

LEARNING THROUGH SCIENCE FIELD EXPERIENCES: AN EVALUATION OF
THE EFFECTS OF EXPERIENTIAL LEARNING
IN A FOURTH GRADE CLASS

by

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ABSTRACT

Students are not always allowed the opportunity to gain real world science knowledge from field trips. This study analyzed students' performance on science based assessments before and after participating in hands-on science field trips. This study also analyzed how a field trip could affect the students and teachers attitudes toward learning. Students in a fourth grade class participated in three field trips throughout the school year. After each field trip students took a test to assess their learning, participated in student interviews, and recorded thoughts and feelings about the trips. The results of the study indicated positive gains in both students' conceptual knowledge and their attitudes towards learning. Participation in field trips had a positive impact on the studied students' content knowledge and attitudes, as well as a positive impact on the teacher's instruction.

INTRODUCTION AND BACKGROUND

West Hills STEM (Science, Technology, Engineering, Mathematics) Academy is a public kindergarten through eighth grade school in the inner city of Bremerton, Washington. The school serves 655 students, 70% of the students are eligible for free and reduced lunch. Of the 655 students 52% of the students are Caucasian, 18% are Hispanic, 16% of are two or more races, and 6% of students are African American (Greatschools.org).

West Hills serves a large population of students with IEP's and 504 plans, 17% of students at the school have an individualized education plan and 6% of students have a section 504 plan (Bremertonschools.org).

Students at West Hills come from different backgrounds and many bring baggage with them to school that makes learning challenging. In the 2016-2017 school year less than 50% of fourth graders and less than 50% of fifth graders met standard on the Smarter Balanced Assessment (Office of Superintendent of Public Instruction).

I have been a teacher at West Hills STEM Academy for three years. During the 2017-2018 school year I taught a fourth-grade class of 24 students. The students in my class were ethnically diverse and varying in academic abilities, as well as socio-economic status. My class featured 14 boys and 10 girls. The number of students and number of boys and girls in my class fluctuated a fair amount during the school year.

For the two years before that I taught first grade, where project based and experiential learning was a focus. I was able to do a lot of projects and fun activities with them, but I was not sure that they were meaningful enough for my students. My students

would learn science content but then in a few months most of the learning they had done was gone. A couple times a month my students would talk about the end of kindergarten trip to the aquarium. They could remember specific science content about the ocean and ocean animals because of the deep meaning that was made during the trip.

I tried and failed to get my teaching team on board to take the first graders on a meaningful science based field trip due to a variety of factors ranging from cost to liability, this became a challenge. This action research project was important to me because I wanted data driven evidence to demonstrate to my school and my colleagues the benefits that can be received from taking students on meaningful outdoor learning experiences.

I teach at a school where most of my students do not get to leave their neighborhood, let alone go on enriching outings outside of school. If I as a teacher do not take them to these places to learn, chances are that they will never get to go. I believe that taking students away from their immediate surroundings, will be able to inspire and engage students to want to learn about new things. I also believe that it will help my students to see that learning happens outside of school walls, and that the content they learn in school can be applied to places in their daily life.

When I moved to a fourth grade, I was able to take the kids on many field trips. I focused on making these field trips more meaningful. I wanted to gain knowledge on what makes a field trip a meaningful learning experience and compare the field trips that we go on so that I can continue to plan meaningful field trips for the rest of my teaching career.

Taking my fourth grade students on field trips also helped my teaching practices because I was inexperienced at taking my students on field trips and seeing to their learning as much as possible from each experience. Learning from experts in their field and from activity coordinators at each field trip destinations gave me ideas and inspiration that will not only improve my ability to lead field trips, but will improve my instruction in the science classroom as well.

My action research question that was the main focus of my investigation is “what are the effects of field trips and outdoor learning experiences on students’ content knowledge?” I want to measure the change in the content knowledge that my students have before and after they take part in a field experience. I also will be looking at the change in how they feel about learning before and after going on a field trip. One of my sub questions is “how will student’s attitude toward learning be impacted by going on field experiences?” and my other sub questions is “how does taking students on field experiences impact my teaching practice?”

CONCEPTUAL FRAMEWORK

Students need to be able to create concrete memories about their learning if they are to hold the knowledge that they gain during school for a long time to come, field trips are a way for students to make meaning about their learning but Green, Kisida, and Bowen (2014) state that

Financial pressures force schools to make difficult decisions about how to allocate scarce resources, and field trips are increasingly seen as an unnecessary frill. Greater focus on raising student performance on math and reading standardized tests may also lead schools to cut field trips (p.80).

We know that field trips are important, but we are not able to take students on them due to many reasons.

Field trips provide students with the opportunity to participate in a real life, hands-on, social activity that deals directly with what they are learning. “A field trip well planned and well executed, is invaluable and stimulates the child’s interest in the world around them” says Michel (1953, p. 137). Educators have known for a long time that a key to getting students to learn is to get them interested in their learning.

When students are doing hands-on science during a field excursion they are doing what real scientists do. Scientists interact with their subject matter in real time, not in a text book or on a worksheet. In an article on science education reform Vesilind and Jones (1996) suggest “hands-on science is embedded in inquiry processes and is not a goal separate for children’s scientific investigation” (p.376). Children are inquiring about the world around them when they do hands-on science learning.

The excitement of field trips can often motivate students to participate in learning that they may struggle to do in class and connect in many ways. Field trip activities can “focus students on collaborative or individual learning, problem solving or other applications of content and skills, and on supportively challenging their understanding of content” (McLoughlin, 2004, p. 160). Interactive, hands-on activities such as field trips can make difficult content and skills easier to grasp.

Constructivist theory states that students learn well when they can make meaning of their learning; “According to [Piaget’s] constructivist theory, in order to provide an ideal learning environment, children should be allowed to construct knowledge that is

meaningful for them” (Ozer, 2014, p. 1). Field trips do just that for instance a student is able to learn about rocks in the classroom, but if they go out into nature and look at rock formations they can see the layers, the weathering and the erosion.

Children are always able to reevaluate their learning and add on to previously learned concepts and ideals. In an article on Bayesian learning, Gopnick and Wellman (2012) explain that children “should also produce intermediate hypotheses, and those hypotheses should improve progressively. In fact, children's conceptual development does progress in this way” (p.1101). Field trips allow students many opportunities to reevaluate their knowledge of subject matter because they are confronted with real world examples of the content that they are trying to process.

Participating in field experiences can help students meet grade level expectations in science and engineering. Field trips feature meaningful opportunities for students to use the eight science and engineering practices. The Next Generation Science Standards state,

an essential part of science education is learning science and engineering practices and developing knowledge of the concepts that are foundational to science disciplines. Further, students should develop an understanding of the enterprise of science as a whole—the wondering, investigating, questioning, data collecting and analyzing (NGSS Lead States, 2013, p. 1).

When students participate in field based science they are getting first-hand experience at using important science and engineering practices such as asking questions, developing models, analyzing data, and construction explanations.

Field excursions can also help students' attitudes toward school, their peers, and learning itself. In 2001 fourth grade teachers from Tennessee took 30 students to Great Smokey Mountains National Park. One year later the students still had fond memories, content understanding, and a sense of care for the environment (Farmer, Knapp & Benton, 2007). When students create deep meaning it stays with them longer.

Teachers play a specific part in the success of a field trip. Kisiel (2005) stated, "that many teachers may not be aware of their role in the experience and subsequently may not be taking full advantage of this resource" (p.160). Teachers need to set specific expectations for their students of what they need to learn just like you would in a regular classroom lesson.

The roles that a teacher plays on a field trip factors into the overall student field trip experience. In a 2017 study on the behavior of teachers during field trips Alon and Tal (2017) discovered that there are four roles that a teacher could fall into on a field trip, supervisor, technical assistant, social active mediator, and cognitive active mediator. The results of the study "found that students who ranked the teacher involvement high ($N = 108$) reported significantly higher learning outcomes than those student who ranked their teacher involvement low" (Alon & Tal, 2017, p. 882). Students whose teacher only monitor and direct students on the field trip may not achieve the desired goal of a field trip, which is that students learn the concept.

In doing research it is important to have many options for data collection. Using interviews, assessments, and surveys is recommended for student research Nadelson and Jordan (2012) said that "The combination of methods affords students the

opportunity to express their perceptions of what they learned from a field trip while allowing the researcher latitude for directing responses toward specific areas of research interest” (p.227). This may allow teachers to have many opportunities to learn from the data their students are giving to them.

METHODOLOGY

I took my students on five field trips during the 2017-2018 school year and these field trips related directly to Washington State fourth grade science and social studies learning standards. The trips were also required to connect students to future careers such as engineering, biology, and environmental studies. The students in my class took most of the field trips along with the other 75 fourth grade students. During each trip, myself or an expert from the location led the field excursions. Before each field excursion my students were briefed with what they would be learning as well as expectations for their learning and their behaviors. They also completed a pre-test so that they could know what information they were looking to learn during the field trip. The research methodology for this project received an exemption from Montana State University's Institutional Review Board and compliance for working with human subjects was maintained (Appendix A).

During each field trip my students participated in engaging activities such as games, presentations, sit spots, tours, and scavenger hunts. They were encouraged to look for answers to questions that they had and to ask questions often. They were also directed by me to record their learning, thoughts, and comments in their field trip journals. As I went around to each chaperone group on the field trips I checked in with students to see

that they were completing the learning objectives and also to make sure that they were having a good time.

When we returned from each field trip my students and I wrote reflections in our journals and they answered questions about their favorite moments, things that they learned and comments about what could have made the field trip better. While students were taking their post-tests I interviewed selected students using pre-determined questions (Appendix B). Finally after three weeks I would administer the extended post-test to assess the retention of what my students learned on the field trip.

I teach fourth grade in a self-contained classroom, meaning that I teach all the subjects and stay with the same class of students all day. For my action research project I used these students as my sample for study. All of the full time students in my class chose to voluntarily participate in my research project. In my classroom I have twenty-four students, ten female students and fourteen male students. The students in my classroom are a diverse group from many different cultural and ethnic backgrounds. They also come from various socioeconomic groups as well.

These students range in academic ability from students who consistently surpass grade level standards to students who are more than a grade level below the grade level benchmark. I have five students who consistently perform more than a grade level behind in the core subjects of math, reading, and writing. Six of my students consistently perform slightly below grade level benchmark in the core subjects. The students who are performing above grade level benchmark standards consistently complete grade level assignments with above grade level thinking and comprehension, I have five students in

this category. The remaining eight students meet fourth grade benchmark standards in all subjects consistently.

The field trip treatments took place from October to April of the 2017-2018 school year. The treatment started one day before each field trip and ended the day after the field trip, so each treatment period lasted for three days not including the extended post-test.

Due to learning content and unplanned changes, data was only collected for three of the science-based field trips that I took my class on. The first treatment trip was to the Puget Sound Salmon Center. During the trip to the salmon center students participated in an interactive discussion about preservation and sustainability, a game about salmon survival, a tour of the facility and a guided introduction to the animals located there, and an interactive workshop on testing soil. During the trip students were all together as a whole group and not broken up into smaller groups.

The second trip that students were taken on was to the Keyport Naval Undersea Museum. During this trip I briefed chaperones with all necessary information that students would need to learn so they could guide students in their learning. Students also participated in a scavenger hunt of the museums exhibits, and got to have hands on interactive time with several coding activities. Some of the exhibits in the museum included military technology, marine mammals, and a large ocean science exhibit. During the trip students were checked on frequently, and I made sure to hit major teaching points with each group.

The last field trip that students were able to take part in as part of their treatment was to Point No Point Park, a sand beach and dormant naval instillation in Hansville, Washington. At the park students participated in, group instruction on the ocean, estuary and forest environments in the park. Students also went on a scavenger hunt to find abiotic and biotic features of the beach environment. To learn about different environments I took students through each of the three environments we stopped and made observations, then compared and contrasted our findings at the end. The last activity that students participated in was to locate larger items on the beach and then hypothesize about how beach sand is created using those objects.

I had three questions that I sought to answer during my action research project. Each of these questions had multiple data sources that were triangulated to work in conjunction with one another. Table 1 is a matrix of which instruments were used and triangulated with each questions.

Table 1.
Data Collection Matrix

Research Questions	Pre-tests	Post-tests	Extended Post Tests	Likert type survey	Student interview	Student Journal	Observation notes	Teacher journal	Student reflection
Focus Question	X	X	X						
Sub Question 1				X	X	X			
Sub Question 2							X	X	X

I developed each of the instruments that were for data collection using fourth grade learning standards and information from liaisons at each field trip sight about what

students will specifically be learning. I also had my colleagues look over each assessment once completed and the pre and post-test was created in collaboration with them. In order to determine that my methods were valid and reliable; I piloted these methods with my class on our first field trip of the year, which was to a hydro-electricity dam. I got a chance to work out a few bugs as well as figure out best practices for doing data collection.

The pre, post, and extended post-tests (Appendix C, D, E) were designed to feature the same questions with the same content so that I could measure which questions students changed their answer to after going on the field trip and after having some time in between the field trip and the test. When designing the assessments I contacted the site liaisons at each location to determine the activities that they would be participating in and the learning targets for those activities. Questions were designed based on those learning outcomes. I looked at the total number of points scored on each as well as looked for patterns on individual questions. The tests are a mix of multiple choice and written answers.

While students took their post-tests I administered student interviews with a randomly selected group of students. The same questions were asked after each field trip, and I made notes during the interviews.

The Likert type attitude survey was developed using input from my colleagues at work and rewriting questions that I found in similar attitude surveys. (Appendix F). The

attitude survey was given at two points during my research, before the treatment started, and at the end of treatments. I gave the attitude survey using a Google form through Google classroom so that data could be stored and easily analyzed.

The use of journals was for the purpose of looking for patterns in students' thoughts and feelings about the field trips. The use of the teacher journal was to track my thoughts and reflections about the process of taking students on meaningful field trips.

The observational notes that I took on field trips were for me to record what instances my students are at a level of high engagement during each treatment experience (Appendix G). I tallied and made comments about the number of times students raised their hands, asked questions, and made comments.

Finally my students completed a final reflection about all of the trips they went on as a whole (Appendix H). The questions were created by me and were reviewed by my colleagues. This instrument sheds light on how my students feel that I could make field trips and my teaching better by using field trips.

DATA AND ANALYSIS

To measure their growth in content knowledge I analyzed students overall score on a pre and post-test for each field trip and then analyzed which students retained the knowledge over a 30-day period. In Figure 1 it is seen that students made noticeable gains between the pre-test and post-test for the trip to the Puget Sound Salmon Center. Overall scores improved for all but one student ($N=22$). After 30 days I administered the assessment one more time and 77% of students retained their scores after 30 days.

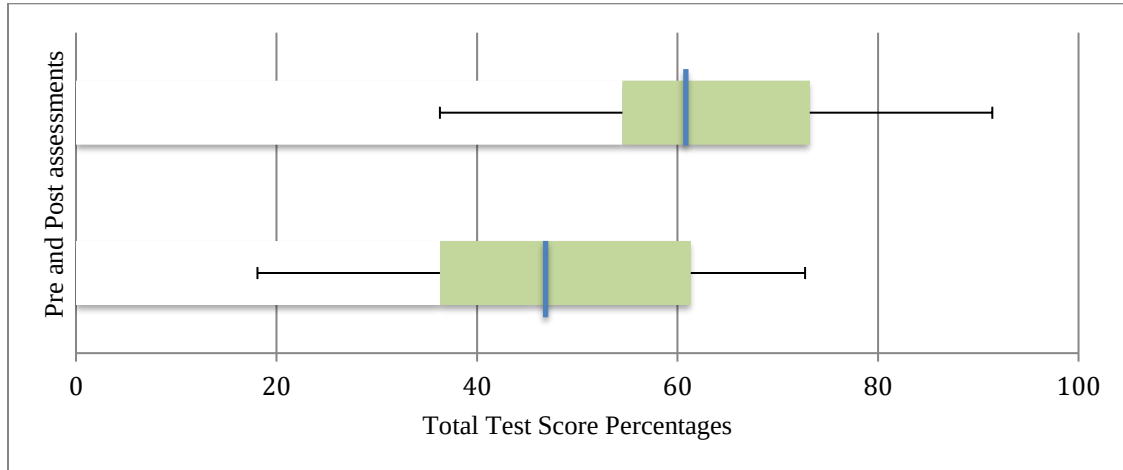


Figure 1: Box and whisker plot showing students, (N=22) percentile scores on pre (bottom) and post (top) tests for salmon center field trip.

The average score of the pre-test was 48% and the average score of the post-test was 61% that is an average growth of 13% between pre-test and post-test. The scores on the post-test were also more concentrated than those on the pre-test, which varied greatly. Students frequently missed the same question or questions, this could indicate a misconception that they developed on the trip.

The student who received the highest score on the post-test was also the same student that received the highest score on the pretest. This student is one of my high achieving students. The student who scored the lowest on both assessments is one of my English language learners whose main focus in school is growing in English proficiency.

The box and whisker plot in Figure 2 is quite similar to the one seen in figure one because the same number of points were available on both assessments and about half of the students (12) scored below 50% on the pre-tests. The difference between the two assessments is that only 60% of students retained their scores after thirty days although this could be attributed to winter break being in between students taking the post-test and students taking the extended post-test.

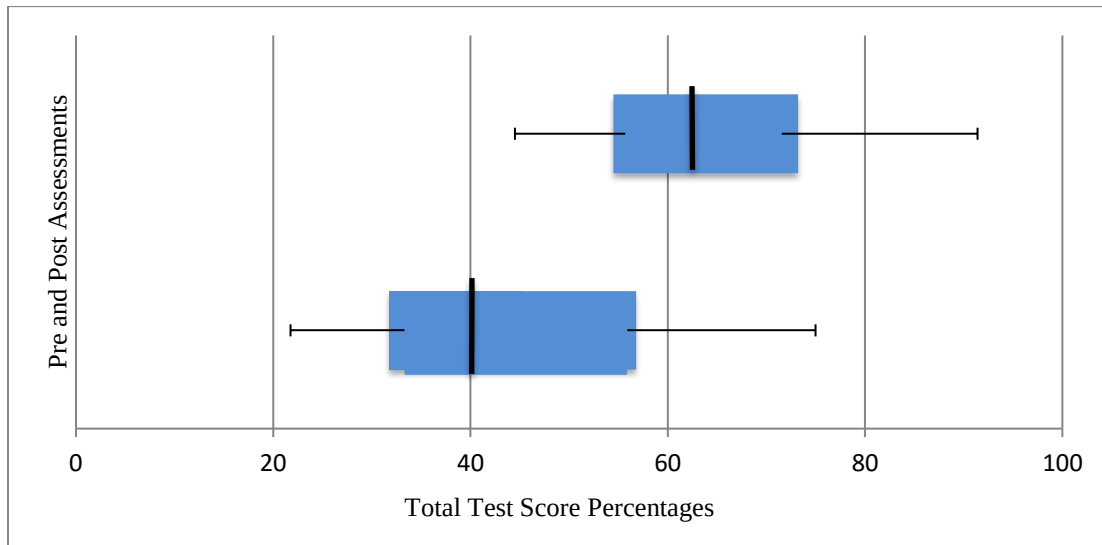


Figure 2: Box and whisker plot of individual students, (N=23) percentile scores from the Naval Undersea Museum Trip pre (bottom) and post-test (top).

On the pre-test for this trip, students scored an average of 41.3% and on the post-tests students scored an average of 61.5% that is an average of 20.2% growth for all students between the pre and post-test for the trip to the naval undersea museum.

On the post-test for the undersea museum trip, two students both received a 91% on the test each only missing one questions. There were two students with a score of 45% on the post-test, but those students still answered more questions correctly than the pre-test. One student raised their score 19% and the other 28%.

The final conceptual pre-test and post-test that was completed by my students was by far the most challenging one with 14 students scoring below a 40%. In Figure 3 the comparison between the two tests is the most similar and I would attribute that to the rigor of the quiz, nevertheless sizable gains were still made and all but two students made growth in the number of questions that they got correct and their overall percentile score. On the pretest students scored an average of 40.4% and on the post-test the class average

was 62%, a growth of 21.6% for the class. On the extended post-test 66% of students retained their knowledge after 30 days.

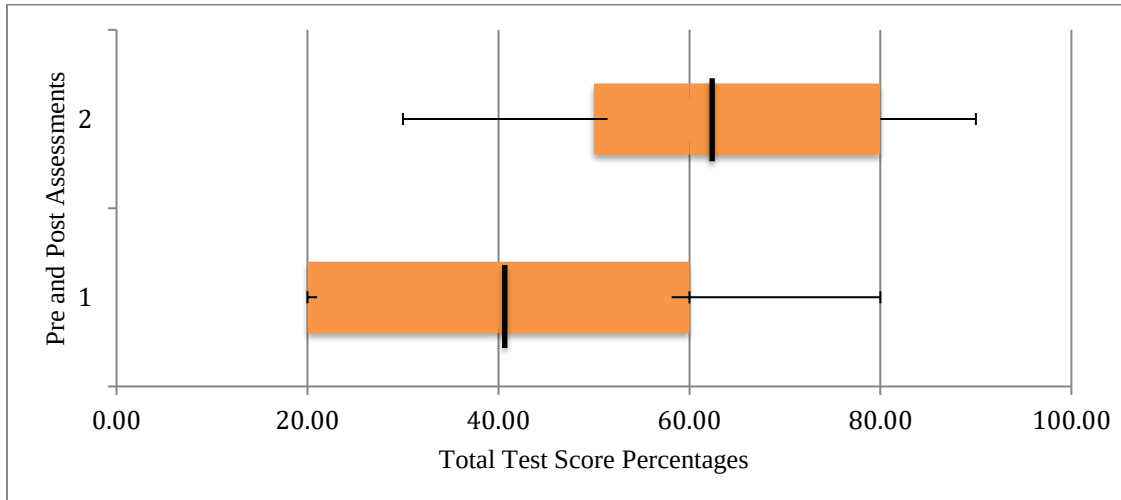


Figure 3: Box and whisker plot of individual students, (N=24) percentile on the pre (bottom) and post (top) tests from the Point No Point Park field trip.

I think that it should also be mentioned that the outliers for the post-test are less drastic than seen in previous quizzes. There were more student scores congregated around the highest score received, which was 90%.

In each instance the students grew in their content knowledge after they participated in hands on science based field trips.

To measure each student's progress of their attitudes toward school and science, the students answered a Likert style survey about their attitudes toward learning before and after the field trip treatments. Figure 4 explains their feelings towards school, science learning and field trips after all of the field trips had been completed. The overall evaluation of the data is that, students have a positive attitude about school, learning, science and field trips.

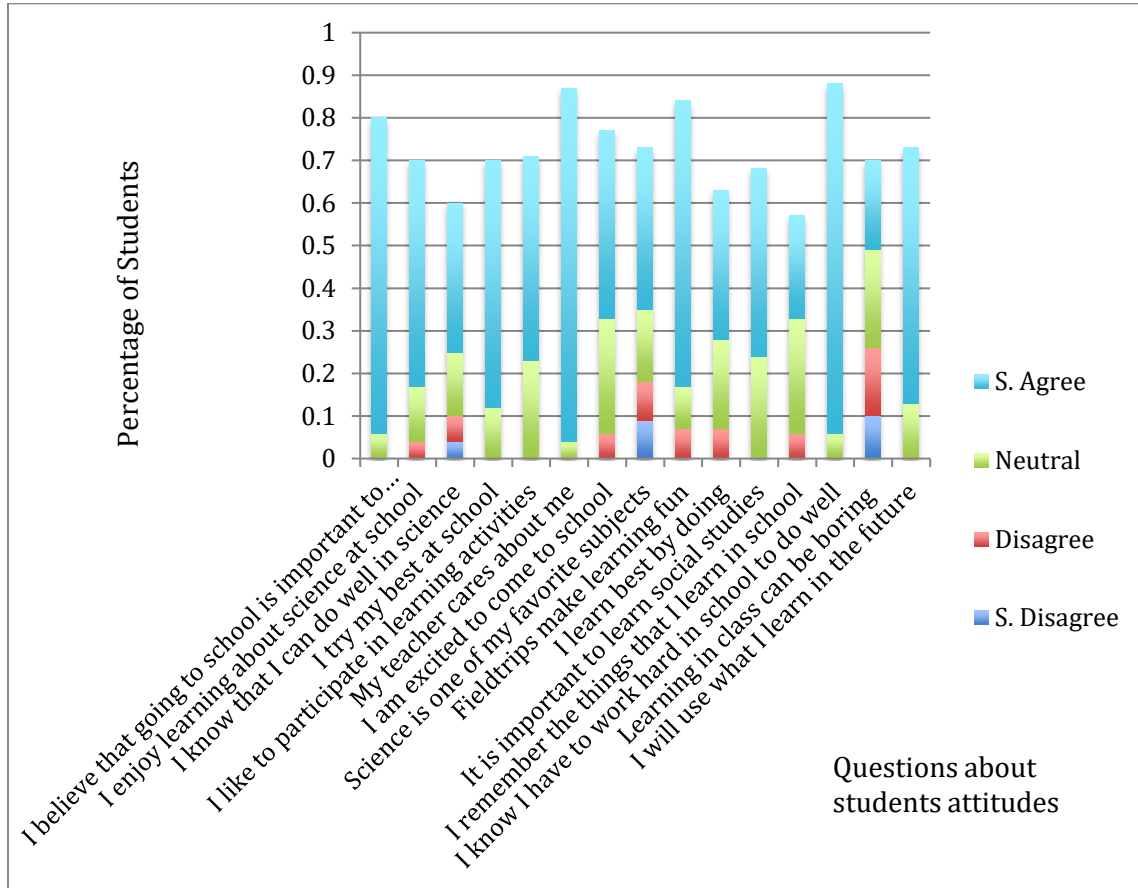


Figure 4: Stacked bar graph representing students', (N=24) attitude toward science learning after all of the treatment cycles were complete.

Students responded positively with either agree or strongly agree with over 70% of students selecting a positive response for 13 of the 15 questions. Only 1 or 2 students if any on each question selected either disagree or strongly disagree. On the field trip specific questions students answered positively more than 80% of the time.

Students responded especially positive to the questions about their school life in questions 1, 6, 13, and 15 (Figure 4). These questions had no negative responses and minimal neutral responses.

On Question 2, students were asked to rate how much they enjoyed learning about science in school. The question then prompted my students to explain their reasoning. There were many students who stated that they liked science because it was fun and four students talked about careers in science one particular student mentioned science was fun because of field trips. He said he enjoyed science because

It's not every day you see animals and cool machines but like when we go on a field trip it real fun! Sitting and listening to the teacher, it does not really help. So when we go out and like go to a factory or a beach and that's why I like it.

Although the question did not specifically ask about field trips my student was able to relate the learning that we had been doing on all of our fieldtrips to his enjoyment of science. In the initial survey there were also students who said that they did not like science because it was boring. At the end only one student still reported that science was boring, she reported that it was “not her thing”.

Students also recorded all of their thoughts and feelings through journals and interviews, Table 2 shows common themes that I found when going over the journals and interviews as well as how often students made comments about each theme and some meaningful quotes. There were six common themes that I identified during my analysis.

Table 2.

Analysis of Student Attitudes After Going on Field Trips

Themes of students attitudes toward field trip	Number of responses featuring these themes.	Sample of Student Quotations
Students loved a particular activity	24 times over the course of all of the treatments	“ I loved getting to search for bird and looking up the birds”

Students were bored during a particular activity	17 times over the course of all of the treatments	“The trip was fun but one thing that was boring was the presentation.”
Students stated that they learned something specifically related to science	32 times over the course of all of the treatments	“ The salmon game taught me about how salmon survive, it was also really fun!”
Students reported the field trip was fun/ they enjoyed it.	39 times over the course of all treatments	“ Going to the beach was my favorite field trip doing the scavenger hunt with my friends was really fun”
Students made positive comments about the staff members.	21 times over the course of all of the treatments	“ The lady at the museum answered all of my questions about coding and let me code the bee bots”
Students made positive comments about the content of the trip.	14 times over the course of all of the treatments	“ My favorite part of the trip was when we learned about coding because I love doing coding.”

The main goal of taking my students on science based field trips was that they grew in their knowledge of science concepts that aligned with Next Generation Science Standards. During the treatment process I was informally evaluating students on what they thought they were learning during each trip.

The first field trip was planned for students to learn about the environment, sustainability, native birds, salmon, and soil. One of my students said her journal response

that she “learned that many birds live by the river because that is where they get most of their food”. After playing a game about salmon survival one of my students recorded in her interview that she learned that “only about 10% of salmon come back to spawn again.”

During the field trip to the Naval Undersea Museum, students were learning about marine mammals, naval technology, and the ocean. One student mentioned in his interview that he learned about how the volcanos on the ring of fire work because of tectonic plates. The students used a scavenger hunt to direct their learning and one student remarked that because of the scavenger hunt she learned “the military use dolphins to help them locate stuff in the water.”

There were students that remarked that they learned “nothing” on the field trips but after prompting from me they were able to think of something that they learned. One of these students said who they did not learn anything on our beach field trip; was then able to tell me that “beach sand is shell, rocks, and animal bones”.

My students were a group that started the year with a fairly mutual love of learning, but I did have students that were not as excited about learning as their peers. Even these students had a good time and learned something on our field trips. One student who has expressed a general dislike of science in class, wrote in her journal that our field trip to the beach was one of the best days at school because we got to learn about ocean animals.

Although students reported generally positive feelings about each trip there were certain activities that some students did not find interesting or made negative remarks

about. Many students did not like doing the scavenger hunt at the Undersea museum stating that it did not give them the freedom to explore what they were interested in. One student wrote in her journal “ the field trip was only sort of fun because the scavenger hunt was boring.”

During their interviews students remained mainly positive about their field trip experiences. After the trip to the salmon center one of my students stated that they “ loved the salmon survival game and going bird watching but the talk in the building was not very fun because it was boring”

My journals, observational data, and reflection sheet recorded data on my efforts as a teacher. The themes that occurred most frequently were that I spend most of each field trip managing behavior and answering questions. All but two students replied to the question about my role on field trips by saying that they do not think I could do anything better. The data showed that my role on field trips was primarily as a facilitator not so much as a teacher.

On the student reflection sheet one of my students wrote that he is glad to have gone on so many field trips and learned about science this year on those trips.

INTERPRETATIONS AND CONCLUSIONS

At the start of this project I set out to find evidence that taking students on field trips is not only beneficial to their learning, but also their attitudes toward school. After the treatment process I was able to confirm that my students made sizable gains in test scores after each field trip and students reflected that they generally enjoyed the time that

was spent on each field trip. The treatment process also gave me the opportunity to reflect on my teaching practices for the better.

Over the course of the treatment students grew in their knowledge of science concepts after going in science-based field trips. Students grew an average of 13% during the first field trip test, 20% on their second field trip tests, and 21% for the third field trip. The upward gains that were made by all students can be seen in Figures 1, 2, and 3. Students were also able to verbalize their learning in their field trip journals and interviews.

My students were mostly aware of their learning throughout the process of the treatments and they were able to easily verbalize or dictate their learning through their journal and interview responses. A quote that sticks out from the group was written as an answer in my student's final reflection. This student said "I learned something on every field trip but I still remember learning about how salmon survived from our trip to the Salmon Center." That reflection was great to read because so often students don't recognize that they are learning or do not retain information over a period of time.

I can see that every time we go on a field trip that my students are bubbling with excitement. They are engaged in the content and when the facilitators or myself ask questions many hands are up in the air. From the data that I have gathered I saw an improvement on all test scores from the pre to the post-test and many students were able to retain what they learned on the extended post-tests. This suggests positive correlation between what they learn on their field trip to their learning in the class.

From the student interview questions and by talking to my students in general they are learning and loving going on these field trips. Every time we go they come back and say “When is the next field trip Miss Machin?” I believe that field trips are having a positive effect on my students attitudes toward schools, they are giving my students opportunities to bond with one another, opportunities for meaning making, and an opportunity to see the real world applications or the “why” of their learning.

The bonding aspect of field trips turned out to be very important to my students. Students enjoyed working with their group members and classmates. In their journals and interview responses 23 students mentioned working with their peers or getting to spend time with their peers was something that made the field trip experience fun for them.

One of the questions that was asked of students after each field trip was what would they change and after each trip there were students who would write “nothing.” I prompted these students to explain why they believed there was nothing that could be changed and one student stated that he wrote nothing “the field trip was so fun I cannot think of anything that could have made it better.” It was nice to see the students think that way even though on the bus ride home from every trip I was analyzing all of the things that I would have done differently.

I learned a great deal from my students and the experiences that they were going on. One thing that I have learned from this is I get a deeper understanding of the way that each of my students learn differently. When we go on trips there are the students who like to read and go slowly and look at everything, there are the students who love to touch and do instead of read or listen, there are the students who really like the experience being

narrated for them. I have also learned about what makes a successful field trip and what makes a field trip less successful.

There were many popular activities that my students participated in during each field trips, and I know that if the students are engaged in the activity then they will be more open to learning. In Table 2 I recorded 24 times that students remarked about a certain activity that they really liked. The most popular activities were when they got do something hands-on with their peers. One activity that got mentioned a lot was when we went bird watching at the Salmon Center. Students said that they enjoyed working with their friends and being able to learn about all of the different birds located in that habitat. Another really popular activity was our scavenger hunt at the beach. One student said she enjoyed it because they “were able to do this activity without help and could find out things for themselves” I will be able to use this information with future students when planning trips for them.

There was one activity on one trip that had more than a few negative remarks about it. On our trip to the Naval Undersea Museum the museum asked that we use a scavenger hunt to direct students learning throughout the museum. The scavenger hunt had 24 questions on it and took a long time to finish. I ended up telling chaperones just to do odd and even questions and then we could share information at the end because I saw that it was too much for the students. One student wrote that they hated the scavenger hunt because they didn’t have enough time to learn about what they wanted too.

Having all of the student feedback after every trip is an excellent tool that I can use in the future. What I learned is that it is important to think about individual students

and their likes and dislikes just as you would in classroom structures. Although there were 17 negative remarks about different activities (Table 2) there were positive remarks made about those same activities from different students. I believe that is the most important thing that I learned from being the teacher during this process is that field trips are not a one size fits all activity.

VALUE

From this process I was able to discern for myself that field trips can be a meaningful engaging practice that is not only fun for the students, but is also a helpful instructional tool. Field trips gave my students learning experiences that they might not otherwise have had. I want to help other teachers feel comfortable and motivated to take their students on the same type of experiences.

I am so excited to share what I have learned during this process with my peers. I not only want to redesign my teaching process, but also to help my fellow co-workers plan meaningful field trips for their students. With the data that I have collected on the growth that my students made with the field trips, I will be able to convince reluctant teachers to take their students on field trips. I know that 20% average test score growth for my class is a fair amount to be gained in just one day on a field trip. I will be showing the growth in conceptual knowledge to my colleagues and peers.

I also would like to use my knowledge to help my colleagues and myself plan field excursions that are designed for students to have a great time and learn as much as they can. I will use the data that I gathered to demonstrate the activities that helped the students learn and that the students enjoyed the most.

The next steps are to continue to go through the trial and error of planning field trips and taking students on them so that I can enhance future field. One of the important ideas that I discovered was that a well-planned field trip is more successful. Students also learn the most when activities are well designed and filled with hands on activities.

I would like to be able to build the field trips that I take students on right into the curriculum that we are using, for example if we are studying landforms I could plan a field trip to a national or state park that has a variety of landform types. The reasoning for this structure is so that students are getting those concrete learning experiences to tie back into the content that we are learning in class. The amount of conceptual knowledge that students were able to retain makes taking the time to take my students on field trips worthwhile. It is something that I believe is invaluable to my students and something that I will continue to use in my teaching indefinitely.

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APPENDICES

APPENDIX A
IRB EXEMPTION



INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
FWA 00000165

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MEMORANDUM

TO: Jena Machin and Walt Woolbaugh
FROM: Mark Quinn *Mark Quinn*
 Chair, Institutional Review Board for the Protection of Human Subjects
DATE: November 28, 2017
RE: "Learning Through Field Experiences" [JM112817-EX]

The above research, described in your submission of November 28, 2017, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

- ☒ (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- ☒ (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.
- ☐ (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
- ☐ (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.
- ☐ (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.
- ☐ (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.

APPENDIX B
STUDENT INTERVIEW QUESTION

Spoken Verbally: Participation in this interview is voluntary and it will not affect your grade in any way if you participate or not.

1. What is something that you enjoyed learning on the field trip to _____?
2. Why did you enjoy or not enjoy the field trip? Explain?
3. Do you think that we should take next year's fourth graders on the same trip why or why not?
4. What was something you learned that you felt will help you in your future learning?
5. How confident are you in learning science or social studies after this field trip? Explain?

APPENDIX C

SALMON CENTER PRE AND POST ASSESSMENT

Participation in the assessment is voluntary and will not affect your academic standing

1. _____ properties include color, size of particles, amount of nutrients, and ability to retain water.
 - A. Rock
 - B. Mineral
 - C. Soil
 - D. Organism
 - .

2. Which type of soil would retain the most water?
 - A. Sand
 - B. Silt
 - C. Loam
 - D. Clay

4. What type of soil would Chris use if he wants to grow a plant that needs a lot of water?
 - A. Sandy soil
 - B. Dark soil that has clay in it
 - C. Rocky soil made of pebbles
 - D. Salty soil made of silt

5. Why is fertile soil the best soil for growing crops?
 - A. It is lighter in color and can absorb more sunlight
 - B. It has more freshwater
 - C. It has more salt water
 - D. It is rich with minerals and matter from dead organism

6. A Clam is a _____
 - A. Mammal
 - B. Fish
 - C. Shellfish

- D. Bird

7. Clams live

- A. In the ocean
- B. In the ground
- C. In a tree
- D. In a bush

8. A survey asks

- A. Questions about How Many
- B. Questions about animals
- C. Questions about math
- D. Questions about soil

9. What does the word monitoring mean

- A. Keeping track of
- B. Finding
- C. Gathering
- D. Searching

10. List three places where you would find a bird?

11.

What does the word sustainability mean ?

12. Which of the following is a natural resource?

- A. Water
- B. Grass
- C. Birds
- D. Cake

APPENDIX D

NAVAL UNDERSEA MUSEUM POST QUIZ

Participation in the assessment is voluntary and will not affect your academic standing

1. Ocean water has a high salt content. Which term is used to describe the amount of salt dissolved in water?
 - A. Heat Capacity
 - B. Pressure
 - C. Density
 - D. Salinity
2. If an object is more dense than water it will _____
 - A. Sink
 - B. Rise
 - C. Heat up
 - D. Spin
3. Name 4 of the Earth's Oceans

4. As you go deeper into the ocean what happens to the pressure?
 - A. It disappears
 - B. It decreases
 - C. It increases
 - D. Nothing Happens
5. Which two marine mammals does the Navy use to help them complete undersea missions?
6. What is one job that marine mammals help navy sailors complete?
7. Which of the following was a reason for early sea exploration
 - Searching for treasure
 - Looking at sea animals
 - Finding the bottom of the ocean
 - To help develop equipment
8. What is one similarity between a spacecraft and a submarine?
9. What instrument helps divers stay underwater for a long time?
10. How does a torpedo stay straight as it shoots through the ocean?
11. What is one use of ROV's (Remotely Operated Vehicles) that the navy uses?

APPENDIX E

BEACH FIELD TRIP PRE AND POST QUIZ

Participation in the assessment is voluntary and will not affect your academic standing

1. What is an estuary?
 - A. A bird sanctuary
 - B. A body of water where fresh water and salt water meet
 - C. A rocky cliff
 - D. A sandy beach
2. Explain how the ocean water helps to create the sand at a beach?
3. Why might a seagull choose the beach for his habitat?
4. How are waves created at the beach?
5. Which of the following places would you be most likely to find a moon snail?
 - A. In the ocean water
 - B. On the sand bar of the beach
 - C. In the woods next to the beach
 - D. In an estuary
6. Which of the following is an example of Erosion?
 - A. Sand at the beach
 - B. Rocks at the beach
 - C. Cliffs near the beach
 - D. Plants at the beach
7. Explain why some animals are better suited for the ocean than the forest or estuary?
8. Which body of water would we NOT find near the beach?
 - A. Ocean
 - B. River
 - C. Estuary
 - D. Lake

9. List 5 Animals that make the ocean there home?

10. Why is the ocean a suitable home for the animals listed above?

APPENDIX F
STUDENT ATTITUDE SURVEY

Participation in this survey is voluntary and your participation will not affect your academic standing

1. I believe that going to school is important to my future

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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2. I enjoy learning about science at school

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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Why do you feel this way?

3. I know that I can do well in science

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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4. I try my best at school

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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5. I like to participate in learning activities

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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6. My teachers cares about me.

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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7. I am excited to come to school

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
-------------------	----------	---------	-------	----------------

8. Science is one of my favorite subject.

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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9. Fieldtrips make learning fun

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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10. I learn best by doing

Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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11. It is important to learn social studies				
Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
12. I remember what I learn in school				
Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
13. I know I have to work hard in school to do well				
Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
14. Learning in class can be boring				
Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
15. What I learn in school is useful to my future.				
Strongly Disagree	Disagree	Neither	Agree	Strongly Agree

APPENDIX G
OBSERVATIONAL FIELD NOTE RECORDING SHEET

Student/ Teacher Observations	Tally	Notes
Student raises hand		
Student asks on topic question		
Student records information in journal		
Student actively participates in proposed activity		
Students answer teacher guided questions		
Students follow teacher/facilitators directions		
Students say something positive about the experience		
Students say something negative about the experience		

APPENDIX H
STUDENT REFLECTION SHEET

**Participation in this reflection is voluntary and will not affect your standing in class
in any way**

1. What are three things that you learned on the field trips that we went on this year?
2. Which field trip did you learn the most on and why?
3. Do you feel that going on field trips was helpful to learning about science this year? Why or why not please explain?
4. Explain one way that going on field trips helped you as a scientist.
5. How could I have helped you learn more during these field trips?