching draws useful examples and case studies from other locally relevant disciplines such as ecology, anthropology, history, and economics; and integrates humanistic and artistic interpretations of places such as landscape photography and painting, nature writing, and cinema; all to provide richer context and relevance for geoscientific inquiry into places (Semken and Freeman, 2008).

Today, place-based education is advocated by educators for its ability to better engage and retain the interest of introductory science students and other potential majors, especially those who have personal, cultural, or community ties to the places under study (Semken & Freeman, 2008). Research has shown that the use of place as an organizing theme for curriculum at different grade levels can measurably enhance students' content knowledge, sense of place, and community engagement (Semken & Freeman, 2008).

Authentically place-based science teaching and learning is distinguished from other situated approaches to science education such as field-based or problem-based teaching because it constructively leverages humanistic place meanings (Elder, 1998) and affective place attachments, i.e., sense of place (Semken and Freeman, 2008), as engaging and relevant contexts for scientific inquiry and interpretation. Ault (2008) characterizes place-based education as a continuum from the use of certain attributes of places as examples in a discipline-centered curriculum to a complete synthesis of disciplinary methods and ideas with place as the focus of inquiry. Place sustains identity, community, and economic security through generations. Having a sense of place constrains the ways in which markets may exploit the land and its community of people and encourages citizens to assume responsibility spanning generations (Ault, 2008). Models and case studies of curriculum and methods ranging across much of this continuum can be found in a growing literature on place-based education (e.g., Gruenewald and Smith, 2008; Smith and Sobel, 2010).

Recent examples of place-based teaching applied specifically to earth science include Endreny (2010), Miele and Powell (2010), Palmer et al. (2009) and Semken (2005). Endreny (2010) conducted a study aimed to determine how 33 urban 5th grade students' science conceptions changed during a place-based inquiry unit on watersheds. Most students came to understand that their watershed was part of an urban environment where water drains from the surrounding land into a body of water. They began to understand how urban land use affects water quality. This study provided evidence for the use of place-based learning in developing students' knowledge of the earth sciences.

Miele and Powell (2010) wrote of a design to develop a program that will produce a new cadre of science teachers who are able to use local cultural and natural resources to enrich their instruction. They succeeded in integrating use of community cultural and natural resources in formal coursework at a college, resulting in enrollment in geology courses has risen dramatically, with courses regularly filled to capacity.

Palmer et al. (2009) demonstrates how a course focused on geoscience topics that relate to the southern plains (particularly Oklahoma) emphasizes "sense of place," integrates indigenous knowledge and geoscience content, makes use of Kiowa stories and metaphors, and uses Native American art as a vehicle for learning. Preliminary assessment results suggest that integrating Native American culture, art, and geoscience content is a successful approach.

Semken (2005) writes of how many teachers and researchers with experience in Native educational systems recommend a greater emphasis on the study of local places, synthesis of local cultural knowledge, and community-directed activities in science education. Such a place-based approach is used by a small number of school systems, nearly all outside of Native communities. Place-based geoscience teaching could potentially enhance science literacy among American Indian, Alaska Native, and other underrepresented minority students, and bring more of them into the geoscience professions.

Recent work has documented that place-based teaching approaches directly affect science learning (e.g., Sobel, 1996; Gruenewald, 2003; Semken & Freeman, 2008), and can be especially effective in engaging underrepresented minority groups (Semken, 2005; Riggs, 2005; Lim &

Calabrese Barton; 2006). Much of earth science education, however, emphasizes national or global issues at the expense of local ones, thereby losing meaningful connections with the local community and places (Gruenewald, 2003; Sobel, 1996). Place-based teaching, in contrast, is intentionally mindful of and leverages the senses of place of students and instructors (Lim & Calabrese Barton, 2006; Semken, 2005; Semken & Freeman, 2008). Accepting earth science literacy for all students as a fundamental goal, and the goal of a general education course such as the course under study, then place-based instruction can help to achieve this.

Research Questions

Since place-based learning is an effective way of learning, this study aims to evaluate its practice within the context of an entry-level geosciences course. Although within the earth science course most of the content is global in scale, the MyPlace project tries to connect the student with one meaningful location that they have chosen. Much place-based learning research has evaluated students' content learning, but lacks a better understanding of the students' change in motivation, attitude, and appreciation towards the earth sciences. This study will evaluate these aspects by answering the following research questions:

1. ***How does the MyPlace project impact students' attitude toward and/or interest in the earth sciences?***
2. ***Which specific attitudes and/or interests are impacted most by the MyPlace project?***
3. ***What do students perceive as the most effective component(s) of the project that contribute to changes in their attitude toward and/or interest in earth science?***

CHAPTER 3

METHODS

Research Design

The study used a sequential explanatory mixed-methods research design (Creswell & Plano Clark, 2007). This approach used a subset of qualitative data to explain the larger quantitative data set, with the quantitative data collected and analyzed first. The data sources included a pre/posttest (given in lecture), an evaluation survey, and student interviews. Student work was also collected to provide examples of individual slides and completed projects. Quantitative data are the primary data source and include multiple-choice content items on the course pretest/posttest and Likert-type survey questions on the MyPlace evaluation survey. Qualitative data serve to explain the quantitative results and include open-ended written comments on the MyPlace evaluation survey, and the information gathered through student interviews. Quantitative data were analyzed first, with qualitative data supporting interpretation of the numerical results. The pre/posttest data serve to document each participating students' overall learning gains during the GEOS 1000 course. The MyPlace evaluation survey and the student interviews serve to document the specific impact that the MyPlace project has had on student attitude toward and interest in the geosciences, and are used to answer the research questions.

Context: GEOS 1000 and the MyPlace Project

The MyPlace project takes place within the undergraduate course GEOS 1000: *Dynamic Earth*. The study draws upon data collected from the spring 2015 semester at WMU. This course had approximately 140 students and was divided into two lecture sections and nine

laboratory sections. The labs contained between 12 and 20 students each, and followed the same sequence of weekly lab activities and assignments. The lectures were not equal in size, but did follow the same sequence of topics and schedule. One lecture section was taught by a faculty member and the other by a part-time instructor. All labs were taught by graduate teaching assistants under the supervision of a head teaching assistant.

Dynamic Earth was designed for non-science majors who seek a basic understanding of earth science. Students are introduced to our "Dynamic Earth," along with other planets, through lecture and laboratory topics including plate tectonics, evolution, earth materials, volcanoes, earthquakes, other earth hazards, rivers and flooding, groundwater and pollution, glaciers and deserts, oceans, coasts, energy resources, and climate change. It satisfies Western Michigan University's General Education requirement in Natural Science with a Laboratory. The overall goal of this course is to help students develop an understanding of how the earth works, how it influences everyone, and how individual choices influence the earth. Content of the course is deliberately aligned with the *Earth Science Literacy Principles* (ESLP, 2010), a document outlining nine key ideas central to earth science literacy. Most students report that they take this course because they have to fulfill this requirement, and many students are upper-classmen who has delayed a science (lab) course. Several students said they choose this course over the other options (chemistry, physics, and biology) due to its lower course call number (GEOS 1000) and that their peers recommended it to them.

The course consists of both a lecture and a laboratory section, and the lab section is further broken down in a hands-on component and the MyPlace project. In this project, students

choose a geographic location that has personal meaning, and apply the weekly earth science-related topics to their location as they are exposed to the information in lecture and lab. Students receive guidance from teaching assistants in choosing their place, and the graded weekly work and final presentation together count as 10% of the total course grade. The teaching assistants instructing the lab give the students guidance and show them examples of successful project ideas and final presentations. This happens during the first week of class, and the examples and detailed instructions are kept online for student viewing throughout the semester. This assignment is designed to get the students thinking about how geology applies to a special place and how the actions we humans take today will determine its future. It also provides a convenient way for the students to track their learning as they get to know their location geologically. The project aims to have the students leave the course with the skill and understanding to be citizen scientists aware of their role and obligation to serve society as informed and engaged community members.

MyPlace Assignment Description

The MyPlace project was introduced during the first week of the semester when the students receive written instructions, grading rubrics, and examples of prior projects (Appendix A). They were encouraged to choose a place that is important to them and that they can relate to, for example, a place that they regularly visit or have always wanted to visit. Several restrictions are imposed to aid their decision (size, importance to them, and available information), and the lab teaching assistants provided advice and feedback before approving the location. Each week, students created a PowerPoint slide that shows how the current earth science course topic (for example, rocks, fossils, oceans, groundwater, climate change, etc. (see Figure 1 and Figure 2))

applies to their chosen place (see Table 1). During the last 50 minutes of the laboratory section meeting, the class moved to a computer lab where students research the weekly topic and prepare their PowerPoint slide(s). The students submit their slides weekly via an online process, and the teaching assistants' grade and give feedback within that week, and before the next lab session.

Slides are compiled week by week to eventually create a full presentation relating all the weekly topics of the semester to each student's special place. Students then each presented a shortened version of their PowerPoint project orally at the end of the semester so that all the students in the classroom can see how these various topics apply to different locations the students deem special and significant. When a student found it difficult to find the appropriate information about their place (for example, it can be difficult to talk about fossils in a location with no know fossil content), the teaching assistant would encourage them to expand their geographic location, and look for relevant information on the areas around. During the oral presentations, each student completes a quiz compiled of questions that the students submitted the week before, so that there is one question relating to each oral presentation. This ensured that all the students paid close attention to the other students' presentations.

Table 1: MyPlace Weekly Topics

Week	MyPlace Assignment Due
1	Introduction to Assignment
2	Choosing Your Place
3	Introduction and Overview of Place
4	Topographic and Aerial Map
5	Plate Tectonics
6	Rocks and Minerals
7	Weathering and Erosion
8	Mountain Building / Past Climate
9	River Systems / Coastal Processes
10	Glaciers / Deserts/ Groundwater
11	Fossils
12	Natural Hazards
13	Human Impact
14	MyPlace Presentation

Figure 1: Example of a Students Weekly MyPlace Slide on the Minerals of the Black Hills

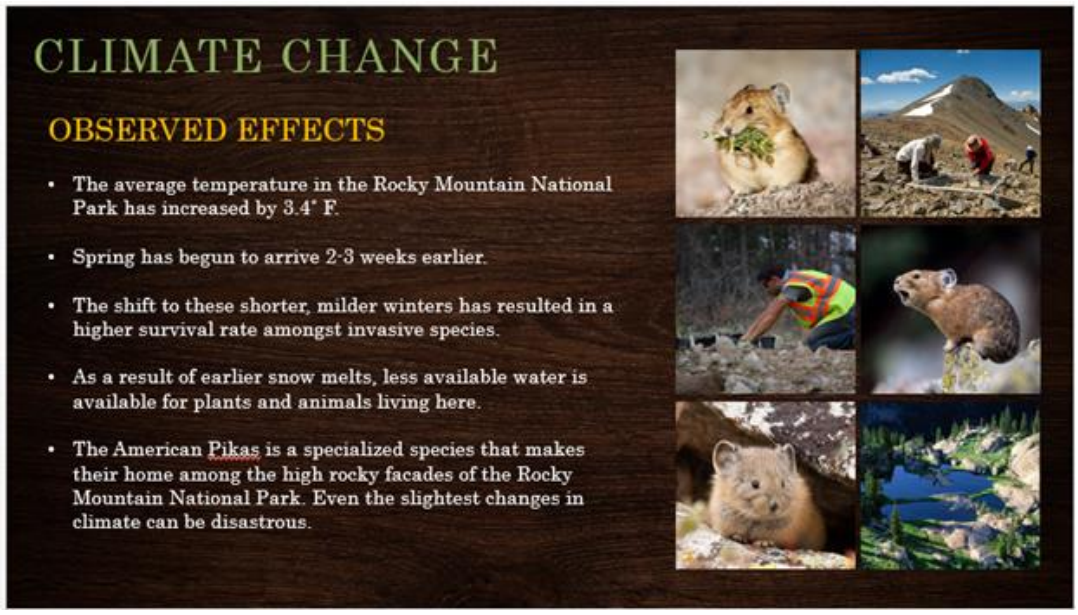

Figure 2: Example of a Students Weekly MyPlace Slide on Climate Change

Instrumentation

Two written instruments were part of this study: content items from the current course pretest/posttest instrument (Appendix D) and the MyPlace evaluation survey (Appendix E). Both are paper/pencil instruments completed during regular class time, not tied to an assignment or course credit. Some of the items in the course pre/posttest serve as prompts for the MyPlace evaluation survey. Thus the pre/post course survey serves both purposes of regular course assessment and an important data source for this research study.

The pre/post course survey has been given to students during the last several years for the purpose of regular course assessment. The pretest and posttest measures both student opinion of earth science, and their understanding of earth science content. It consists of 15 Likert-type questions that gauge the student's attitude toward earth science (e.g.. statements about scientific thinking, the importance of earth science, and appreciation for earth science) that are not used as a data source for this study, and therefore will not be further discussed. It also consists of 24 content questions in the earth sciences (covering earthquakes, climate change, tectonics, etc.) that are used as a data source for this study. Content questions are derived from the Geoscience Concept Inventory (GCI), a nationally validated test of conceptual knowledge of earth science (Libarkin & Anderson, 2005). The tests are given at the beginning and end of the semester, and data were aggregated across both lecture sections to determine overall learning gains in the course.

The MyPlace survey was created by a student researcher during a previous semester, to initially see how well the project was working for course/project improvement/assessment. The MyPlace survey has been face validated by a geoscience education research group at WMU to better assess the affective learning impacted by the MyPlace project. The geoscience education research group provided support by reviewing the questions for content validity and for ease of understandability (appropriateness of the language to the level of the course). The 10-statement MyPlace survey uses a four point Likert scale without a neutral option in order to discourage students from simply selecting the middle point. It measures how the project affects such attributes as motivation, connectivity, incentive, appreciation, learning, and encouragement with regards to earth science.

The interview script (Appendix F) is largely derived from the instrument items and serves to provide additional probing data about potential changes in student knowledge and attitude, as well as causes of possible change. Interviews were semi-scripted and lasted 10-20 minutes. The interview script was initially created by the student researcher revised with feedback from the thesis advisor, and later improved through peer-review by the geoscience education research group. Mock interviews with the research group were used to test and improve the script prior to any student interviews.

Data Collection

The pretest was administered during the first week of class in the same semester The MyPlace survey, posttest, and interview data were collected during the final two weeks of the academic semester in spring 2015. Consent forms were given out two weeks before the

anticipated survey week. The MyPlace survey was given the last week of the lab sections, and the interviews were scheduled for the last two weeks of the semester. The MyPlace surveys were collected by the student researcher. All data were de-identified to conceal student identity.

In Keeping with the approved human subjects protocol (Appendix B), consent forms (Appendix C) were given out two weeks before the final lab session. The students were invited to participate in the regular work and MyPlace evaluation survey portion of the study, or to participate in both this portion plus an interview. Students were offered 10 points of extra credit toward their MyPlace project grade as an incentive to complete the interview (an alternate extra credit option was also offered to all students to avoid coercion).

One hundred and fifteen students consented to participate in the regular work/survey part of the study, and 89 gave consent to participate in the extra interview. The goal was to select a 20% (~23 students) representative student sample for the interviews from among consenting students. Twenty-seven students were chosen for interviews based on the following criteria: three students from each lab section, their MyPlace grade near the end of the semester (one student with a high grade, one low grade, and one in between), their sex, their ethnicity, and their major, in that order of priority. This was done so the study had a diverse population and all groups were represented. If a student did not reply to the initial interview invitation, a second invitation was sent. Fifteen students (out of the initial 27) responded to the initial invitations. Since this was less than the target number a second round of invitations was offered to another 15 students who were chosen randomly from all nine lab sections. A total of 26 students completed interviews.

Data Analysis

Quantitative data from all surveys were compiled and entered into a Microsoft Excel database in order to link student demographic data with survey and pre/posttest results. Descriptive statistics (e.g., mean, standard deviation, median, mode, etc.) were calculated on these measures for the survey results.

Open-ended survey comments were collected in a database and were thematically coded to look for common response patterns for each interview question as well as relationships between students' attitudes, interest in learning earth science, and comments concerning the MyPlace project. Each interview was recorded using a digital audio recorder, and transcribed by a professional transcription service. Transcribed interviews were analyzed such that similar responses to the questions were grouped into related themes. This process involved thoroughly looking through the transcribed answers, and placing them into recurring themes (usually two through five per question). Almost all of the interview questions showed consistency in student answers. When students, for example, were asked why they choose the place they studied for the MyPlace project; the 26 responses were easily thematically coded into one of four results (see Table 3). The thesis advisor generated thematic codes separately from the student researcher and compared results, adding a higher degree of validity to the study.

CHAPTER 4

RESULTS AND DISCUSSION

Student Population

All participants in this study were enrolled in GEOS 1000: Dynamic Earth during the spring 2015 semester. Only data from students who gave consent to participate in the study and completed at least the course pre/posttest or the evaluation survey are reported here (N=115). The student population was about half male and half female, dominantly white, and mainly business and humanities majors (Table 2). The interview population (n=26) is reflective of the overall student population, except for a slightly higher percentage of females, white students, and education and fine arts majors (Table 2).

Table 2: Course Demographics

	Total Consenting Population (N=115)		Interview (n=26)	
Gender	**No.**	**%**	**No.**	**%**
Male	55	48	10	38
Female	56	49	16	62
No Answer	4	3	0	0
Ethnicity	**No.**	**%**	**No.**	**%**
Caucasian/White	67	58	20	77
African-American	7	6	2	8
Mixed Race	5	4	2	8
Hispanic/Latino	2	2	1	4
Native American	2	2	1	4
No Answer	32	28	0	0
Major	**No.**	**%**	**No.**	**%**
Business	33	29	9	35
Humanities or Science	19	17	8	31
Fine Arts	9	8	4	15
Undecided	7	6	2	8
Education	3	3	3	12
No Answer	44	38	na	na

[1]

Pre- and Post-Course Content Test Results

Figure 3 shows results for 73 of the 115 total students who completed both a pretest and a posttest across the two lecture sections. Overall, 61% of students had improved pretest to posttest scores in Section 1, and 78% had improved scores in Section 2. Each section was taught by a different instructor.

[1] Percentages do not add up to 100 as not all students responded to every question.

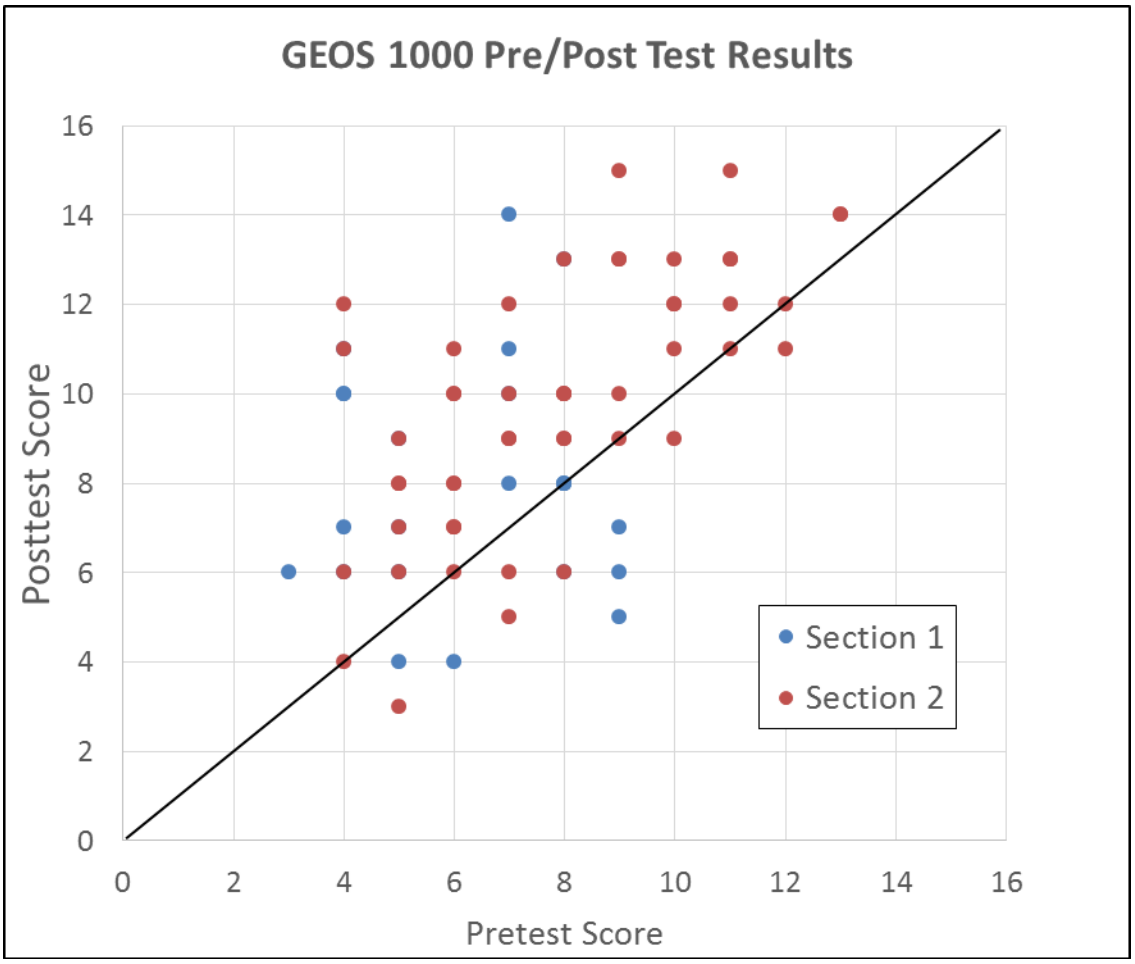

Figure 3: GEOS 1000 Pre/Posttest Results

MyPlace Survey Results

Figure 4 shows how overall, the students report a positive affective impact from the activity, with 50-85% of students agreeing that the project improved their understanding, interest in, and appreciation for earth science. Students most strongly agree with statements 7 and 9, showing that more than over 85%of students agreed that the MyPlace Project helped with demonstrating how human use impacts a location, and approximately 80% agreeing that they were able to learn more about a place of their choosing. Students agreed least with statement 6,

with just over 50% agreeing that they wanted to learn more about earth science as a result of the project.

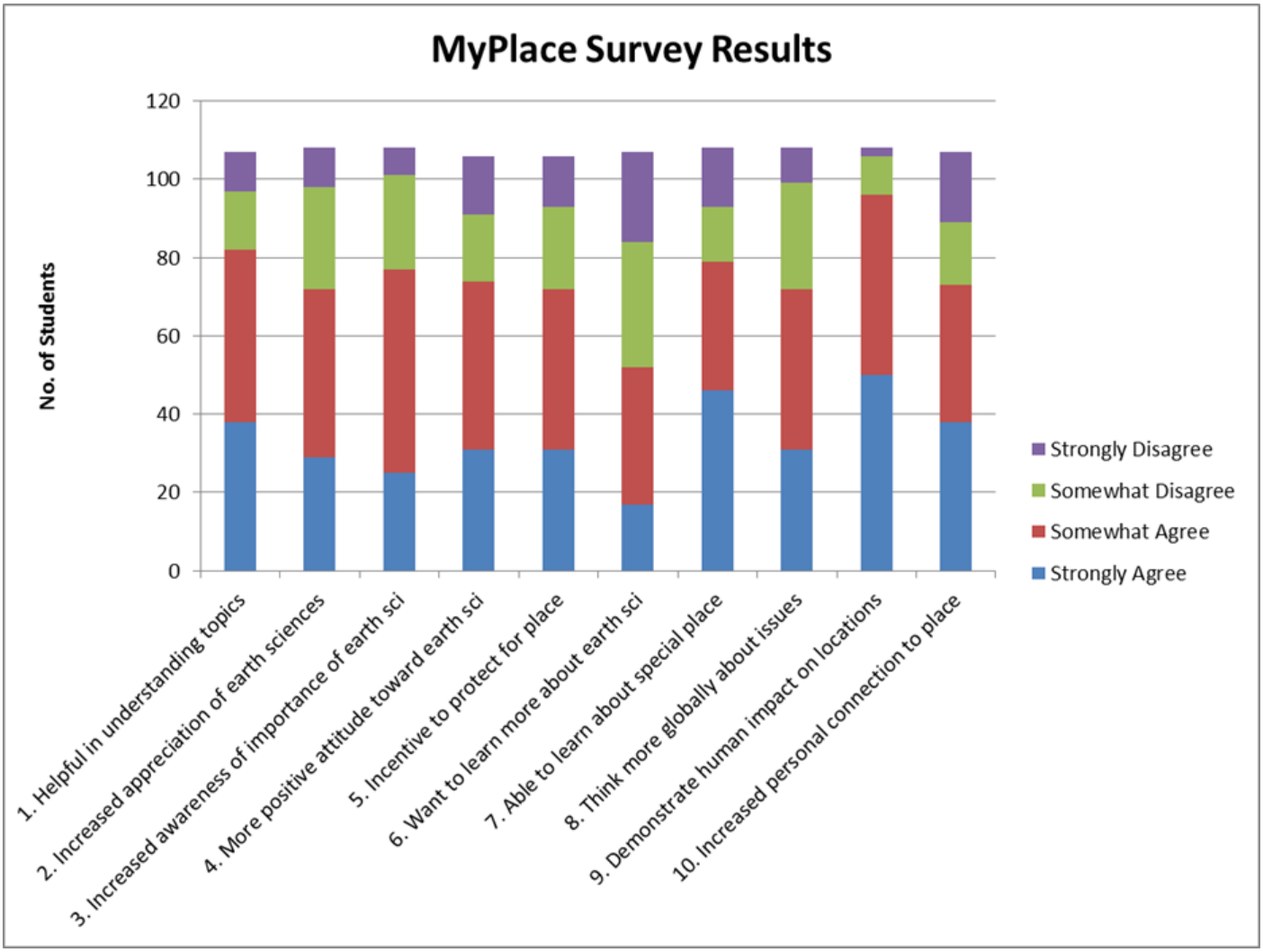

Figure 4: MyPlace Survey Results

MyPlace Survey Open-ended Question Results

1. What did you like best about the MyPlace Project?

58% of the student responses were captured by the theme of "freedom to choose" their own location to learn about, and to be able to apply the weekly lecture/lab topics to their personal

place. 14% of responses indicated that students liked the fact that the MyPlace project was “easy and straightforward”. 6% of the responses indicated that students liked best that the MyPlace project was “in place of a lab exam”.

2. What did you like least about the MyPlace Project?

The answers were more variable, but 23% of the responses fell under the theme of “hard to find information during class / lack of information” and 20% fell under “too much time in class spent on it / too many slides”. 14% of responses indicated that students found the “presentation” their least favorite aspect of the MyPlace project.

3. ***What advice or comments can you give to improve the MyPlace project?***

21% of students gave “no answer” and 18% of responses indicated “keep it as-is”. Other themes were to “give students better/specific instructions” and “offer different/varied weekly topics to better expand the assignment.”

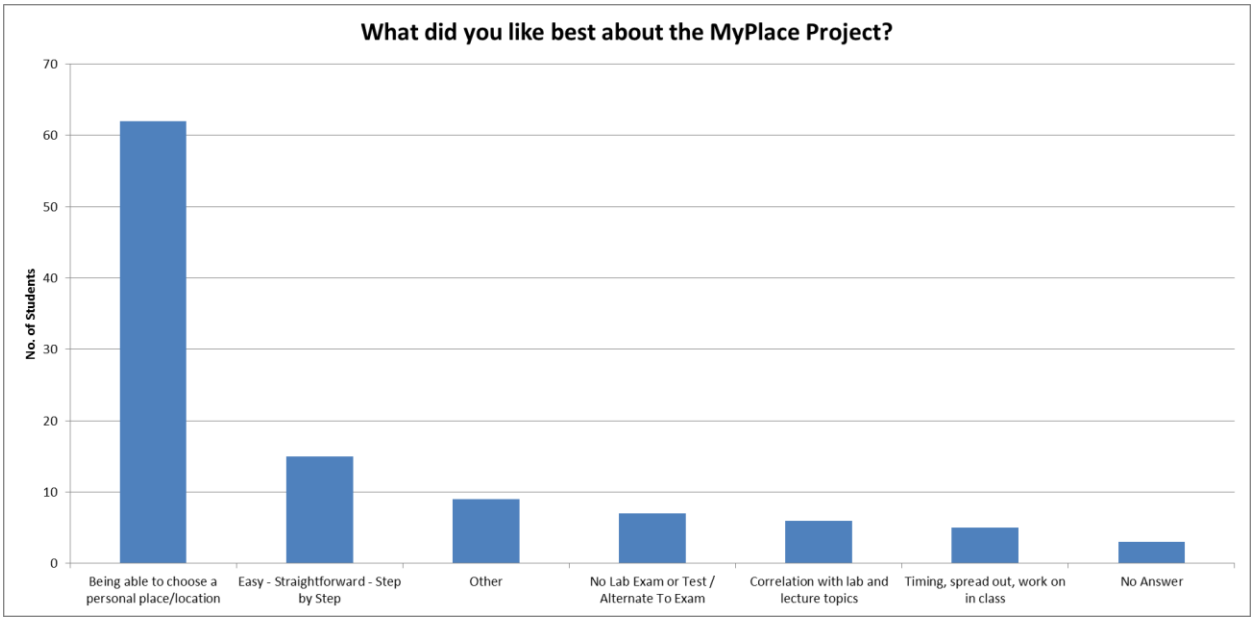

Figure 5: MyPlace Open-ended Question Results (Question #1)

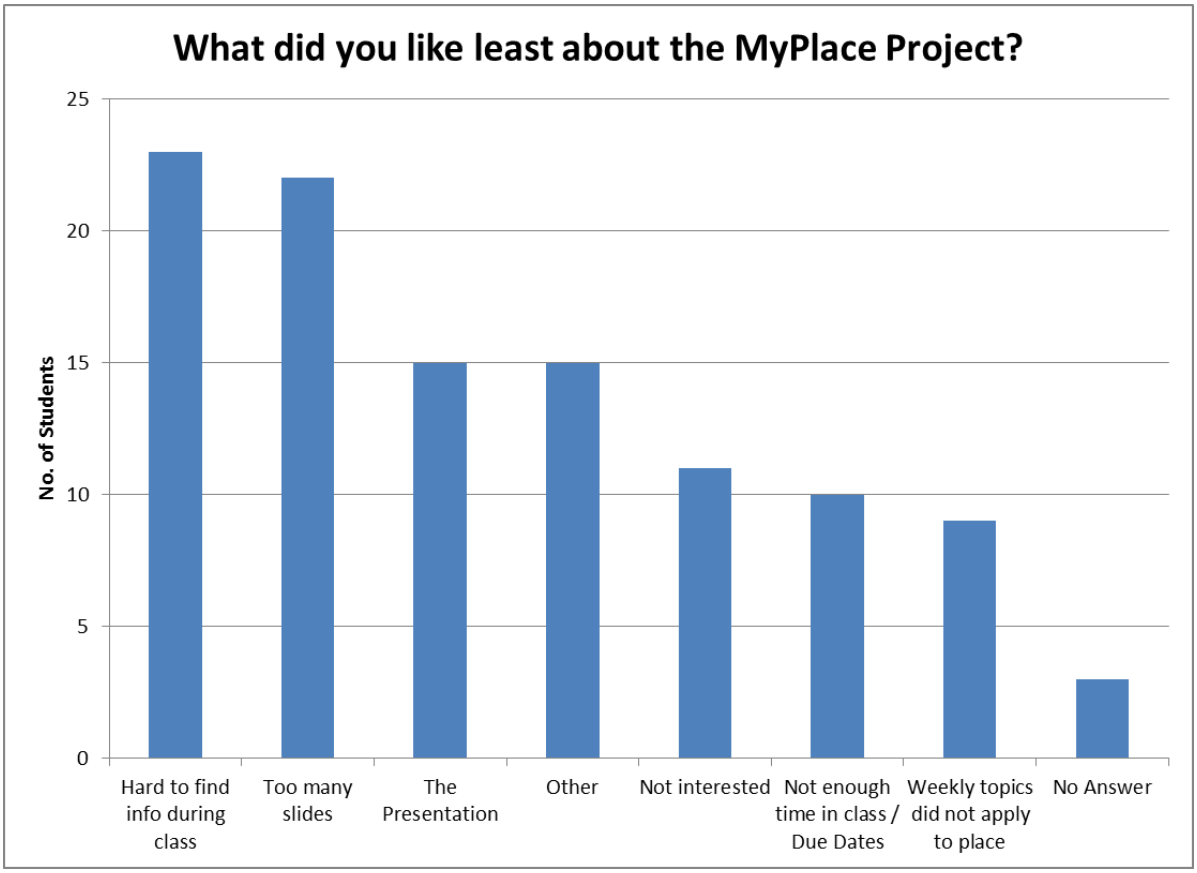

Figure 6: MyPlace Survey Open-ended Questions Results (Question #2)

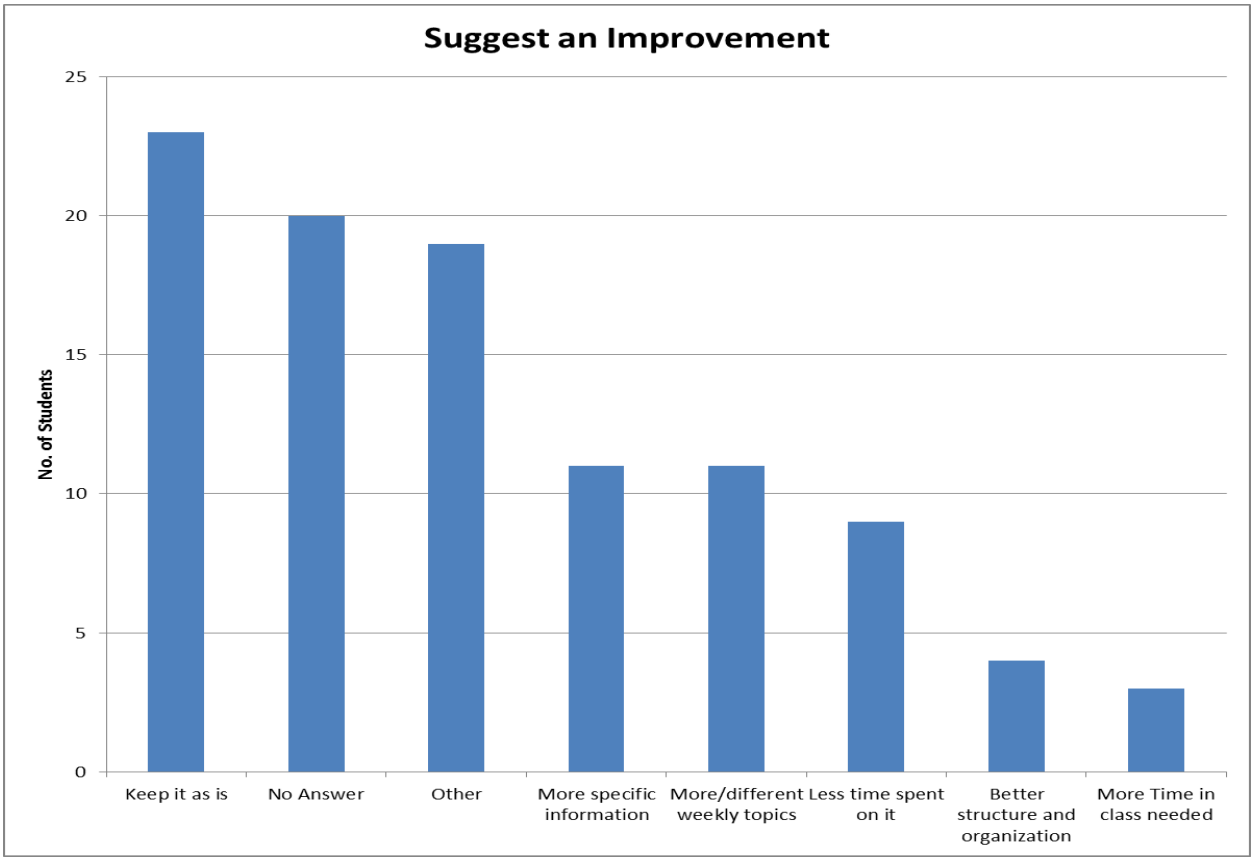

Figure 7: MyPlace Survey Open-ended Questions Results (Question #3)

Interview Results

Table 3 shows the number of student responses in each theme that was identified for each interview question. The theme with the greatest number of responses to each question is shown in green and the theme(s) with the least number of responses is/are shown in red.

Table 3: MyPlace Student Interview Results

1. How or Why did you choose the place that you studied for the project?	**No.**	**%**
Past direct personal experience (has visited/vacationed/spent time there)	15	58
Future direct personal experience (wants to visit/vacation there)	7	27
Novel (interesting, different, not a place they have been to before)	2	8
No answer/comment	2	8
2. What important things did you learn about your place?		
How it formed (general, no specific geologic features or phenomena discussed)	16	62
General overview information (Wildlife)	5	19
Specific content (e.g., fossils, volcanoes, erosion, climate, etc.)	3	12
Human impacts/uses	2	8
3. What was your favorite topic?		
Natural Hazards	6	23
Human Use/Impact	5	19
Overview (Wildlife, climate, etc)	5	19
Tectonics	3	12
Rocks and Minerals	2	8
Sedimentary processess	2	8
Fossils	2	8
Glaciers, Groundwater	1	4
4. What was your least favorite topic?		
Rocks and Minerals	6	23
Other	6	23
Plate Tectonics	5	19
Groundwater/Glaciers	3	12
Natural Hazards	2	8
Human Use/Impacts	2	8
Topographic Mapping	2	8
5. I see that you agreed with [ITEM NUMBER(S)]. Can you explain why?		
All	11	42
Increased appreciation or personal connection about the specific location	6	23
Learning content (more about specific topics)/helped with learning GEOS 1000	2	8
None	4	15
Increased desire or incentive to protect/care	2	8
Increased appreciation or personal connection to earth/geo science broadly	1	4
6. I see that you disagreed with [ITEM NUMBER(S)]. Can you explain why?		
None (no disagrees)	9	35
Did not increased desire or incentive to protect/care	6	23
Did not increase appreciation or personal connection about the specific location	5	19
Did not increased appreciation or personal connection to earth/geo science broadly	3	12
Lack of learning content /did not help with learning GEOS 1000	3	12

Table 3 –continued

7. You wrote that you liked [STUDENT RESPONSE] best about the project.		
Attributes of the project itself (Easy, fun, simple; Time in class (no HW), spread out	9	35
Personal engagement (Student got to pick the topic)	8	31
Application of topics to a real world example (Made class/learning more	7	27
No Answer	2	8
8. You wrote that you liked [STUDENT RESPONSE] least about the project.		
Too many slides, too much work	14	54
No effect on learning content	5	19
Personal reasons of the student (Presenting, lack of interest)	4	15
Other (No answer)	3	12
9. You wrote that you think [STUDENT RESPONSE] should be improved.		
None	14	54
Improvement to the project logistics (instructions, timing, alternate assigments)	10	38
Improve by sharing more examples of successful projects	2	8
10. Do you think the MyPlace project is appropriate for an introductory class for		
Yes	26	100
No	0	0
11. Do you think other students should pick their own place for the project?		
Students should choose	21	81
TA should choose or provide list	5	19
12. In thinking about the GEOS 1000 course overall, Which components had the greatest impact on your overall interest and learning in earth sciences?		
Lab	10	38
Lecture	9	35
MyPlace	6	23
Mastering Geology	1	4

Student responses are discussed for each interview question, highlighting the most common themes and sharing example quotes.

1. ***How or why did you choose the place that you studied for the project?***

The most common responses fell under the theme of "past direct personal experience (has visited/vacationed/spent time there)" (15), followed by "future direct personal experience (wants to visit/vacation there)" (7). When asked why a student chose Yellowstone National Park for their project, they said "*Well that was the one national park that I knew the most about, really, that I had the best idea of, and that I wanted to learn more about because I've always wanted to*

go!" Another student replied "*Because I don't get out much, so if I do travel it's to like a city. So I chose a place where I've heard a lot about it and I could potentially see myself going to, then I could know more about it when I go visit."* Another student stated *"I choose Isle Royale National Park because it was a place my parents took us to for a family vacation when we were younger, and camped for three nights. I thought it would be a good choice for this project."*

2. What important things did you learn about your place?

The most frequent theme found here (16) is "how it formed (general, no specific geologic features or phenomena discussed)" followed by "general overview and wildlife".

Most student interview answers were that they enjoyed learning about how their location formed geologically speaking, one student stated "*Well, I would say the eruption of Mount Mazama, and then just how the caldera formed and how it's all just from precipitation and snow. And people can't actually go into the lake, which I think is cool, so it's like super clean and stuff."* Another student said *"My favorite part about learning about the Great Barrier Reef was learning more about the wildlife and underwater plants that live there."*

3. What was your favorite topic?

"Natural Hazards" (6) was the most frequent answer, followed closely by "Human Use/Impact" (5) and "Overview and Wildlife"(5) An interviewed student said "*I think my favorite topic was the natural hazards slide, because I learned about the super volcano in Yellowstone, and how that affect the whole country when it erupted."*

4. What was your least favorite topic?

"Rocks and Minerals" (6) and Plate Tectonics" (5) were the two most frequent answers. A student stated *"I dunno, it was just harder to find information on my place regarding plate tectonics, and I had to end up having the TA help me."* Another said *"The minerals topic wasn't*

very interesting to me, as my location was on Lake Michigan and I couldn't find anything online…"

5. I see that you agreed with [ITEM NUMBER(S)]. Can you explain why?

Although the most frequent answer was "All" (11), the next most frequent type of response was "increased appreciation or personal connection about the specific location" (6). Students agreed for the most part that this place-based project increased their appreciation for their location; one student said "*When I learned more about how the native people use the lake for so many purposes, it made me like appreciate how important it is to keep resources like that clean and safe". ."*

One student said they agreed most strongly with the statement "were able to learn more about a place that is special to you" and stated "*Yeah, definitely. I think that was a good, you know, it was cool because it was, you know, something I could pick and you know."*

6. I see that you disagreed with [ITEM NUMBER(S)]. Can you explain why?

Again, the most frequent answer here was "None, no disagrees listed"(11), but the second most frequent answer was "did not increased desire or incentive to protect/care"(6)
When a student was asked why the project did not motivate them to learn more about the geosciences, they said *"Because it's going to take a lot to motivate me to want to learn more about geology. And that is not supposed to offend anyone."* Another interviewed student said of the same question *"I don't know, I guess it didn't really, I mean, I definitely wasn't expecting to enjoy this class as much as I did."*

7. You wrote that you liked [STUDENT RESPONSE] best about the project.

The three most frequent answers here were "attributes of the project itself (easy, fun, simple; time in class (no homework), spread out)"(9), "personal engagement (student got to pick the

topic)"(8), and "how the project affected learning in the class (made class/learning more interesting/easy; application of course topics to a real world example)"(7).

Student interview answers examples included "*Easy, not hard*." and "*Yeah, I mean, it just gave us knowledge applied. So rather than just knowing, you know, this is what causes this, and this is what this means, we actually got to see it with somewhere we've actually been. Well, at least for me, I've actually been there and seen the things that I was looking up and I just never knew what caused them or what they… like the limestone formations, I never knew what those really were until I did this project and getting to see all of that."* One student surveyed stated *"It was helpful to actually see how the stuff we learned in lecture could be applied to our location, and it kinda made lecture more interesting."*

8. You wrote that you liked [STUDENT RESPONSE] least about the project.

The most frequent answer here is "too many slides, too much work"(14), followed by "no effect on learning content"(5). Several students said they didn't like to present to the class and this was their least favorite part of the project. *"It felt like there were too many moving parts to the class to begin with, and the MyPlace project just felt like way more busy work."*

"The project was fun and easy overall, but I don't think it helped me in lecture…the work in lecture was larger scale and harder than the MyPlace project.""Yeah, just getting up in front of people presenting is never one of my favorite things to do."

9. ***You wrote that you think [STUDENT RESPONSE] should be improved.***

"None" (14) was the most frequent answer followed closely by "improvement to the assignment/logistics (improve instructions, improve timing, and create alternate assignments)" (10).

"…it would have been helpful if there were alternative assignments we could have chosen from when we couldn't find information on our place". "The due dates for the weekly slides were way too soon and I usually didn't time to finish it in class that week."

10. Do you think the MyPlace project is appropriate for an introductory class for non-science majors?

All interviewed students chose "Yes" (26); Students verbal responses to this questions were mostly just "*yes*", although some added "*Yes, no question*", and "*Absolutely*."

11. Do you think other students should pick their own place for the project?

The most frequent answer was "Yes, students should choose" (21) and the rest (6) said the TA should choose for them or have a list of pre-determined locations." *"I don't think they should be assigned. I mean, maybe have a list of things that, I don't know, for ideas that people can look at. But I don't know, I feel like you have more of a connection if you pick it yourself." "Because if… It's nice if you get to pick your own because you might be more involved with the place and that's great. However, for students who maybe have only been to a few places, like me, could potentially become more involved, or that would help make me for example more involved or more connected with a place. They gave me something I had never learned about before and I was going in completely blind, and then I started really learning things about a place, and making connections and saying, 'Maybe this is some place I would want to go visit or…'"*

Interpretation and Discussion

The specific research questions addressed in this study are:

1. ***How does the MyPlace project contribute students' attitude toward and/or interest in the earth sciences?***

The MyPlace project contributes to the overall observed changes in the student's attitude toward and/or interest in the earth sciences by increasing the student's connection with the discipline. The results show that aspects of the affective domain such as student motivation, appreciation, and positive attitude increased as they were able to apply these weekly geosciences topics directly to a place that they cared about. 67% of students said they agreed that the MyPlace project increased their appreciation of the earth sciences, and 69% of students agreed that this place-based approach caused them to have a more positive attitude towards the earth sciences. One Student stated that *"…actually being able to understand the human impact and resources of a place I have been and care about made the class more interesting and relevant".*

2. Which specific attitudes and/or interests are impacted most by the MyPlace project?

Students reported that the MyPlace project increased their appreciation or personal connection about the specific location, improved their understanding and appreciation for the human use and impacts on the earth, and helped them to understand the weekly lecture topics within the course. Overall, 73% of students scored better on the posttest than on the pretest. We cannot attribute those gains directly to the MyPlace project, but about 70% of the students reported on the survey that the project helped them to understand topics in the class. This result indirectly suggests that the MyPlace project does have a positive impact on learning.

Furthermore, an interviewed student said *"Being able to apply our weeks topics to our own location made the class more interesting and made me more aware of the lectures, and helped with the quizzes."*

3. ***What do students perceive as the most effective component(s) of the project that contribute to changes in their attitude toward and/or interest in earth science?***

This study showed that the most effective component of the project that contributed to changes in their attitude toward and/or interest in the earth-science was the freedom to pick a personal location for this project. This study shows that in doing so, their learning and appreciation has increased/enhanced and they were not only able to increase their positive attitude towards the earth-sciences, but they were more able to easily understand the topics in lecture/lab as they applied them to their real-life location.

This place-based approach in the geosciences allowed students who had relatively no prior formal education in earth sciences the chance to apply the core topics of the course to a special location of their choosing. The MyPlace project works as a place-based approach because it connects the student with a place that they have affixed a meaning to. Whether the student chose their location because of direct contact, a wish to visit, or simply a novel location, the study illustrates that the type of learning benefits and increases the student's attitude towards earth science. Place-based education often involves hands-on learning, project-based learning, and is always related to something in the real world. The MyPlace project follows this approach by having the students apply important earth science topics to a real-world place they have an existing personal connection to.

The survey results show that students report an increase in appreciation, motivation, and awareness in the earth sciences due to the fact they were able to apply the various course topics to a place they had been to, wanted to go to, and/or thought was interesting. The freedom the students had to choose their own location gave them incentive and personal interest to learn more and understand the various topics in the geosciences. This compares well with other studies in place-based education, and supports the idea that relating learning and education to a personal location increases students understanding, motivation, and general attitude of the earth sciences.

Limitations

This study demonstrated the advantages and benefits of how a place-based project in the geosciences improved the attitudes of a population of non-science majors, although there are limitations. One potential source of bias is that the student researcher was an instructor of the course and so had a vested interest in seeing positive results. Perhaps students felt compelled to give positive answers during the survey and interviews, as extra credit was used as an incentive. It is likely a future advantage would be to give the MyPlace Survey multiple semesters, and compare the results in a long-term study. Although this study collected attitude pre/post-data in the lecture portion of the course, it was not used in the results as the study. Furthermore, the study relies on student self-reported data and not objective measures. It is hard to determine the impact of the project from the overall impact of the course. Another limitation is this project had no comparison data to look at, as there does not exist any data about student's attitudes when they do not complete the MyPlace project during GEOS 1000. A possible limitation could be looking at the effectiveness of this project across all demographics, for example; perhaps this type of learning approach may not work well on a foreign student new to the United States.

Future Work

It likely would be helpful to look at other place-based studies and self-determination theories. Such studies suggest this is a major theory in motivation that claims personal autonomy is a major piece of intrinsic motivation. Future recommendations for the evaluation of this project would be to compare individual students MyPlace project grades with their course grades, and see how well they compare. It would be advised to look at this evaluation/study and compare it with other semesters where students do not do the MyPlace project, or look at students who take the GEOS 1000 class online, instead of in class. It would also be helpful to look at including more of the MyPlace project information and examples in lecture, and have the instructor show examples of their place applied to the current earth science topic, to better connect lab and lecture.

Practical Implications

The practical implications of this study are to assess how this place-based project can be used to engage, enhance, and improve students' attitudes towards the sciences. The MyPlace project could be used in a variety of college courses in the geosciences and geography, and not just within entry-level courses. A large part of the surveys and interviews focused not only on how the project affected their attitudes, but also how the project itself could be improved for further dissemination beyond WMU.

After reviewing the open-ended questions on the MyPlace Evaluation Survey, some apparent considerations were evident. The primary concerns with the project were that students sometimes had trouble finding the correct information within the time allotted, or at all. To

mitigate this, it might be helpful to train the lab teaching assistants better to work with the student's one on one to discuss ways of finding information, or giving the students more time in class and at home to work on their weekly slide. Many students agreed that the due dates were too early, and that their projects may have suffered because of that. A common concern that kept popping up as well was the fact the students had to give an oral presentations and this was difficult for some.

Suggestions for improving the MyPlace project:

- Looking closer at the weekly topics and expanding the choices of topic if applicable
- Reorganizing the due date and submission process, so that students have more time for feedback from the lab instructor
- Simplifying the instructions, and giving more examples of good projects
- Giving the students more time in class to work on this project with instructor

CHAPTER 5

CONCLUSIONS

This study concludes that a place-based approach such as the MyPlace project has the power and potential to increase some aspects of the affective domain within the context of this study. Students reported that their motivation, appreciation, and attitude towards earth science improved as a result of completing the MyPlace project. The results show that aspects of the affective domain such as motivation, appreciation, and positive attitude increased as they were able to apply the weekly geosciences topics directly to a place that they cared about.

This place-based project was successful in enhancing the participating students' appreciation for, awareness of, and motivation to learn about the earth-sciences. Students report that their attitude toward the geosciences was strengthened as they were able to apply the course weekly topics to their personal location. Critically, they report that the freedom to choose the place of study for the project is critical to forming a genuine connection to their place. This study also demonstrated that students preferred this place-based project to other classroom projects, and through being able to work with a location that was special to them, report that their understanding of various topics in the geosciences was increased. Using a place-based approach such as the MyPlace project demonstrates each student's ability to utilize the geologic content they are learning in an authentic and engaging assessment demonstrating critical skills colleges strive to build. Place-based education is an approach to learning that takes advantage of the earth sciences to create authentic, meaningful and engaging personalized learning for students.

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Appendix A: MyPlace project instructions

Many students want to learn about earth science in order to understand and protect the special places that touch our hearts, whether they are a park or hill near your home, a lake or beach from summer camp, a mountain visited on a family vacation, or a cherished stream valley on the family farm. While we will be focusing our studies in the lecture and lab on geologic processes worldwide, it is important for you to gain a sense of the connections between these processes and the places you know and care about.

Thinking globally is fine, but the effects of most of our actions occur locally. That is where all battles be they political, economic, or environmental are won or lost. It is the sum of our local actions that determines what happens to the whole earth. With the interconnectedness of Earth processes, pulling on a single thread can cause the whole cloth to unravel. It all comes down to what you do or fail to do!

This assignment is designed to get you thinking about how geology applies to a special place of yours and how the actions we humans take today will determine its future. It also provides a convenient way for you to track your learning in this course and gives you a chance to get to know your place geologically (and, as a bonus, we do this ***INSTEAD of a Lab Final!!!!***).

The project has four parts:

I. Choosing your Place (5 points)
II. Weekly Assignments (5 points each, 70 points total)
III. My Place Final Slide Set (40 points)
IV. My Place Presentation and Quiz (30 points)

First you will need to choose a special Place, with which you are familiar and have a personal connection. Your TA can advise you as to whether this place will fit the assignment, but the choice of place must be up to you. During the semester you will complete a weekly assignment applying the topic covered in lecture and lab to your Place. Through creating these weekly power point slides, you will develop a final slide set that shows the geology, human impacts, and special meaning of your Place. You will be expected to correct or improve any of the weekly slides to be incorporated into this final set. During the last week of lab you will create a short presentation (6-8 slides) that introduces your Place to other students in your lab section. Additional instructions and grading criteria for each part of this project are described below.

Unless otherwise noted, all assignments for this project should be submitted via the Dropbox tool in your Elearning lab section of GEOS 1000. All assignments must be uploaded into Dropbox via Elearning each week by Monday at 11:59 pm – LATE assignments will NOT be accepted.

I. Choosing your Place

You must begin by choosing the place you wish to learn about. This decision should not be taken lightly as a poor initial choice can make your work difficult. The place you choose should meet the following criteria:

- Familiarity – The place must be a REAL place on Earth that is well known to you. It need not be a place that you have spent years in, but you should know the place well enough so that you can picture it in your mind and describe it accurately without struggling. Please note that you may not choose the places portrayed in the Elearning examples.

- Interest – Your place must be "special" to you and a place you value for personal reasons. These can be any reasons you wish, just be prepared to explain to others why this place is meaningful to you.

- Size – Your special place must be neither too big nor too small. Your site must have some landscape features (for example, a stream, lake, waterfall, mountain, or canyon) that you can describe. Your site should not be too large. For example, the Rocky Mountains are a great part of the world, but they contain many, many, many places that are affected by different processes. You would need to narrow the Rockies down to a particular river valley, lake, or mountain. You also do not want to pick a place that is too small – unless you or your family owns many acres of land, your backyard is probably too small for this assignment. Don't worry about finding a place that is "geological" - if you are unable to find specific information for the week's topic you can increase the area to the county, state, or region level.

To complete this assignment, upload a text, MS Word, PowerPoint, or PDF file to the Elearning Dropbox (Assignment 1: Choice of Place) that has the following information:

- Name of your Place
- Location (city, county, state required; also latitude/longitude if known)
- Approximate size of area
- Short description of landscape and features (for example, if your Place has a river, waterfall, beach, mountain, canyon, etc.)

Grading (5 points):

All TA's will use the grading rubric below to determine grades for the initial choice:

Grading Criteria	Has name of place, detailed location, approximate area/size, landscape and features of the area. Place is acceptable to use.	Has name of place, detailed location, approximate area/size, landscape and features of the area. Place is not acceptable to use. Student must resubmit.	Missing one of the following: name of place, detailed location, approximate area/size, landscape and features of the area. Unable to determine if place is acceptable to use. Student must resubmit.	Missing two of the following: name of place, detailed location, approximate area/size, landscape and features of the area. Unable to determine if place is acceptable to use. Student must resubmit.	Missing three of the following: name of place, detailed location, approximate area/size, landscape and features of the area. Unable to determine if place is acceptable to use. Student

					must resubmit.
Score	5 points	4 points	3 points	2 points	1 point

If you receive a score of less than 5 points, you must resubmit the assignment. You must obtain your TA's approval of your Place before you can complete any additional assignments.

II. Weekly My Place Slides

You will be provided with about a ½ hour at the end of each lab to get started on (and hopefully complete) your weekly assignment. Each week you will create 1-2 PowerPoint slides that show how the topic(s) in lecture apply to your special Place. Please title your PowerPoint slide with your last name and Dropbox Assignment number from below.

There are several examples of weekly slides (compiled into final slide sets) done by previous GEOS 1000 students posted in the "Student Examples" folder under "My Place Project" in the "Content" area of Elearning. Please use these to get an idea of what will be expected of your weekly assignments (individual slides) and your final slide set.

Week	Dropbox Assignment No.	My Place Assignment Due
1		Introduction. No assignments due.
2	1	Choosing your Place. You must have TA approval before completing any other assignments in this project.
3	2a and 2b	TWO SLIDES (submit each as a separate file as each is graded separately): a) Introduction: slide includes your name and lab section, an image and the name of your place, why you chose it, and its location (include latitude/longitude; town, county, state, etc). b) Overview: slide describes the landscape, rocks, plants & animals, climate (include temperature and precipitation over the course of a typical year), and typical human uses of your Place.
4	3	Slide or slides share a topographic map and aerial photo of your Place, and describe important landscape features.
5	4	Slide or slides explain how plate tectonic activity shapes your Place, both in the present and in the past.
6	5	Slide or slides show and name the minerals and/or rocks that are found in your Place.
7	6	Slide or slides explain how the processes of weathering and erosion have shaped your Place.
8	7	Slide or slides explain how the processes of mountain building, folding, and faulting have shaped your Place; OR explains how past climate has impacted your Place.
No Labs		Spring Break – NO ASSIGNMENT

9	8	Slide or slides explain how river systems past or present have affected your Place OR how coastal processes/oceans have shaped your Place OR for a lake, describes the watershed (what rivers feed into the lake)
10	9	Slide or slides describe how glaciers, deserts and/or wind activity has shaped your Place OR for groundwater aquifers, how water enters/exits the groundwater system in your Place.
11	10	Slide or slides describe what your Place was like in the past according to evidence of fossils, and names/shows some fossils that can be found in your Place.
12	11a and 11b	a) Slide or slides describe how natural hazards such as earthquakes, volcanoes, tsunami, mass movement, and/or flooding affects your Place. b) Submit Quiz question and answer to your TA
13	12a, 12b, and 12c	a) Slide or slides describe natural resources of your Place, and how human activity may impact your Place in the future. b) Full, revised slide set due c) Upload presentation slides (6-8 slides)
14		My Place Presentations: Students will have limited time (4-5 minutes) to present. Complete presentation rubric and presentation quiz.

Grading (5 points per Assignment; 70 points total):

All TA's will use the grading rubric below to determine grades for weekly slides:

Grading Criteria	Information on the slide completely and accurately explains how your Place relates to the week's content. Website/ references included.	Information on the slide is complete and accurate, but does not relate to the required content. Website/ references included.	Information on the slide is complete but has minor errors, OR is accurate but missing minor information. No websites/ reference included	Information on the slide is complete but has major errors OR is accurate but missing key information. No website/ references included	Information on the slide is both inaccurate and incomplete. No website/ references included.
Slide Quality	Excellent	Good	Fair	Poor	Inadequate
Overall Score	5 points	4 points	3 points	2 points	1 point

Remember, LATE assignments will NOT be accepted and will earn 0 points for that week. Early uploading is encouraged due to weekend maintenance and updates in ELearning.

III. My Place Final Slide Set

You will submit a final version of all power point slides you have created, compiled into a single file. You are expected to correct or finish any slides, using the feedback your TA has provided in the Dropbox comments section.

Grading (40 points):

All TA's will use the grading rubric below to determine grades for the final slide set:

Assignment #	Slide Content	Information provided is both accurate and complete	Information provided is either inaccurate or incomplete	Information provided is both inaccurate and incomplete	No significant information is provided
2a	Introduction: include your name and lab section, an image and the name of your place, why you chose it, and its location (include latitude/ longitude; town, county, state, etc)	3 points	2 points	1 point	0 points
2b	Overview: describe the landscape, rocks, plants & animals, climate (include temperature and precipitation over the course of a typical year), and typical human uses of your Place	3 points	2 points	1 point	0 points
3	Share a topographic map and aerial photo of your Place, and describe important landscape features	3 points	2 points	1 point	0 points
4	Explain how plate tectonic activity shapes your Place, both in the present and in the past	3 points	2 points	1 point	0 points
5	Show and name the minerals and/or rocks that are found in your Place	3 points	2 points	1 point	0 points

6	Explain how the processes of weathering and erosion have shaped your Place	3 points	2 points	1 point	0 points
7	Explain how the processes of mountain building, folding, and faulting have shaped your Place; OR explain how past climate has impacted your Place	3 points	2 points	1 point	0 points
8	Explain how river systems past or present have affected your Place OR how coastal processes/oceans have shaped your Place OR for a lake, describes the watershed (what rivers feed into the lake)	3 points	2 points	1 point	0 points
9	Describe how glaciers, deserts and/or wind activity has shaped your Place OR for groundwater aquifers, how water enters and exits the groundwater system in your Place	3 points	2 points	1 point	0 points
10	Describe what your Place was like in the past according to evidence of fossils, and name/show some fossils that can be found in your Place	3 points	2 points	1 point	0 points
11a	Describe how natural hazards such as earthquakes, volcanoes, tsunami, mass movement, and/or flooding affects your Place	3 points	2 points	1 point	0 points
12a	Describe natural	3 points	2 points	1 point	0 points

	resources of your Place and how human activity may impact your place in the future				

Mechanics	Yes	Somewhat	No
Slides are well organized (good use of images, space, and appropriate and readable font size) and use correct spelling	2 points	1 point	0 points
Slides include references	2 points	1 point	0 points

Scale: A= 40-38; BA= 37-35; B= 34-32; CB= 31-29 C= 28-26; DC= 25-23; D=22-20; E=0-19

IV. My Place Presentation and Quiz

All students will share their special Place and what they have learned about its geology with their classmates on the last lab meeting of the semester. Presentations will be limited to about 4-5 minutes, in order for all students to have a chance to present. Your TA will inform you ahead of time how much time is available for your presentation.

Your presentation should consist of 6-8 slides total, organized as follows:

- Slide #1 (Introduction) – required (assignment 2a)
- Slide #2 (Overview and Human Uses) – required (assignment 2b)
- Slide #3 (Topographic map and aerial photo) – required (assignment 3)
- Two additional weekly slides of your choice
- Slide #13b (Human Iimpacts) – required

When choosing the two additional slides, think about what you have learned about the geology of your Place – what makes it unique or interesting? What was the most significant geologic event that shaped this place that you know? Compile these slides into a single file and upload the file to Elearning.

To ensure that other students learn about your Place (and you learn about theirs), you will also need to create a quiz question about the geology of your Place. Your TA will compile all of the individual questions into a Quiz handout, which you will fill out in class during the presentations.

The Quiz question that you create should not be too easy (for example, “What is the name of my Place?” or “Where is my Place located?” are bad questions). Instead, focus on the interesting geological aspects of your Place. For example, you might ask about what significant fossils, rocks, or resources are found in your Place, or how a particular event (erosion, past climate, volcanic eruption, etc.) shaped your Place. Your question may be in the form of: True/False,

Multiple choice, Matching, Fill in the blank, or Short answer (limited to a few words). No essays, please!

To complete this assignment, upload a text, MS Word, PowerPoint, or PDF file to the Elearning Dropbox (Assignment 11b: Presentation quiz question and answer) that includes BOTH your quiz question AND the correct answer.

Grading (20 points for Presentation; 10 points for Quiz & Question/Answer):

All TA's will use the grading rubric below to determine grades for the presentation:

Criteria	Meets or Exceeds Criteria	Somewhat Meets Criteria	Missing or Inadequate
Required Slide #1 (Introduction) complete and accurate (assignment 2a)	2 points	1 point	0 points
Required Slide #2 (Overview & Human use) complete and accurate (assignment 2b)	2 points	1 point	0 points
Required Slide #3 (Topo map and photo) complete and accurate (assignment 3)	2 points	1 point	0 points
One additional relevant slide or slides for a weekly topic is included, and is complete and accurate – student choice	2 points	1 point	0 points
Second additional relevant slide or slides for a weekly topic is included, and is complete and accurate – student choice	2 points	1 point	0 points
Required Slide #4 (Human impacts) is complete and accurate (assignment 12b)	2 points	1 point	0 points
All slides are free of spelling errors and/or typos	2 points	1 point	0 points
All slides are well-organized (good use of space and images, readable font size)	2 points	1 point	0 points
Presentation is well-organized (good use of time, not rushed or skipping around)	2 points	1 point	0 points
Presentation stays within the assigned time limits	2 points	1 point	0 points

Scale: A= 19-20; BA= 18; B= 16-17; CB= 14-15; C= 13; DC= 12; D=11; E=0-10

Failure to submit the presentation slides in Elearning by the due date will result in an automatic zero for this part of the project grade. An unexcused absence on the day of your presentation will also result in an automatic zero for this part of the project grade.

To earn credit for your Quiz question, submit it and the answer by the due date. Quizzes will be graded out of 10 points based on the correctness of your responses to the questions submitted by

your classmates. Failure to submit a quiz question by the due date will lower your final quiz score by 50%.

Appendix B: Human Subjects Institutional Review Board (HSIRB) approval letter

WESTERN MICHIGAN UNIVERSITY

Human Subjects Institutional Review Board

Date: March 16, 2015

To: Heather Petcovic, Principal Investigator
Nathan Charlton, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair Amy Naugle

Re: HSIRB Project Number 15-03-11

This letter will serve as confirmation that your research project titled "Evaluating the Affective Impact of a Place-based Learning Course Project in the Geosciences" has been **approved** under the **expedited** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., ***you must request a post approval change to enroll subjects beyond the number stated in your application under "Number of subjects you want to complete the study***)." Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: **March 15, 2016**

251 W. Walwood Hall, Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276

Appendix C: Informed consent document

Western Michigan University
Department of Geosciences

Principal Investigator: Dr. Heather Petcovic
Student Investigator: Nathan Charlton
Title of Study: Evaluating the Affective Impact of a Place-based Learning Course Project in the Geosciences

You have been invited to participate in a research project titled "*Evaluating the Affective Impact of a Place-based Learning Course Project in the Geosciences.*" This project will serve as Nathan Charlton's thesis for the requirements of the MS Geosciences. This consent document will explain the purpose of this research project and will go over all of the time commitments, the procedures used in the study, and the risks and benefits of participating in this research project. Please read this consent form carefully and completely and please ask any questions if you need more clarification.

What are we trying to find out in this study?
The MyPlace project is a significant part of your lab work in GEOS 1000 this semester. We are studying this project to find out how it might affect student learning, attitudes toward earth science, and interest in earth science. We hope that the results of this study will improve the project for use at WMU and other colleges, and will help us better understand how projects like this may help students learn about the earth.

Who can participate in this study?
All students currently taking GEOS 1000 may participate in the study.

Where will this study take place?
This study takes place at WMU in your normal GEOS 1000 lecture and lab rooms. Interviews will take place in a private office in Rood Hall.

What is the time commitment for participating in this study?
Participating in the survey part of the study will take about 10 minutes of your lab time. Participating in the interview will take about 20-30 minutes.

What will you be asked to do if you choose to participate in this study?
If you choose to participate in this study, you will be asked to do two or three things. First, you will allow us to keep a copy of work that you do in this class, such as your MyPlace final presentation and the pre- and post-test that you took in lecture. Second, you will complete a short survey here in lab asking about how the MyPlace project may have affected how you think and learn about earth science. Third, if selected, you will complete a short interview.

What information is being measured during the study?
We are using your pre- and post-test for this course and your work to measure how much you have learned about earth science, and whether your attitudes toward earth science have changed during GEOS 1000. We are using the MyPlace survey and the interview to measure and

understand how much this project has affected any changes in your attitude toward or interest in earth science that we see.

What are the risks of participating in this study and how will these risks be minimized?
There are little to no foreseeable risks to participating in this study. To protect your privacy, your name will be removed from all work, and surveys that we collect from you and replaced with a randomly generated numerical code. Interviews will not include your name, only your assigned code.

What are the benefits of participating in this study?
There are no direct benefits of participating in this study. Your information will help us to improve the MyPlace project for other students.

Are there any costs associated with participating in this study?
There are no costs for participating.

Is there any compensation for participating in this study?
There is no compensation for participating in the survey part of the study. If you consent to participate in the interview, are selected, and complete the interview, you will receive 10 points of extra credit toward your MyPlace project grade.

Who will have access to the information collected during this study?
Only the research team will have access to the raw data collected from you, such as your work, survey responses, and interview. Only examples of your work, survey responses, or interview quotes with your name and all other identifying information removed will be shared with others, including your course instructor and TA. Results of this project will be presented at conferences and in journal papers.

What if you want to stop participating in this study?
You may stop participating in this study at any time for any reason with no consequences either academically or personally. Once your responses have been de-identified, it may not be possible to remove your data from the study.

Should you have any questions prior to or during the study, you can contact the primary investigator, Dr. Heather Petcovic at 269-387-5488 or heather.petcovic@wmich.edu. You may also contact the Chair, Human Subjects Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298 if questions arise during the course of the study.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

I have read this informed consent document. The risks and benefits have been explained to me.

Please mark the box that indicates your level of participation in this study:

☐ YES – You may use my regular class work and survey data in this research study.

☐ YES – You may contact me to participate in an interview at

Email: _____

Phone: _____

Please note that volunteering for an interview does not guarantee that you will be selected. A researcher will contact you to set up an interview time if you are selected to participate.

_____

Please Print Your Name

_____ _____

Signature Date

Appendix D: Pre/post course attitude and knowledge survey

NOTE: Pre- and post-course assessment is identical with only Part III not on the post-assessment.

Instructions: We are interested in how your opinions about and understanding of each science might (or might not) change in this course. Completing this survey counts toward your i-clicker points.

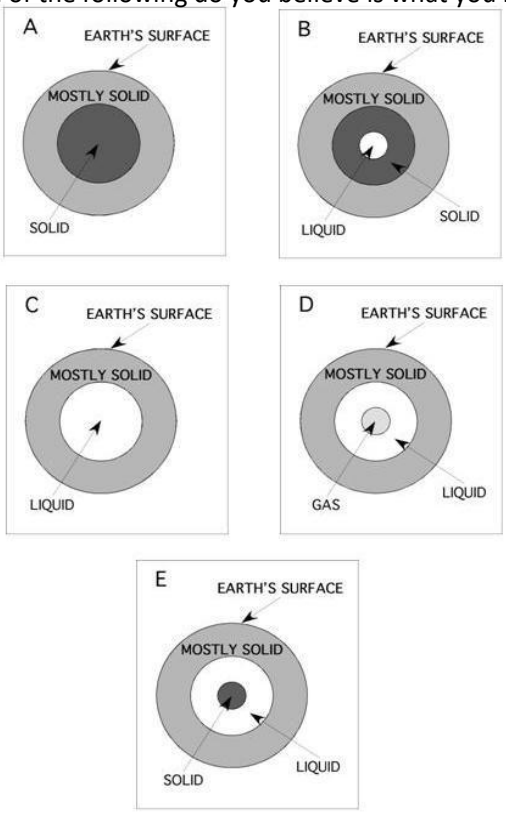
Part I – Your thoughts about earth science
Please indicate your reaction to each of the following statements by coloring in the corresponding bubble.

	Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
1. Much of what I learn in earth science class is useful in my everyday life.	a.	b.	c.	d.	e.
2. Learning earth science can help me when I make decisions about purchases such as food, cars, or electronics.	a.	b.	c.	d.	e.
3. Caring about people is part of making a scientific choice, such as whether to use pesticides on plants.	a.	b.	c.	d.	e.
4. The things I do in science class have nothing to do with the real world.	a.	b.	c.	d.	e.
5. Earth science helps me to make decisions that could affect my health.	a.	b.	c.	d.	e.
6. Learning earth science will have an effect on the way I vote in elections.	a.	b.	c.	d.	e.
7. Earth science class helps me to work with others to make decisions.	a.	b.	c.	d.	e.
8. Earth science has nothing do with local issues, such as waste from nearby factories.	a.	b.	c.	d.	e.
9. Using scientific thinking helps me to make environmental decisions.	a.	b.	c.	d.	e.
10. Learning earth science is not important for my future success.	a.	b.	c.	d.	e.
11. I only take science because it is a required course.	a.	b.	c.	d.	e.
12. Knowing earth science can help me to make better choices about where to live.	a.	b.	c.	d.	e.
13. Collecting evidence is an important part of making a decision.	a.	b.	c.	d.	e.
14. Earth science class will help prepare me for major decisions in my future.	a.	b.	c.	d.	e.
15. Knowledge of science will help me protect the environment.	a.	b.	c.	d.	e.

Part II - What you know about earth science
Please select the best answer to each question.

16. Which comes closest to your own view?
a. Most scientists think global warming is happening
b. Most scientists think global warming is not happening
c. Scientists generally disagree about whether or not global warming is happening

17. Which of the following do you believe is what you might see if you cut the Earth in half?



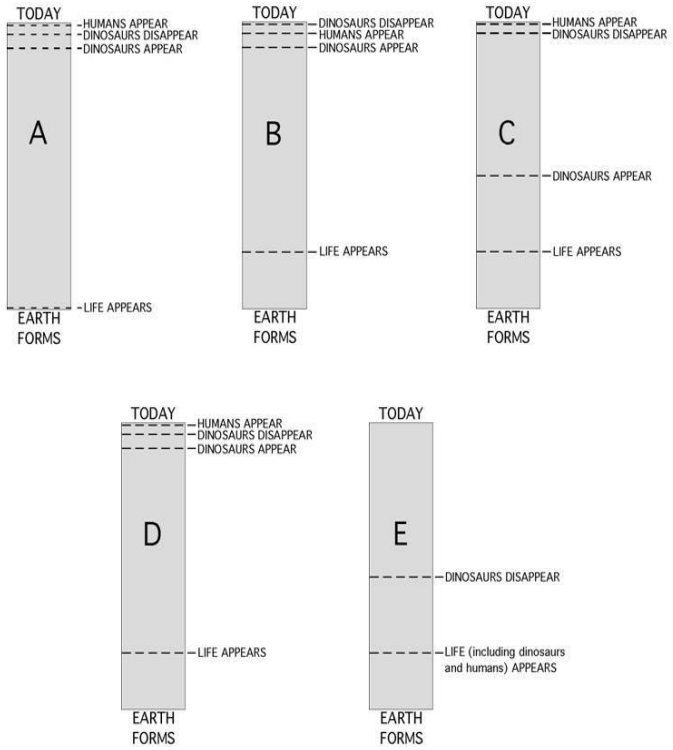
18. Are rocks and minerals alive?
a. Yes, rocks and minerals grow
b. Yes, rocks are made up of minerals
c. Yes, rocks and minerals are always changing
d. No, rocks and minerals do not reproduce
e. No, rocks and minerals are not made up of atoms

19. What causes most of the waves in the ocean?
a. Tides b. Earthquakes
c. Wind d. Tsunamis

20. Which of the following can result in the formation of a mountain?
a. Winds at Earth's surface moving material
b. Forces beneath Earth's surface moving material
c. Pressures beneath Earth's surface moving material
d. Waves at Earth's surface moving material

21. Which of the following best describes the relationship between the greenhouse effect and global warming?
a. The greenhouse effect and global warming are likely the same thing.
b. Without the greenhouse effect, there would be almost no global warming.
c. Without global warming, there would be almost no greenhouse effect.
d. The greenhouse effect and global warming are likely unrelated.
e. There is no definite proof that either the greenhouse effect or global warming exists.

22. Which of the following figures do you think most closely represents changes in life on Earth over time?



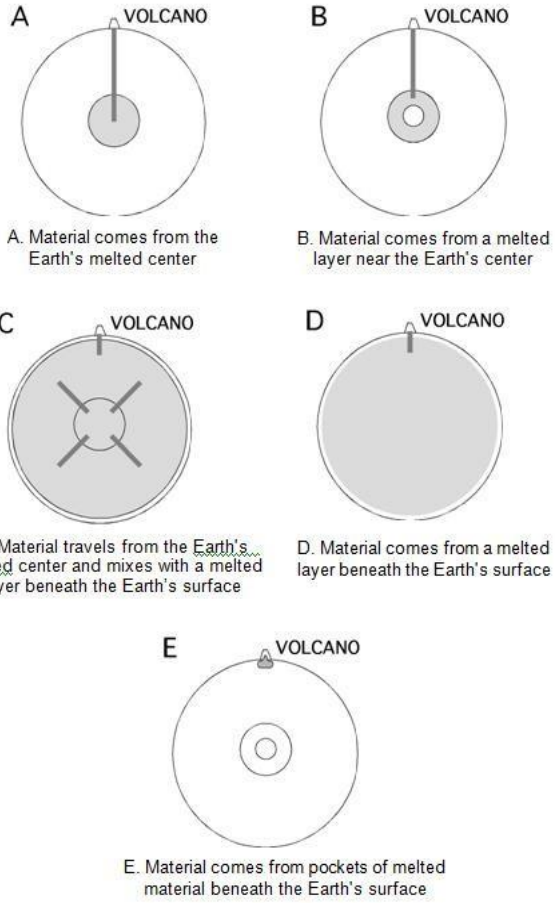
23. Which of the following responses best summarizes the relationship between volcanoes, large earthquakes, and tectonic plates?
a. Volcanoes typically occur on islands, earthquakes typically occur on continents, and both occur near tectonic plates
b. Volcanoes and large earthquakes both typically occur along the edges of tectonic plates
c. Volcanoes typically occur in the center of tectonic plates and large earthquakes typically occur along the edges of tectonic plates
d. Volcanoes and large earthquakes both typically occur in warm climates
e. Volcanoes, large earthquakes, and tectonic plates are not related, and each can occur in different places

24. If human civilization had never developed on Earth, would there be a greenhouse effect?
a. Yes, the greenhouse effect is caused by naturally occurring gases
b. Yes, the greenhouse effect is caused by plants giving off gases
c. No, the greenhouse effect is caused by humans burning fossil fuels
d. No, the greenhouse effect is caused by humans depleting ozone
e. No, there is no conclusive evidence that a greenhouse effect exists

25. How far do you think continents move in a single year?

a. A few inches
b. A few hundred feet
c. A few miles
d. We have no way of knowing
e. Continents do not move

26. On continents, where does most volcanic material come from?



27. Some people believe there was once a single continent on Earth. Which of the following statements best describes what happened to this continent?

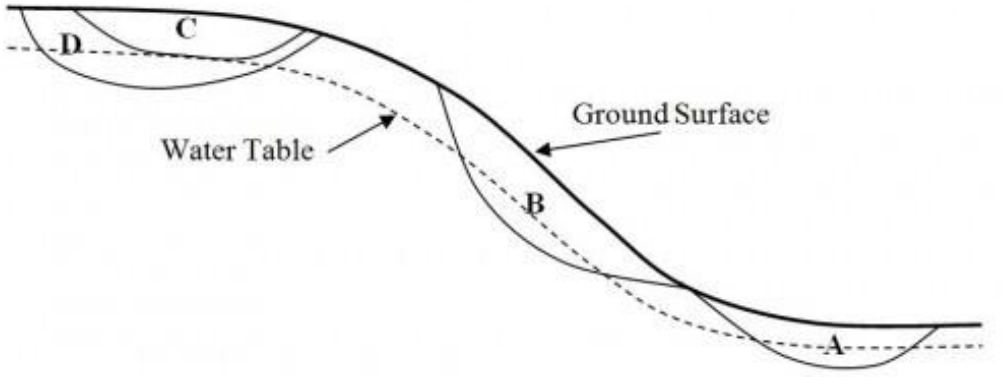
a. Meteors hit the Earth, causing the continent to break into smaller pieces
b. The Earth lost heat over time, causing the continent to break into smaller pieces
c. Material beneath the continent moved, causing the continent to break into smaller pieces
d. The Earth gained heat over time, causing the continent to break into smaller pieces
e. The continents have always been in roughly the same place as they are today

28. If you put a fist-sized rock in a room and left it alone for millions of years, what would happen to the rock?

a. The rock would almost completely turn into dirt
b. About half of the rock would turn into dirt
c. The top few inches of the rock would turn into dirt
d. The rock would be essentially unchanged

29. Which technique for determining when the Earth first formed as a planet is most accurate?
a. Comparison of fossils found in rocks
b. Comparison of layers found in rocks
c. Analysis of uranium found in rocks
d. Analysis of carbon found in rocks
e. Scientists cannot calculate the age of the Earth

30. For the slope cross-section below, where is a landslide most likely to occur?



a. At A, because it is both flat and below the water table
b. At B, because it is both steep and below the water table
c. At C, because it is both high and touching the water table
d. At D, because it is both high and below the water table

Part III - Finally, please answer a few questions about yourself

31. What is your gender?
a. Male b. Female c. Transgender d. Prefer not to respond

32. What is your age?
a. 18-19 b. 20-21 c. 22-23 d. 24-25 e. 26 or older

33. With which of the following groups do you most closely identify?
a. African–American b. Native American
c. Caucasian/White d. Hispanic/Latino
e. Mixed race or Other

34. What is your year in college?
a. First (Freshman) b. Second (Sophomore)
c. Third (Junior) d. Fourth (Senior)
e. Fifth or more (Super-senior)

35. Are you a transfer student?
a. Yes b. No

36. What is the general area of your major (if you have more than one major, pick the one most closely related to your career goals)?
a. Humanities or Sciences (for example, biology, English, geography, psychology, political science, etc.)
b. Fine or Performing Arts (for example, music, dance, art, design, etc.)
c. Education (for example, elementary or secondary education, special education, family studies, etc.)
d. Business (for example, communications, business, marketing, management, etc.)
e. Undecided, Interdisciplinary, or Other

37. What is your overall college GPA?
a. 3.5 to 4.0 b. 3.0 to 3.4 c. 2.0 to 2.9 d. below 1.9 e. don't know

38. Did you take an earth science class in middle or high school?
a. Yes b. No c. Can't remember

39. How many science classes did you take in high school?
a. None b. One c. Two d. Three e. Four or more

40. How many other science classes have you taken in college?
a. One b. Two c. Three d. Four or more
e. None – this is my first college science class

Appendix E: MyPlace evaluation survey

GEOS 1000 MYPLACE SURVEY
Spring 2015

Please mark one answer for each question:

	AGREE			DISAGREE
1. The MyPlace project was helpful in understanding the GEOS 1000 weekly topics.				
2. The MyPlace project increased my appreciation of the earth sciences (human impact, resources, natural hazards, etc.).				
3. The MyPlace project increased my awareness of the importance of earth science/geosciences.				
4.After the MyPlace project I have a more positive attitude towards earth science.				
5. The MyPlace project provided an incentive to want to protect and care for the place I chose.				
6. The MyPlace project has motivated me to want to learn more about earth science.				
7. Overall, I enjoyed the MyPlace project because I was able to learn more about a place that is special to me.				
8. The MyPlace project encouraged me to think more globally about earth science issues such as hazards, environmental degradation, natural resources, etc.				
9. The MyPlace project demonstrated how human impact can have a positive and/or negative affect on our locations.				
10. The MyPlace project increased the personal connection that I feel with the place I chose.				

Please turn over

1. What did you like **best** about the MyPlace Project?

2. What did you like **least** about the MyPlace Project?

3. What advice or comments can you give to **improve** the MyPlace project?

Appendix F: Semi-scripted interview protocol

NOTE: this interview is semi-scripted. Questions may be asked in any order or skipped entirely. Allow the interviewee to steer the conversation as much as possible, and keep an overall conversational tone for the interview.

Prior to starting the interview, the interviewer will have a copy of the student's MyPlace evaluation survey to use in prompting the conversation. The interviewer will invite the student to take a seat. Once the student is settled, the interviewer will start the audio recorder.

This is an interview with [STUDENT ID] on [DATE] for the MyPlace evaluation project. [INTERVIEWER NAME] is conducting the interview.

Thanks for coming today. As you know, we are studying the MyPlace project from your GEOS 1000 course to see how it might affect what students think about earth science. I have a couple of questions for you about the project, what you liked about it, and how it might be improved. I am recording this interview because I might use quotes from you in papers or presentations about this research. Your name will not be shared, and nothing you tell me about the project will have an impact on your grade in GEOS 1000.

Do you have any questions before we continue? (*Pause, answer any questions*).

First, let's talk about <u>your</u> MyPlace project. What was your project about?
(Ask prompting questions from the list below as needed – the object is to get the student to talk about their own project, why they choose it, benefits and challenges of their project, and what they perceived that they learned):

- How did you choose the place that you studied for the project?
- Why did you choose your place?
    - Have you been there? Are you going there again soon? Did you already know a lot about your place to begin with?

- What important things did you learn about your place?
    - Do you want to learn more about your place? Did this project make you want to travel to your place more often? Did this project cause you to feel more connected to your place?

- What was your favorite topic for your place? Why?
- What was your least favorite topic? Why?

Earlier in class we took a survey asking about the MyPlace project. Let's take a look at your survey so I can ask you to explain some of your answers. *(Make student's survey available for both the interviewer and interviewee to examine. Use the survey to guide this part of the interview, focusing on items with strong agreement or disagreement.)*

- I see that you agreed with [ITEM NUMBER(S)]. Can you explain why?
- I see that you disagreed with [ITEM NUMBER(S)]. Can you explain why?

- You wrote that you liked [STUDENT RESPONSE] best about the project. Can you explain why?
- You wrote that you liked [STUDENT RESPONSE] least about the project. Can you explain why?
- You wrote that you think [STUDENT RESPONSE] should be improved. Can you explain why?

- *(If needed):* I see you left [ITEM NUMBER] blank. Do you have any thoughts on this that you want to share?

I have a few last questions about the project and how it fits into the course overall.

- Do you think the MyPlace project is appropriate for an introductory class for non-science majors? Why or why not?

- Do you think other students should pick their own place for the project? Or should your TA provide a list of places that you can pick from?

- In thinking about the GEOS 1000 course overall, what components (such as lecture, lab, the MyPlace project, homework, quizzes, or exams) had the greatest impact on your learning? Which components had the greatest impact on your overall interest in earth sciences?

We're almost done! Do you have any final overall thoughts on the MyPlace project or GEOS 1000 that you'd like to share?

Thank you for your time. *(Turn off audio recorder).*