MARINE SCIENCE INTERTIDAL FIELD TRIPS
IMPACT ON STUDENTS
OVERALL LEARNING EXPERIENCE

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1. Introduction

The following sections will introduce myself as the teacher researcher in a large urban high school setting in Hawaii. The introduction will also review research on similar field trip projects as well as the educational theories that support the use of field trips in the curriculum. Following the review of research, the purpose and rationale of my study will be explained in detail.

1.1 Background

Three years ago I made a great professional development choice when I became involved with the GK-12 Fellows at the University of Hawaii. The GK-12 Fellows are scientists who partner with kindergarten through high school teachers to promote scientific research in the schools. It is a national program that is funded by the National Science Foundation. My partnership with this organization started with a mass email sent to members of the Hawaii Science Teachers Association. Science teachers were needed to work on a shark project at Coconut Island. I thought to myself, “What a neat experience for myself and the students,” and quickly responded to that email. Little did I know that this simple email would become one of the greatest professional development decisions in my career.

The goal of that GK-12 Fellows program was to teach kindergarten though high school students how to study science by incorporating students into the Fellow’s scientific research through hands-on field experiences. As a beginning teacher in the public schools, I was new to the profession and wanted to learn more about current science technologies. I had just been certified as a teacher and was starting my second year at a large urban high
school. My belief as a teacher was that science should not be taught straight from a text, but instead be made relevant and incorporate hands-on experiences. I saw the GK-12 program as a unique opportunity to expose students to a real and current scientific investigation as I gained valuable professional development for myself.

The Fellow’s research at Coconut Island involved investigating the growth of hammerhead shark pups in the Kaneohe Bay ecosystem. Students fed the sharks and collected growth data twice a week and benefited from a class visit by the scientist every other week. Having a science background, but no real lab work experience, I relished the opportunity to learn more about current investigative trends and on-site scientific methods. That year of Coconut Island field trips, data collection, and class visits by the shark scientist fueled my burgeoning interest in field study. The partnership with the GK-12 Fellow also led me to another scientist who needed a teacher partner, and during the second semester my students and I worked on an intertidal project (OPIHI – Our Project in Hawaii’s Intertidal) which investigated the biodiversity of our shorelines. I have incorporated this intertidal project into my marine science curriculum to build and develop student understanding and motivation in science class. This curriculum is the focus of the study and includes in-school and extra weekend field trips to collect data in Hawaii’s intertidal zone.

Through this University partnership, my high school students were taken into the field and worked alongside scientists conducting research using scientific tools and methods. Overall it was a busy, but fantastic, year for both the students and myself. I saw motivated students who were excited in class and had an enthusiasm for learning. I continued with the partnership for two more years, seeing positive student behaviors and
hearing positive feedback from students and outside observers. Despite this, I continued to wonder if the field trips were meaningful “learning experiences” that helped students to understand the content better.

Personally, I realized that I had learned a tremendous amount from the experience. I discovered how “real” science experiments are carried out in the marine environment as opposed to in-class experiments with expected, almost scripted, outcomes. I became confident in the use of field materials and following detailed experimental methods as I worked side by side with the scientists. Through these activities I learned specific facts about the marine environment through application. To this day, it still surprises me at how much information I retained through the fieldwork and discussions with the scientists. Now when I head to the ocean I’m able to classify and identify living organisms without the aid of a textbook, and use the methods of science and discovery intuitively and naturally. But, as I did my own personal reflections through the years of this project, I still wondered if the students were sharing the same unique learning experiences and growth as I was.

These observations and questions led me to my present study on the affect of these intertidal field trips on my high school students. Because I was part of an educational environment governed by reform, restructuring, and high-stakes testing, I felt that it was important for me to document the affects of these trips on students. I had to become accountable for my curricular decisions and also be able to justify future field trips. These field trips take many hours of planning and many more hours of student preparation. In addition to the time spent, money is needed to fund equipment purchases and charter buses. Although the equipment used during this project was purchased through the GK-12 Fellowship with National Science Foundation funds, sustaining such a program would
require school funds. Schools must now justify all expenses according to student learning and achievement, so studying the affect of these field trips on the students needed to be done in order to justify the time, money, and energy spent by the school and the teacher.

1.2 Research on Field Trips

This literature review describes how teachers in a variety of classroom settings have used field trips. The following sections organize the literature review into five categories: educational theories that support the use of field trips in the curriculum, research done on similar field trips in curricula similar to my marine science field trips, suggestions for planning field trips, intertidal field trip study, and other apprenticeship programs.

Constructivist Theory and the Learning Environment

As a type of learning experience, field trips can be described as constructivist in nature. Learning and the environment are two of the important factors in the constructivist learning theory. John Dewey believed that knowledge stems from a personal interaction between the learner and the external environment. He acknowledged that learning is an active process that needs to have students solving problems that are of interest to them (Llewellyn, 2005). Jean Piaget recognized that knowledge is not a collection of facts waiting to be discovered, but is a result of interaction between the learner and the people or objects within the social and physical environment. A student develops patterns of reasoning only by having experiences that allow or stimulate thinking (Bybee & Sul, 1982).

Piaget also recognized that children learn through equilibration. This describes the situation when a child encounters situations and objects with which they are unfamiliar and
must resolve the situation. Learning through equilibration requires that a student is actively thinking about what they are doing and in situations that are engaging. Thus, they can transition from the hands-on concrete to a more complex thinking, the formal operations (Llewellyn, 2005). Based on Piaget’s work, hands-on labs and field trips are recommended to provide students experiences that help them transition to more abstract thoughts (Bybee & Sunl, 1982).

Apart from the physical environment, the social environment is also an important part of constructivist theory. Lev Vygostky added another aspect to the theory as he emphasized the importance of social interaction between the learner and peers. An important part of social learning is providing the opportunity for students to interact with adults and peers in cooperative settings and to learn through imitating and modeling (Vygotsky, 1978). Bandura (1974) also recognized that people do not function in isolation, instead they observe the behaviors of others to motivate and inform future actions. Cognitive constructivist theory describes learning as being triggered by experiences that can be physical, mental, or social. Physical experiences involve interaction with the environment, mental experiences involve thinking about things students have observed, and social experiences involve interactions with adults and peers (Palmer, 2005).

Research on Field Trips within the Curriculum

The following research describes how field trips have been used in curriculum as both physical and virtual excursions. Braund and Reiss (2006) examine how out-of-school contexts can contribute to student learning in science. They concluded that authentic school science should provide experiences that are more in line with the sorts of activities that
scientists and technologists do in the real world of science. Authentic science should be more student directed with open inquiry. Their study concluded that laboratory-based science needs to be complemented by out-of-school science learning that draws on the actual world, the present world, and the virtual words that are available through technologies.

The virtual environment has been explored as another learning environment and a possible replacement to physical field trips. Garner and Gallo (2005) compared physical and virtual field trips and their effect on undergraduate non-science students. Their study found no significant differences in achievement and attitudes, implying that both field trips promote learning. A previous study conducted by Spicer and Stratford (2001) on zoology undergraduate students found that nearly all students insisted that virtual field trips should not replace real field trips, but could be most effective in preparing for, or revising after, a real field trip.

Studies by Braund and Reiss (2006) and Spicer and Stratford (2001) compared the physical and virtual field trip environments and focused on a population of college students and additional research on physical field trips note their positive influence on learning on K-12 students. Field trips that offer hands-on experiences gave students a better understanding of the subject matter and help maintain their interest during the educational excursion (Pace & Tesi, 2004). These field trips were found beneficial because they teach students in a variety of settings outside of school grounds and provide valuable additional exposure to careers and cultural activities.
Suggestions for the Planning of Field Trips

Field trips were found to be the most successful when incorporated throughout a curriculum or unit because there is greater opportunity for supporting student understanding at different stages in their learning (Kisiel, 2006). When planning field trip-based units, it is necessary to plan relevant and interesting activities before, during, and after to encourage students to hypothesize, compare, analyze, synthesize, create, and reflect on their experience (McLouglin, 2004). Students can be actively engaged in their field experience through activities that foster ownership, ensure student readiness by pre-trip activities, and work to include students in the evaluation of the trip (McLoughlin, 2004). Hurley’s (2006) study on using a weeklong field trip to Yellowstone National Park demonstrates how these outdoor field trips can provide cognitive learning experience for high-level science learning. Hurley highlighted how the field trips moved through the levels of Bloom’s level of cognitive learning with the higher levels of application, analysis, synthesis, and evaluation occurring after the field trip through post-trip activities.

Although past studies highlighted how field trips can be used in the curriculum, the research does not describe in detail the effect the experiences has on a population of students that are similar to the students that I teach. The studies focused on undergraduate college students and not struggling high school students.

Intertidal Study: The OPIHI (Our Project in Hawaii's Intertidal) Project

The intertidal field trips in which my students participated were in partnership with a statewide program organized by the GK-12 Program. Many other Hawaii public and
private schools have participated in this program. One of those school’s involvement was studied and results were presented in a research paper.

According to Baumgartner (2004), the OPIHI program allows teachers and students to participate in “authentic experiences to develop a true understanding of scientific process including the context of a local experiences that students can then analyze and apply to larger global ideas.” The goal of the GK-12 Program is to help teachers and students experience project-based field work and scientific inquiry outside of the class through a cooperative effort with scientists in the field. Through the GK-12 program (funded by the National Science Foundation), scientists at the university are able to share their knowledge with students and teachers in an inquiry-based format.

The OPIHI project curriculum includes materials for data collection including transects, quadrats, species identification cards, site-specific data sheets, and reference books. Over the years, the project has also developed lessons for teaching sampling methods to the curriculum to students. Classes that participate in the project are adding their data to previous years data that has just recently been validated and put into a database. The goal of the data is to create a monitoring system for Hawaii’s intertidal area, a previously ignored and understudied environment that is rich in species and biodiversity.

According to Baumgartner (2004), students’ self-reported content knowledge increased significantly on a concept inventory survey method after the year-long unit and data collection in the intertidal. Students’ concept knowledge about taxonomic groups developed in sophistication following the field research. Additional qualitative observations and case students on individual students signified a positive learning experience. The study by Baumgartner, highlighted the project at the University
Laboratory School in Hawaii, a school community that differs greatly from the population in this study. It also used self-studies to look at concept understanding rather than a summative assessment to look at the student understanding of specific marine science topics.

Other Apprenticeship Programs

Abraham (2002) evaluated a field-based research apprenticeship program that partners the scientists with secondary students and teachers to determine what effects the apprenticeship model had on its participants. The population comprised of “seventy to seventy-five high school students who have been nominated by their high school teachers and who have expressed a strong interest in pre-collegiate science education.” Abraham’s population of students differs greatly from my population of students reported in this study, half of whom have experienced failure in a science course and are struggling to graduate and aren’t thinking about education after high school.

Based on the open-ended responses from Abraham’s (2002) evaluation survey, common themes arose. Students reported an increased interest in pursing a science-related major in college or a career in science. Students would more likely participate in a future science-related project as a volunteer and many showed a positive shift towards science. They reported that the “opportunity to be engaged in authentic research was pivotal to this shift in attitude. The fact that the data they collected or the observation they made were going to be used to inform original research had a tremendous impact.” This indicates that through the program there was a positive attitude shift.
Previous research has chosen student populations that are very different from my own. Unlike the students in Abraham’s study (2002), my students would not be “nominated by their teacher” to participate in science field trips, instead many of them are in the class because they have failed other science courses and are in need of their third science credit for graduation. The research has shown growth in learning and positive changes in attitude towards science that I believe all populations of students should experience, not just the selected few.

1.3 Research Questions

My project investigated how intertidal field trips incorporated into my marine science curriculum impacted my students’ overall learning experiences. The project spanned a semester of instruction and required the use of varying forms of data collection to highlight the affect the field trips have on the students. This project had many components with the related sub-questions: How do optional Saturday intertidal field trips affect students? How does the number of field trips attended affect student understanding of science concepts (assessed through an exam and lab report)? What are the student’s perspectives towards the field trips?

According to the research, constructivist theories support how field trips can be the active learning experience that students need in order to learn abstract science concepts. Other researchers have shown that field trips have a positive influence on learning and that if planned appropriately can provide a high level learning experience. However, the research reported used students from colleges or those who were already highly motivated.
My research had my students working on an intertidal project that required them to become scientists and collect data in the field. The data was subsequently used for their own authentic experiments. Data was collected through student surveys, concept assessments, field and in-class observation, and student work samples throughout the semester, focusing on the two planned class field trips and optional Saturday field trips. Data was analyzed and trends were described so that an overall picture of the affect of these field trips on the students’ learning experience can be understood.

1.4 Purpose

With all the mandates placed on schools and federal requirements from NCLB (No Child Left Behind), student learning is the center of curriculum decisions, funding, and under increasing scrutiny in the public arena. Schools need to identify the strategies that work best for their students so that understanding takes place and national mandates are met. Finding a strategy to help at-risk students understand science concepts is challenging, so I was hoping that my research would shed light on how common field trips can be used to promote science in and out of the classroom. Another motivation to my doing this study was to practice being a reflective teacher who looked closely at my curriculum and continually improved in my profession.

2. The Study

The students in my school and study are thought to be among the most challenging group of students in our educational system. They have a harder time reaching their
educational goals and often struggle to find success in the classroom. These students are the important factor that separate this study from others and so will be described in detail in the following section.

2.1 Student Population - Participants

Previous studies on field trips and similar field experiences involved student populations unlike my students. Farrington High School is a Title One school in a community that includes five federal housing projects and over 46,000 residences, with a percentage of families receiving public assistance (17.1%) higher than the state average of 11.2% (2004-2005 School Status and Improvement Report). Our community is predominantly made up of lower socio-economic families of diverse ethnic backgrounds and a small number of middle-class families.

Farrington students are not meeting the state expectations on the Hawaii State Assessments, with 50% meeting or exceeding proficiency in reading and only 15% meeting or exceeding proficiency in math; current Hawaii targets are 58% proficiency in reading and 15% in math (Hawaii Department of Education: Reading and Mathematics Assessment Results, Spring 2007). Farrington's enrollment is approximately 2500 students, the largest student and staff population of any high school in Hawaii. The three largest ethnic groups are (59.6%) Filipino, (13.6%) Samoan, (9.7%) part Hawaiian (Farrington High School Registrar – Mac School). Farrington has 54.8% of the school qualified as “disadvantaged status” (receive free, reduced, or certified lunch) and 17.1% of students qualify as English Language Learners compared to 8.2% in similar schools in our state.
Both of my marine science classes were heterogeneous and represent the diversity of learners and challenges that the school faces. A majority of my students had struggled in previous science courses and throughout their school years in general. I believed that this population of students needed active and relevant experiences to help them learn difficult and seemingly abstract scientific concepts. Many of my students had already failed a science course and exhibited a limited understanding of science concepts. They arrived from many different backgrounds and struggled with motivational issues and personal problems. Throughout my five years at Farrington I have worked to find curriculum that is hands-on and provided meaningful relevant learning experiences that helped to motivate these, often passive, learners. This quest led me to the regular use of field experiences in my curriculum.

2.2 Marine Science Curriculum

The following section highlights the curriculum used throughout the research period. The curriculum is based on my philosophy of teaching and follows constructivist theories highlighted in the research.

Field experiences were used to create a unique learning environment for students. I wanted them to assimilate learned information through experiences to help them make further connections to science concepts. These common class experiences were built upon and prepared for during the semester.

The field trip planning process started at the beginning of the school year due to the paperwork and logistical preparations that needed to take place. The intertidal field trips required careful analyses of Hawaii’s tides (ideally students would explore the intertidal
ecosystem at the lowest tides and arrive as the tide is retreating so that marine organisms are revealed during their visit). The natural tides of the year needed to be matched with bell and bus schedules to ensure that students were not missing any necessary classes and would be returning for lunch or near a break period.

Once the best dates and tides were chosen, the school’s calendar was checked so that there was no overlap with school events, testing, or meetings. When all the dates seemed logistically possible, the school’s field trip procedures were then followed with paperwork completed and parent and teacher consent forms sent home to be signed. Buses were reserved for the four school days and requests were made for colleagues to cover a few class periods that would be missed while I took the other class on the field trips.

(Appendix – include all school and teacher generated forms)

Both of my marine science classes were instructed in the same format, focusing on developing the scientific literacy skills and providing practice for their Hawaii invertebrate investigation that would be done during the field trips in the intertidal. The invertebrate investigation required students to generate their own purpose for their experiment and create a testable hypothesis. The intertidal field trips allowed them the opportunity to collect their data for their experiment.

The first quarter of instruction (in a two quarter course) focused on Hawaii State Science standards for Earth Science and also addressed biological standards of fish evolution, natural selection, and adaptations that led students into the more in-depth study of the intertidal ecosystem. The second quarter of instruction used invertebrates to explore and apply knowledge of classification and included two trips (per class) to the intertidal.

The two field trips per class were designed and conducted as an integral part of the
curriculum. The purpose of the first trip was to acquaint the students with the environment and scientific methods, providing enough time for them to prepare for their second trip and field investigation.

The field trips provided students with opportunities to elaborate on their learning in class about scientific concepts. They recorded data and observations, then drew conclusions from the evidence that they collected. Field trips were purposefully not planned as a one time event; instead, they were incorporated into a quarter-long unit with time for careful preparation and meaningful reflection.

These factors, along with the preparatory in-class instruction, helped to reduce the “novelty space” that Orion & Hofstein (1991) found to have a significant influence on the learning abilities of students. “Novelty space” refers to the effect of “novelty” on students’ ability to benefit from field trips. Orion & Hofstein (1991) found that when students are familiar with the field trip location, they concentrate better on the learning assignments rather than exploring the physical surrounding. In my project the exploration of the environment occurred during the first field trip, so that the students could focus on their research question during the second trip.

The first trip followed the methods from the OPIHI project (Baumgartner & Zabin, 2006) and provided students with the opportunity to practice their data collection methods (point-intercept method using a transect and percent-cover estimate method using a transect and quadrat) and time to collect preliminary data (on the biodiversity at the Sand Island intertidal site) from which they formulated their experimental questions. In class, students developed their materials, methods, and plan for their second field trip. They first had to ask a question that could be tested in the field, then discussed with their group the methods
that they would use to test their hypothesis. Each group was responsible for creating their methods, drawing their field data sheet, and gathering all materials prior to the trip. During the second field trip students collected their data. Each group did something different and followed their agreed-upon methodology.

After the second field trip, students analyzed their data and wrote up their conclusions and analyses to share with the rest of the class. In-class instruction throughout the second quarter applied the intertidal theme and students’ familiarity with intertidal organisms to help them understand the broader concept of ecology. These hands-on labs and experiences helped students prepare for the field experiences and were unique and important learning opportunities in themselves. Students practiced with the physical objects in class and applied learning in the field.

Throughout the year and especially during the field trips, students worked with peers and groups to ask their questions, set the experimental procedures, collect the data in the field, and analyze it in class. Thus, the social aspect of the constructivist teaching methods was also addressed throughout the implementation of the curriculum.

3. Methodology – Data Analysis

This research was done in two parts to coordinate with the two teaching quarters in a semester course. During the first quarter, the data collected focused on the preparation and planning prior to taking field trips. The second quarter focused on the observations made during the field trips and assessments of learning and field trip reflections. The methodology used is described in the following section and will be revisited with the data and analysis portions later in the paper.
3.1 Student surveys

My goal during this stage of the study was to gain an understanding of the students I would be working with throughout the semester. I was interested in their past educational experiences, motivation, understanding of science concepts, and perceptions of field trips. This information was collected through open-ended questions and survey questions.

I started to collect information from my students on the first day of class. Students completed a “Student Background Information” sheet that had three parts: demographic information, student survey: rating on personal beliefs in likert format, and open-ended questions. (See Appendix)

Students were allotted 15 minutes to answer the open-ended questions:

1. Who are you? (Tell me about yourself)
2. How can I teach you better?
3. How do you feel about science? (Past experiences)

I collected the students’ sheets, adding in demographic information (collected from the students on that same informational sheet) into my computer for future contact information, and read through student responses immediately so that I had a better idea of what my target group was like. I was interested in specific questions on the survey and focused on those questions in my analysis. Listed below are select questions from the survey followed by my reasoning behind choosing each survey item.

- Have you failed a science class before?
Provided me with an idea about my students past learning experiences in science

• I try hard to do well in school.
  • Told me about how students view school in general.

• I take care of the environment.
  • One of the main reasons I teach marine sciences is to help students realize their role in the environment, so this question revealed their thoughts about the environment before they take the course.

• I can solve science problems.
  • Provided insight into how students perceive their science understanding.

• I do my part when working in a group.
  • Students are expected to work in groups throughout the semester, so knowing how they thought about group work situations helped me to plan better.

• Having a science career would be interesting.
  • This question offered me insight into how students view science in general.

Responses to these Likert scale questions were calculated with percentages. Open-ended questions were coded for their responses with major themes being shown.

3.2 Introductory Student Field Trip Survey

After the in-class preparation and before the first field trips, I was still unsure about how students were feeling toward future class field experiences and I administered a Likert scale survey (with space for explanation) to students on their perceptions of field trips.

Throughout the first term I continually acknowledged the intertidal ecosystem in discussion
hoping that it would help to encourage student curiosity and keep them excited and
anticipating the following quarter. However, informal surveys of students did not give me a
clear idea of their perceptions, so I wanted to get honest written feedback. Students were
encouraged to be honest and were reassured that in no way would their responses affect
their grade in the course. Surveys were coded for themes.

3.3 Introductory Saturday Field Trip

I wanted to provide opportunities for students to participate in extra field
experiences. Saturday field trips were offered and they fit well with a colleague’s on-going
partnership with a community effort to restore an offshore island called Mokauea.
Throughout this school year Farrington students from the marine science and biology
classes, as well as Science Club members, worked one Saturday each month to help with
the restoration. The focus was to clear invasive species and create a garden for native
species that will be used as nursery for future efforts to restore the rest of the island.
Previous students also explored the intertidal mud flats on the island recording species of
invertebrates, fish, and algae. This semester students had the opportunity to practice
scientific methods that they used in the class field trips on Saturdays at Mokauea Island.

The opportunity was offered to both of my marine science classes. Students who
attended the field trip did a reflection upon return. Their reflections were collected and
analyzed for common themes. Field trip reflections were prompted to be about “learning,
feelings, recommendations, and questions” based on their Saturday experience.
The Experience

During the in-school field trips, special attention was given to and extra effort was made to record detailed teacher observations and collect student assessments. These assessments included teacher journals and reflections, student journals and surveys, exams, and their final project lab reports.

3.4 Teacher Journals and Observations

The teacher reflective journal from the first semester was continued and carried on throughout the second semester during field trips and class instruction. The teacher journals were based on observations of students and included wonderings and questions about the day’s events or teaching and students in general. Journals were word-processed and there was no limit on length or topic. Journals were completed at varying times during the school day (whenever I had an opportunity to sit at my desk and gather my thoughts). Most reflections were done the following morning when I had a clear and more focused mindset. However, if a critical event (something that stands out) occurred during the day, I would try to make it a point to type a brief summary of the incident. Teacher reflective journals were analyzed by looking for themes in the writing.

The journals for the first quarter focused on the student population and the gathering of information on the students who would be participating in the field trips. Journals for the second quarter focused on the students and curriculum implementation for that day (that focused on their intertidal field work project).

The day after each field trip, I typed detailed observations about the previous day’s activities. The reason why this reflective journal was not done the same day as the trip was
due to my fatigue after a day in the sun working with the students. Although I knew that my thoughts would be fresher the day of the trip, I felt that my reflection and writing would be more accurate if I had a day’s rest to recover. When writing these field trip reflections, I would first start with a chronological reflection on the activities, then move to the big picture of what had occurred. I also reflected on pursuant class discussions and included more detailed observations that I had made during the field trip.

3.5 Student Assessments

Throughout the project students were assessed using both formative and summative methods. As they learned techniques and worked with each other, observations were made and class discussions helped students understand the field trip methodology. Practice data collections were done in class and used as a formative assessment to see what additional lessons needed to be done to help them better understand the science concepts. I also collected student journal reflections and surveys to view students’ understandings and thoughts on concepts and used tests, quizzes, and lab reports as summative assessments to look at their science understanding.

3.5.1 Student Journals

Daily student journals were a routine throughout the entire semester of the course. The class started with two questions as prompts and students had 10 minutes to answer the questions thoughtfully in their science journal. The journal questions were based on past learning reflections or in preparation for future activities. Student journals were collected every week and responses, comments, and grades were given regularly. Journals also
included lab work and observations that were done throughout the year. Although every journal was read carefully, for this study journals on the field trips were copied and analyzed further. Every Friday was a class learning reflection, and on the days after a field trip, students reflected on their experience. These journals were coded for similar reoccurring themes.

The last journal was a Likert scale survey for the students to complete based on their experiences in the class. The survey was anonymous and included five questions, with the first asking "how many intertidal field trips have you been on?" Then every student needed to answer and write comments for the following questions. Answers were either strongly disagree (1), disagree (2), agree (3), and strongly agree (4).

- The intertidal field trips helped me to learn marine science concepts.
- The intertidal field trips helped me to understand the scientific method.
- The intertidal field trips were important to my learning in the class.
- Field experiences like the intertidal field trips should be a part of science classes.

3.5.2 Final Exam

Throughout the project, summative assessments checked student understanding of science concepts. Quizzes were administered and a final exam was given to all students at the end of the semester. This final exam was the same as the pre-test students had taken during the second day of instruction. The final exam included multiple-choice questions that covered topics from the Hawaii State Standards in Biology and Earth Science that it into the Marine Science context. Students’ scores were analyzed and compared to their
pre-test scores. Scores from students that did not go on any field trips were compared to those that went on one, two, and those that also participated in the extra Saturday trips.

3.5.3 Lab Report

Another assessment of student understanding was made based on their final lab reports of their field experiments conducted in the intertidal zone. Students were able to discuss findings and work through difficulties as a group, but each student was required to type and submit an individual final lab report. Lab reports were graded using a rubric created for the project. Grades were compared among the four groups of students: those who had not attended any field trips, those who had attended only one field trip, those who had participated in both school-time trips, and those who went on additional trips.

4. Findings

The findings section of this study is extensive because I believe that the many aspects of the project needed to be addressed thoughtfully. Student perceptions and learning will be described through the themes that arose from the data analyses. A discussion of what those themes mean to me, the teacher researcher, will follow the descriptions. A “lessons learned” section will expose additional meaningful findings from the entire project that might provide important information for others who try the same curriculum ideas.

4.1 Emergent Themes
The different themes that arose from the data analyses will be presented in the same format as the methodology, in two groups: preparation/planning and the experience.

4.1.1 Preparation and Planning Emergent Themes

A) Students have mixed views towards science

The first day's survey gave me a clearer understanding of the students whom I would be teaching throughout the semester. It revealed that 54% of my students admitted to having failed a science class previously. Responses from the Likert scale are reported below in percentages:

Table 1: Day One Survey, N = 50

<table>
<thead>
<tr>
<th>Question</th>
<th>Always</th>
<th>Usually</th>
<th>Sometimes</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I try hard to do well in school</td>
<td>57</td>
<td>37</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>I take care of the environment</td>
<td>21</td>
<td>52</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>I can solve science problems</td>
<td>2</td>
<td>40</td>
<td>44</td>
<td>13</td>
</tr>
<tr>
<td>I do my part when working in groups</td>
<td>49</td>
<td>33</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Very True</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat true</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not very true</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all true</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Their responses show that although they feel that they try hard in school, they do not feel comfortable or competent in solving science problems. Their views towards taking care of the environment and having a science career seem to be mixed with a high
percentage 26 (51%) choosing “usually”. Students recognize that in groups they try to do their part with no one saying that they “never” do their part.

When asked in the open-ended format, “How do you feel about science? Provide examples with experiences”, responses were mostly positive with 34 (68%) students responding with positive or neutral comments. Neutral comments were those that did not directly state a good or bad experience, but answered the question in a different way such as “I have been taking science since 6th grade” or “I’ve never had problems with science before.” Of the 50 students who answered the short answer, 16 (32%) students had negative experiences about science. They ranged from “I dislike science” to “I feel that science is boring” to “I failed last year, but I’ll give it a shot.” One student shared “To tell you the truth I really don’t care for science. I’d rather sit home, eat chips, and watch a movie.” Another shared “its like all my other classes because you have that feeling where you know you are going to fail.”

The pre-field trip survey revealed that 29 (62%) of the 47 students had not been on a science related field trip before. Science related field trips that were mentioned included the “aquarium, whale watching, Kalihi Valley Park, Zoo, Sea Life Park, Hoomaluhia Garden, Submarine” and a few mentioned “learning and looking at lava rocks” and “going into the forest and eating poi.” A majority of these experiences involved visits and observations of natural science phenomena in a more structured environment. Of the 47 students who completed the survey, 40 (85%) shared that they were excited or very excited to attend the upcoming field trips. When asked to describe “why do you feel this way” students’ comments revolved around the upcoming intertidal field trips being their “first
science field trip”, wanting to “experience something new”, “learn something about species in the intertidal.”

B) Students perceptions of Saturday Field Trips: More than Science

When offered the opportunity to participate in Saturday field trips there was a lot of initial interest. Many field trip forms were passed out, with half of the students actually turning them in. Even fewer than that attended the field trips, as shown in Table 2.

<table>
<thead>
<tr>
<th># attended</th>
<th>Additional comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3 that attended the first, 5 new students</td>
</tr>
<tr>
<td>2</td>
<td>2 that attended the second, one brought a friend (same day as Junior Prom and mother’s day celebrations)</td>
</tr>
</tbody>
</table>

When student reflections were coded and analyzed, two main themes became apparent: (1) the students learning were of different science ideas and (2) the idea of giving back and helping the community. Ana states that she “learned a lot about the coral and also the fish” and “planted trees and helped out the environment.” Ino also comments on both aspects: “learned more about the low tides and high tides” and “I felt really good about myself because for once I did something good for someone else.” Other students commented about the learning of “different species there in the intertidal and how we can help them survive and not destroy it” and “more of the animals how it survives by currents
waves...when the waves go out they have to hide then when it comes in they could go looking for food.” Ashley writes that she learned “about the native plants that grow there and the invasive species ... and it’s a way for us to help out the community and make our environment more clean.” Joeanne’s learning was less about science and more about the politics that is involved in the island and their location as she describes “the feeling of being back home at Micronesia (Chuuk). I learned how the environment was now, how the government wanted that island. No one else, but people stayed there because they fished.”

4.1.2 Themes: The Experience

The following section highlights the three main themes that arose through the data collected during the project. The student surveys and student content assessments led me to these three themes for discussion.

A) Students consider the intertidal field trips an important learning experience

Table 3. Post Field Trip Student Survey Results, N=44

<table>
<thead>
<tr>
<th># field trips attended</th>
<th>1 Strongly disagree</th>
<th>2 Disagree</th>
<th>3 Agree</th>
<th>4 Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The intertidal field trips helped me to learn marine science concepts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>3 (7%)</td>
<td>1 (2%)</td>
<td>1 (2%)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 (5%)</td>
<td>8 (18%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1 (2%)</td>
<td>7 (16%)</td>
<td>21 (48%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>10</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>The intertidal field trips helped me to understand the scientific method.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1 (2%)</td>
<td>3 (7%)</td>
<td>1 (2%)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 (9%)</td>
<td></td>
<td>6 (14%)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1 (2%)</td>
<td>11 (25%)</td>
<td>17 (39%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>18</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>The intertidal field trips were important to my learning in the class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>3 (7%)</td>
<td></td>
<td>2 (5%)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1 (2%)</td>
<td></td>
<td>9 (20%)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1 (2%)</td>
<td>5 (11%)</td>
<td>23 (52%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>5</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>
Field experiences like the intertidal field trips should be a part of science classes.  

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>5 (12%)</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>1 (2%)  9 (21%)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>3 (7%)  25 (58%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>4 39</td>
</tr>
</tbody>
</table>

Students who had not attended any field trips felt the least impact of the experience on their learning, although all of them (even though they did not attend) felt that they “should be a part of science classes.” The students that attended zero field trips were included in the survey because although they did not attend the field trips, they were still part of the groups in the classroom and were responsible for listening to and recording data from the field. Students that participated in the field trips, returned to class to share results either the day of the trip or the next day depending on the time of arrival. Their responses were included because they offer a different, third party perspective, to the inclusion of field trips in the marine science curriculum.

A majority of the students agreed that the field experiences were important part of their learning in class and helped them to learn marine science concepts and helped them to understand the scientific method. When their short answers were analyzed for common ideas, four common ideas emerged. Specific quotes were selected that illustrate the main idea and are written below each of the main ideas.

(1) a hands-on interesting and fun learning experience that motivates learning, 19 (43%)

- “entertaining learning experience”
- “will make more students interested in what they’re learning rather that just sitting in the room all day”
- “so that kids won’t be bored in class and be motivated”
- “help students be most active and excited about science”
• "helped us in a way that is fun and interesting, made learning easier"
• "made me more interested in what we were learning"
• "easier to understand and learn hands-on rather than from books"

(2) specific science content, 15 (34%)
• "understanding more about the phylum"
• "learned how to use a transect and quadrat to learn more about a habitat"
• "helped me expand my learning about marine life, for example adaptation and evolution"
• "seen how the organisms are adapted to the environment"
• "made me understand how they live and know the organism"

(3) relevance of the scientific method, 10 (23%)
• "helps you to be responsible and prepared to do an actual experiment"
• "learning put into a real experience"
• "helped me realize the importance of a lab report and its purpose"
• "gave me a first hand experience to what the field was like!"
• "understand science is more than just people in lab coats"
• "science is everywhere!"

(4) Group work, 10 (23%)
• "cooperating with other people and helping each other"
• "learned how to work as a team"
• "trips were a big help because we not only got to discover and learn, but we also learned to work as a team with our group"
Based on responses to the surveys, students felt that the field trips were an important part of
their learning in the class and helped them to understand marine science concepts and the
scientific methods. In addition, students felt that they were a motivating experience that
promoted learning of science concepts and a cooperative learning experience.

B) Students who participated in more field trips produced a better quality lab report on
their scientific investigation

This emerging idea is based on the analysis of student lab reports that were submitted
following the field trips. The lab reports document the study that the students did in the
intertidal zone during the two field trips.

Table 4. Results that Show Lab Report Grades, N=51

<table>
<thead>
<tr>
<th># of Field Trips that students attended</th>
<th># of students</th>
<th>Average points received on intertidal lab report</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>33</td>
<td>91</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>89</td>
</tr>
<tr>
<td>0</td>
<td>7</td>
<td>84</td>
</tr>
</tbody>
</table>

According to the data collected in Table 4, students who had attended more field
trips showed better results on their lab report for the intertidal investigation; however, the
difference between their scores and those of the students who attended one field trip was
minimal.

C) Students who participated in more field trips did not show a greater gain in knowledge
as assessed through final exam
This emerging idea is based on student's exam results that were analyzed and compared to each other based on the number of field trips the students attended. Data from the analysis is found below in Table 5.

Table 5. Final Exam Results, N = 49

<table>
<thead>
<tr>
<th># of Field Trips that students participated in</th>
<th># of students</th>
<th>Average points gained from pre-test to post-test (final exam)</th>
<th>Average points on post-test (final exam)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>32 (65%)</td>
<td>5.6</td>
<td>17.2</td>
</tr>
<tr>
<td>1</td>
<td>11 (22%)</td>
<td>6.5</td>
<td>22.0</td>
</tr>
<tr>
<td>0</td>
<td>6 (12%)</td>
<td>5.8</td>
<td>14.6</td>
</tr>
</tbody>
</table>

Note: At the end of the year, some students had dropped out of school or were truant and not attending classes regularly. Data is unavailable for these students. Few students were not able to participate in any field trips because they were doing poorly in other classes and were not permitted to miss those classes.

Based on the average gains and average of total points earned on final, there is no correlation between the amount of field trips attended and the learning assessed on the final exam of 25 points. Students who were only able to attend one field trip did better on the exam and showed better understanding of the broad range of topics assessed in the final. Even those students who did not attend any of the field trips showed greater gain that those students that attended both trips.

Of the students that participated in only one of the field trips, half of them participated in the field trip that was earlier in the semester and half participated in the field trip that was closer to the lab report and exam deadline. Those 11 students were very diverse, with a few unable to attend the last trip because of other class requirements and wanting to get the best grade in the other class. Other students did not seem motivated to attend the first trip, but once classmates returned and shared these students made sure to
attend the second. For future studies, it may be important to do assessments after each of
the field trips to see how learning progresses (or does not progress) from the participation
on the first trip to the second.

4.2 Discussion

Based on student surveys, I realized that although students may recognize that
science is important and can be an interesting topic, they struggle with it. When more than
half of my students admitted to having failed a science course, I recognized that they were
entering the class with negative past experiences that needed to be overcome in order for
them to succeed in my class. Many students had been on science field trips, but the
examples given were of trips taken in the earlier elementary and middle school grades.
Experiences in conducting science fieldwork and authentic data collection in a natural
environment were limited. This new information helped me to plan better and resulted in
the inclusion of a lot of preparatory activities to build student confidence in the field.

The students' responses to the Saturday field trips showed me how learning on
these outdoor trips can extend beyond information and facts from a textbook. Although
these Saturday trips were not identical to the class field trips, students did use similar tools
and practiced science techniques of classification and identification. Their reflections
included scientific terms that we had discussed in class “tides, intertidal, species, coral,
invasive, native”, but also revealed a great excitement for the community service aspect of
the day. This shows me that although we may have intended outcomes for our planned
activities, what we want our students to learn may not always be what they leave with.
Their reflections showed me that for some, just paddling a canoe and feeling how
teamwork makes a canoe fly through the water, was a rewarding experience, while others
made a meaningful connection to their culture, and others really felt good about planting
native plants and helping the environment. These field trips reminded me that as a teacher
of this population of students, our job is not only to teach concepts and standards, but also
to provide experiences that will help students make future connections between their
learning and life.

When the data on lab reports and the final exam were organized, the numbers
represented the average and does not take into account the different learning levels of each
student. The data has clumped all students together assuming that the only variable is the
amount of field trip participation, which is definitely not the case when studying student
learning. Each student is an individual with different learning needs and is not necessarily
best represented by that average number. Also the student groups are not random or
heterogeneous, but instead put students who struggle in school into the group that attended
zero field trips. These students were unable to attend field trips because either their other
teachers would not allow them to or they chose not to due to the difficulty they have with
making up work. A few of those students also forgot or did not want to participate in the
field trips. Thus, the more responsible and more motivated students returned their forms –
those who were keeping up with their other courses, attending all classes regularly, and
who generally were being allowed to attend field trips. The field trip participation group
seemed to have naturally become the “chosen” group mentioned in other studies, but
instead of being chosen by teachers they grouped themselves by being responsible and
motivated to attend both trips.
4.3 Conclusion: Lessons Learned

My research question was investigating the impact of intertidal field trips on my students overall learning experience. I hoped to find a strategy to help at-risk students understand science concepts. Through the course of the research, I believe that I was able to find not just one strategy, but found a few powerful strategies that helped and motivated my students to actively participate in the project and complete the course successfully (many students earned their final science credit that allowed them to graduate). The field trips were not a strategy of their own, but became an overall theme that helped to connect many different ideas into a cohesive learning experience for the students.

One strategy that I feel helped to make this project a success was the scaffolding of information and ideas throughout the entire semester. I began the semester explaining the project and expectations for the field trips and during the entire year I helped the students build the skills and content understanding that would allow them to complete their own scientific investigation at the end of the year. Each unit was connected to the intertidal and helped the students make connections to the real world environment that surrounded them.

Another strategy that I used throughout the project was a focus on creating a classroom learning community that would provide a safe climate for students to take risks and challenge themselves. This was also started from the first day and emphasized throughout the semester as I prepared the students to work collaboratively in groups for their final field trip and intertidal investigation.

As I conducted this study, I drifted off my intended research question. I had originally planned for an experiment with an independent variable, the amount of field trips students’ attended and a dependent variable of learning. What I realized through the entire
process is that student learning is not as simple as changing one variable. Each student is unique with different struggles and challenges that go beyond the classroom and the curriculum. In order to see the overall affect of field trips on students, I looked at all the data collected and also looked closely at my teacher reflective journals that documented the journey that my students and I took during the research period. These data sources allowed me to come to my conclusions as a teacher-researcher. These conclusions are explained in the sections that follow.

4.3.1 What I learned about my students and their learning

I learned a lot about my Farrington students. I learned that although many students arrive with learning and motivational challenges - they want to learn. However, they need something to spark that motivation to learn because if not, they will continue on their path of passive learning and acceptance of failure. The environment for that learning needs to be created and their previous challenges need to be addressed before learning can take place. When my students feel that they are capable and have the confidence in themselves, they are able to complete quality work and conduct their own science field experiments with a purpose and hypothesis created by themselves.

I learned that students benefited from the semester-long topic of intertidal work and the emphasis on the field trips. The field trips provided a cohesive project that helped to unite a curriculum throughout a semester and unite students of all grades and experiences. Students who struggled at different points throughout the semester (with absences, behavior, other classes and grades), were able to be successful and participated in the field trips actively with their groups. The sustained group work throughout the semester created
a community in our classroom. One student said in a journal “I thought it would be like all
my other classes where students don’t get along, but it wasn’t.” On the last day of class,
students reflected on their semester and shared pictures and thoughts in a community circle.
In my five years at the school, I have never seen so many pictures and discussion revolving
around the friendships they had formed with their classmates. I noticed the pictures and
names mentioned were the students they had been working with on the field trips. I wrote
in my teaching journal, “They drew people in their pictures from their group and talked
about the friendships made. It was touching. I felt very proud that people wrote in their
journals about the community that was built.”

The Department of Education emphasizes “Rigor, Relevance, and Relationships”.
What I’ve found is that all three components are equally important in the classroom and
that one should not be sacrificed for the other. The relationships that formed through the
field trips and class curriculum lay an important foundation for learning. Although this
component can be met through other in-class activities, the field trips seemed to be a
cohesive way of addressing all three of the important educational Rs.

4.3.2 What I learned about myself

As I planned for this project and started to carry out the field trips, I learned a lot
about my philosophy of teaching. I believe that all students can learn, but recognize that
each individual is arriving with a different history, and that I must understand and work
with each learner’s needs and work to fit those needs into the science curriculum’s
objectives. Through my reflective journals I was able to see how I documented many of
the students’ personal struggles throughout the semester, while at the same time reflecting
and recording curriculum decisions and observations. These reflective observations showed me how unique each student was. A few of the student's individual stories were documented in my reflections and their participation and reactions to the field trips would deserve a case study of its own.

I recognize that learning is not something as simple as reading a text, but deep learning experiences will only grow in a classroom environment that is built on trust and respect. Students must feel safe to learn and to take the risks necessary for true understanding. This means that I, as the teacher, must create the environment through activities and curriculum that foster trust and respect amongst the students and with myself.

Through my reflections and my curriculum planning, I've realized that I love curriculum development and believe that our subjects need to be relevant, integrated, and include many active learning experiences. Students may not always see the connections on their own, so the teacher needs to spend time on organizing the information so that connections can be made and explained. Thus, the learning experience cannot be a mélange of scattered ideas and vocabulary terms presented in a static textbook, but is instead a meaningful and exciting quest for knowledge.

I've also come to realize that my field trips may not be the answer to every student's learning needs. There are students who don't respond to it and those who don't participate on Saturday field trips due to personal and family obligations. However, I am confident that a relevant, well-planned and executed field trip is an important learning experience that should not be abandoned as the mandates to reach reading and math proficiency bear down on schools. I'm not confident that field trips "raise the grades" of students as assessed on exams, but learning may be shown in ways that I cannot assess.
through a pen and paper. Perhaps only glimpses are available through their journaling, assessments, and behaviors. Each student is so unique, that to put them into a cause and effect equation with no outside variables is impossible.

My final thoughts in my reflective journal stated, “there are so many different variables involved with student learning, that it seems nearly impossible to say that field trips positively affected student learning. Students who didn’t attend were still able to benefit from the sharing and showed gains in learning. A student who had gone on all the field trips, conversely, showed little gains in learning as assessed on the exam. This student, however, did miss many days of regular class instruction and went through personal issues earlier in the semester. Yet, she made it to school for each of the field trips and participated actively in both of them. What does this mean?” I continue my reflection and my wonderings.

4.3.4 Further wonderings

I wonder why our high school students seem so unmotivated and passive. Where has their curiosity gone? Why are trips to the Big Island and Camp Erdman included in curriculum throughout the elementary grades, yet not through high school where deeper appreciation may occur? Has our instruction changed in a way that it squelches the natural curiosity and questions that arise when we are young and exploring the world? I wonder if field trips could help at-risk and motivationally challenged students build a deeper connection with and appreciation for what they are learning.
Throughout this process as a teacher-researcher, I’ve learned many things about myself, my students, and student learning. I am convinced that field trips are a valuable tool in education. However, I believe that they must be planned and carried out in a sustained unit that allows students to take abstract science concepts and connect them to the environment that surrounds them. Unfortunately, my research may not include enough numerical data that convinces administrators and school officials that field trips increase student learning. However, I believe that this study could be the foundation for future studies that investigate the effect of field trips on student learning.

During the semester I witnessed students take leaps out of their comfort zone and even surprise themselves with their participation and enthusiasm on the field trips. One student has never worn shorts before in front of his peers, and he stepped out of the bathroom with shorts on, hair pulled back, reef shoes on tightly, with gloves on both hands ready to go to collect data. He said, “Ms. Taira I’ve never done anything like this before” looking uncomfortable but excited at the same time. He was a leader that day and explored the intertidal with the curiosity of a true scientist.

Then there were my two quiet ESL (English as a second language) students that showed little enthusiasm for the trips in class, but surprised me on each trip with their focus and attention to detail. Both showed up for both trips, not saying much but always prepared with their supplies. Then one day I sat down to talk to them after they collected their data and they were quick to show me the organisms they found and started sharing
asking very thoughtful questions. It was clear from their faces and their words, that the field trip had been a success for them.

These are just a few of the student stories this past semester that convinced me that field trips are worth the time, effort, and money and are a valuable learning experience. I could not fit the stories into my paper, because the growth seen in the student didn’t fit into the data tables. I would recommend further research that looks at students beyond just the numbers they produce on assessments, but instead as case studies that focus on individual students or groups of students to closely study their response to field trips. These groups may include students that failed two or more science classes, students that are regularly truant from school, students that are English language learners, and students that are heading to college after high school.

A case study approach would help to explain my student Joseph this past semester. He needed special motivation and took special classes to help him attend school regularly because he was normally absent from school. His excuse was that he was sleeping and tired, so much so that he was absent for such lengths that sometimes he didn’t know the month. However, Joseph knew that the marine science field trips were during second quarter and started to attend class regularly. He was excited about his intertidal fish project and even participated in additional optional Saturday trips during this time. He planned the entire experiment with his group, set his procedures, took the lead in his group in class and in the field, and made sure to make it to class throughout that entire intertidal unit. Joseph never missed a class during the span of the field trips, yet he didn’t make it to the end of the year to complete the lab report or the course. I believe that there is another way to share the impact of field trips on students learning that doesn’t rely upon converting student
experiences and learning into numbers. Joseph is not part of the quantitative data reported in the study. He did not complete assessments, but does that mean that his growth and learning should be left unreported?
References


Appendix
MEMORANDUM

January 8, 2008

TO:           Mari Taira
              Principal Investigator
              Curriculum Studies

FROM:         William H. Dendle
              Executive Secretary

SUBJECT:      CHS #15721- “Investigating How Authentic Field Experience in Hawaii’s Intertidal Affect Student's Understanding of Marine Science Concepts”

Your project identified above was reviewed by the Chair of the Committee on Human Studies through Expedited Review procedures. The project qualifies for expedited review by CFR 46.110 and 21 CFR 56.110, Category (7) of the DHHS list of expedited review categories.

This project was approved on January 2, 2008 for one year. If in the active development of your project you intend to change the involvement of humans from plans indicated in the materials presented for review, prior approval must be received from the CHS before proceeding. If unanticipated problems arise involving the risks to subjects or others, report must be made promptly to the CHS, either to its Chairperson or to this office. This is required in order that (1) updating of protective measures for humans involved may be accomplished, and (2) prompt report to DHHS and FDA may be made by the University if required.

In accordance with the University policy, you are expected to maintain, as an essential part of your project records, all records pertaining to the involvement of humans in this project, including any summaries of information conveyed, data, complaints, correspondence, and any executed forms. These records must be retained for at least three years from the expiration/termination date of this study.

The CHS approval period for this project will expire on January 2, 2009. If your project continues beyond this date, you must submit a continuation application to the CHS at least four weeks prior to the expiration of this study.

We wish you success in this endeavor and are ready to assist you and your project personnel at any time.

Enclosed is your certification for this project.

Enclosure
**Protection of Human Subjects**

**Assurance Identification/IRB Certification/Declaration of Exemption**

**Policy:** Research activities involving human subjects may not be conducted or supported by the Departments and Agencies adopting the Common Rule (56FR28003, June 18, 1991) unless the activities are exempt from or approved in accordance with the Common Rule. See section 101(b) of the Common Rule for exemptions. Institutions submitting applications or proposals for support must submit certification of appropriate Institutional Review Board (IRB) review and approval to the Department or Agency in accordance with the Common Rule.

<table>
<thead>
<tr>
<th>1. Request Type</th>
<th>2. Type of Mechanism</th>
<th>3. Name of Federal Department or Agency and, if known, Application or Proposal Identification No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[X] ORIGINAL</td>
<td>[ ] GRANT</td>
<td></td>
</tr>
<tr>
<td>[ ] CONTINUATION</td>
<td>[ ] COOPERATIVE AGREEMENT</td>
<td></td>
</tr>
<tr>
<td>[ ] EXEMPTION</td>
<td>[ ] OTHER:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Title of Application or Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Investigating How Authentic Field Experience in Hawaii's Intertidal Affect Student's Understanding of Marine Science Concepts&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Name of Principal Investigator, Program Director, Fellow, or Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mari Taira</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Assurance Status of this Project (Respond to one of the following)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[X] This Assurance, on file with Department of Health and Human Services, covers this activity: Assurance Identification No. F-3526, the expiration date September 23, 2008 IRB Registration No. IORG0000169</td>
</tr>
<tr>
<td>(agency/dept) Assurance No._____________________________________________________________ the expiration date________________________ IRB Registration/Identification No.________________________________________(if applicable)</td>
</tr>
<tr>
<td>[ ] No assurance has been filed for this institution. This institution declares that it will provide an Assurance and Certification of IRB review and approval upon request.</td>
</tr>
<tr>
<td>[ ] Exemption Status: Humansubjects are involved, but this activity qualifies for exemption under Section 101(b), paragraph__________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Certification of IRB Review (Respond to one of the following IF you have an Assurance on file)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[X] This activity has been reviewed and approved by the IRB in accordance with the Common Rule and any other governing regulations. by: [ ] Full IRB Review on (date of IRB meeting)______, or [X] Expedited Review on January 2, 2008</td>
</tr>
<tr>
<td>[ ] If less than one year approval, provide expiration date_______________________________</td>
</tr>
<tr>
<td>[ ] This activity contains multiple projects, some of which have not been reviewed. The IRB has granted approval on condition that all projects covered by the Common Rule will be reviewed and approved before they are initiated and that appropriate further certification will be submitted.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHS #15721</td>
</tr>
</tbody>
</table>

| 9. The official signing below certifies that the information provided above is correct and that, as required, future reviews will be performed until study closure and certification will be provided. |
| 10. Name and Address of Institution |
| University of Hawaii at Manoa |
| 2444 Dole Street, Bachman Hall |
| Honolulu, HI 96822 |
| 11. Phone No. (with area code) | (808) 956-5007 |
| 12. Fax No. (with area code) | (808) 956-8683 |
| 13. Email: | dendle@hawaii.edu |
| 14. Name of Official | William H. Dendle |
| 15. Title | Compliance Officer |
| 16. Signature | [Signature] |
| 17. Date | January 8, 2008 |

Public reporting burden for this collection of information is estimated to average less than an hour per response. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: OS Reports Clearance Officer, Room 503 200 Independence Avenue, SW., Washington, DC 20201. Do not return the completed form to this address.
Dear Parent/Guardian,

My name is Mari Taira. I am your child's marine science teacher at Farrington High School. I am writing this letter to explain my plan this semester to improve my teaching by studying whether field trips help my students to learn science. My study is part of my work at the University of Hawaii to earn a master's degree in curriculum studies. The results of my study will help me to become a better teacher as I try to find ways to make science more understandable and exciting for students.

Doing my study does not change what I will teach in class, nor the kinds of activities that students will do during the field trip, nor what I expect them to do for my class assignments. However, so that I can do my study, I am requesting that you give me permission to ask your child to voluntarily complete a survey that asks students about how they learn best and their opinions about field trip activities. I am also asking your permission to use all or portions of your child’s responses on written assignments and oral discussions as data for my study. My study also will include my own observations of my students in class and during the field experiences as they work to understand science concepts. When I report the data in my study, no child will ever be identified by name.

Because I am doing this study as a graduate student at the University of Hawaii, I am required to provide you with the following additional information:

- Whether or not your child completes my survey, and whether or not you give me permission to use your child’s responses in my study will have no effect on the grade your child earns in my marine science class. If you do not want me to use your child’s data, I will respect your wishes and their responses will not be included in the project report.

- I believe there is no risk to your child’s participating in this study. All data and observations will be kept confidential and I will store all my records for the duration of the research project. The University of Hawaii Committee on Human Studies does have the authority to review research data. Participation in this project is completely voluntary. You are free to withdraw from participation at any time during the duration of my study with no penalty, or loss of benefit to which you would otherwise be entitled.

- If you have any questions regarding my study, please contact me directly, Mari Taira, at 832-3645 or mtaira@hawaii.edu, or speak with my graduate studies advisor, Dr. Barbara Klemm at 956-3823 or klemm@hawaii.edu. If you have questions regarding your child’s rights as a research participant, please contact the University of Hawaii Committee on Human Studies at (808) 956-5007.

At this point, please help me by signing the attached form that allows me to use your child’s responses and student work as data in my project. Also, please keep this letter for reference and return only the attached consent form.

Thank you for your support.
Dear Student,

My name is Ms. Taira. I am your marine science teacher at Farrington High School. I am writing this letter to explain my plan this semester to improve my teaching by studying whether field trips help you to learn science. My study is part of my work at the University of Hawaii to earn a master’s degree in curriculum studies.

Doing my study does not change what I will teach in class, nor what I expect you to do for my class assignments. However, so that I can do my study, I am requesting that you give me permission to use all or portions of your responses on written assignments and oral discussions as data for my study. My study also will include my own observations of the class during the field experiences as they work to understand science concepts as well as in the classroom. When I report the data in my study, you will never be identified by name.

Because I am doing this study as a graduate student at the University of Hawaii, I am required to provide you with the following additional information:

- Whether or not you complete my survey and give me permission to use your responses in my study will have no effect on your grade in this class. If you do not want me to use your work and responses, I will respect your wishes and it will not be included in the project report.

- I believe there is no risk to your participating in this study. You are free to withdraw from participation at any time during the duration of my study with no penalty.

- If you have any questions regarding my study, please contact me directly, Ms. Taira, at 832-3645 or mtaira@hawaii.edu, or speak with my graduate studies advisor, Dr. Barbara Klemm at 956-3823 or klemm@hawaii.edu. If you have questions regarding your child’s rights as a research participant, please contact the University of Hawaii Committee on Human Studies at (808) 956-5007.

At this point, please help me by signing the attached form that allows me to use your responses and student work as data in my project. Also, please keep this letter for reference and return only the attached assent form.

Thank you for your support.

Ms. Mari Taira
Marine Science Teacher, Farrington High School
808-832-3645
A Study on the Effect of Authentic Field Experience on Student’s Marine Science Understanding

Student Assent Form

Ms. Mari Taira
Marine Science Teacher, Farrington High School
808-832-3645
mtaira@hawaii.edu

Participant:
I have read and understand the attached letter and agree to participate in Ms. Taira's project.

________________________
Student’s Name (Printed)

________________________
Student’s Signature

________________________
Date
PARENT AUTHORIZATION FOR STUDENT TRAVEL

Completed form and payment (if applicable) are due on or before: ____________ to: ________________

Dear Parents:

Permission is requested for your child to participate in the following activity:

School: __________________________ 
Teacher/Advisor: ______________________ 
Activity: __________________________ 
Place: __________________________ 
Date(s): __________________________ 
Time(s): __________________________ 
Organization: ______________________ 
Mode of Transportation: __________________________ 

PARENTAL PERMISSION
(To be completed by Parent/Guardian)

Name of Student: __________________________ 
Home Phone #: __________________________ 

Check as appropriate: 

____ My son/daughter has permission to attend the above activity. 
____ My son/daughter does NOT have permission to attend the above activity.

MEDICAL INSURANCE COVERAGE

____ My child has medical coverage with __________________________ 

____ My child is NOT covered by any medical insurance plan. 

Note: If a child is not covered by medical insurance, special arrangements must be made through the school office to purchase trip insurance. Please contact the sponsoring teacher of the field trip/activity.

PRIVATE VEHICLE USAGE

If private vehicles are used, permission is granted as follows (Initial ALL appropriate statements):

____ My son/daughter may drive to the activity alone (Form 80-4, "Application for Use of Private Vehicle to Transport Students" must be completed and attached to this form.).
____ My son/daughter may transport other students to the activity (Complete Form 80-4).
____ My son/daughter may ride in a vehicle driven by another student to the activity.
____ My son/daughter may ride in a vehicle driven by an adult to the activity.

We (I) grant permission for said student to participate in the planned activities of the travel, and to travel by private or commercial car, bus, train, airplane, and other means of transportation as required. I release the State from liability resulting from the use of other than school vehicles pursuant to HRS 286-181.

In the case of illness or injury to said student, we (I) hereby consent to and authorize such medical or dental treatment as deemed necessary, and agree to pay for such medical and dental costs if incurred.

Print or type Parent’s/Guardian’s Name: __________________________ 
Parent’s/Guardian’s Signature: __________________________ 
Date: __________________________

Specify any special medical or other such instructions you would want considered:

*******************************************************************************

(TO BE COMPLETED BY SUBJECT TEACHERS, IF APPLICABLE)

Please sign below to acknowledge that the above student will be missing class because of the activity mentioned above. He/she understands that all class work shall be made up at YOUR convenience. If you have any reservations, please state them.

Ht: __________________________ 
Period 1: __________________________ 
Period 2: __________________________ 
Period 3: __________________________ 
Period 4: __________________________ 
Period 5: __________________________ 
Period 6: __________________________ 
Period 7: __________________________

FORM SA-1. Rev 6/01. RS 01-1267 (Rev of RS 99-0995)
REQUEST FOR INTRA-STATE OR OUT-OF-STATE STUDENT TRAVEL

DESTINATION: Sand Island Beach Park

School or Branch: Farrington High School

Dist. or Div.: Honolulu

Trip No: 131

No. & Name of Student Traveler(s) (Attach list if necessary)

Name/Title of School Chaperones (Attach list if necessary)

Name of Adult Non-school Chaperones (Attach list if necessary)

PURPOSE OF TRAVEL: (Attach program agenda)

To conduct field work in the intertidal zone for student research and application of concepts learned in class. Supports NExt Generation Science Standards in Science and general learner outcomes.

TRAVEL ITINERARY (Specify dates, times, and destination):

Date Departure Time Date Arrival Time Destination (City, State)

See attached days and times

San Island Beach Park

RATION OF TRAVEL:

No. of Days Dates

School Days: 1 each day 5/4/08 - 5/6/08
Non-school days: 5/7/08 - 5/11/08
Total travel days: 5/22/08 - 5/24/08

COST OF TRIP:

Per Student x No. = Total Per Adult x No. = Total Group Totals

Plane Fare

Ground Transportation: $153 per bus

Per Diem (meals/lodging)

Conference or Registration Fee

Other (Specify):

Total

SOURCE OF FUNDS:

Program ID/Program Title (Title of Fund) Org ID Student Adult Total

Type of Fund

General Fund

Federal Fund

Special Fund

Trust Fund

Other (Specify)

Total

- See Reverse Side -
Nice Saturday Tides:
March 8th LT 10:46 AM - .2
April 5th LT 9:25 AM - .3

Planned Field Trips:
Tuesday  May 6th   Low Tide -0.5   9:07 am
(Period 4, leave at 8:10 am pick-up from Sand Island at 11:40pm)
Wednesday May 7th    Low Tide -0.4   10:24 am
(Period 3, leave at 8:10 am pick-up from Sand Island at 12:00pm – time to rinse and clean materials)
Wednesday May 21st  Low Tide -0.2   9:35 am
(Period 3, leave at 8:10 am and pick-up from Sand Island at 12:00pm – time to rinse and clean materials)
Thursday May 22nd  Low Tide -0.1   10:08 am
(Period 4, leave at 8:10 am and pick up from Sand Island at 11:45pm)

* Spoke to VP. Shannon Geo via Email regarding late dates in May. It is due to the low tides and teachers will be given advance notice at the beginning of Term 4.
Student Background Information

Name: [Redacted]

Gender: [ ] Male [ ] Female  Current grade level: [ ] 9th [ ] 10th [ ] 11th [ ] 12th

Student contact # ____________________________________________

Important Contact Information
Person to be contacted 1st ______________________________________
Relationship ____________________________ Phone number __________

Person to be contacted 2nd ______________________________________
Relationship ____________________________ Phone number __________

Ethnicity (Nationality): Please check all that apply.
[ ] African/African American  [ ] Samoan/Samoan American
[ ] American Indian/Alaskan Native  [ ] Japanese/Japanese American
[ ] Filipino/Filipino American  [ ] Chinese/Chinese American
[ ] Hispanic/Latino (Mexican, Spanish, Cuban, etc.)  [ ] Korean/Korean American
[ ] Native Hawaiian  [ ] Part Hawaiian
[ ] Micronesian/Micronesian American  [ ] Vietnamese/Vietnamese American
[ ] White (not of Hispanic origin)  [ ] Other: ____________________________

Have you failed a science class before? [ ] Yes [ ] No
If Yes, which class? ____________________________________________
Why did you fail? ____________________________________________

Student Rating Form #1
Your opinions are important to me, so I would like you to be honest when filling out this questionnaire. Please mark one of the boxes in each row below to show how often you do what is described in the statement on the left. Your answers will not affect your grade.

<table>
<thead>
<tr>
<th></th>
<th>All the time</th>
<th>Usually</th>
<th>Sometimes</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I forgive others.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>2. I talk to others to stop fights.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>3. I help keep peace in the classroom.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>4. I try hard to do well in school.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>5. I keep trying, even when things are difficult.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>6. I take the lead in group activities.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>7. I take care of the environment.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

Please Turn Over  

p. 1 of 3
8. I let the teacher know when I know the answer.

9. I can read and understand the science materials.

10. I can summarize the lessons the teacher gives me.

11. I know the math needed to do the class work.

12. I can solve science problems.

13. I try to do things correctly.

14. I accept it well when people correct me.

15. I have good skills for managing my time.

16. I can work by myself.

17. I do my part when working in a group.

18. I respect other students.

19. I respect the teacher.

20. I go to school all the time.

21. I take care of the classroom materials and equipment.

22. I follow classroom rules.

23. I follow instructions.

24. I follow written directions.
**Student Rating Form #2**

**Student Name_________________________**

I am interested in how you feel about science and careers in the scientific field. In your opinion, how true is each of the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very True</th>
<th>Somewhat True</th>
<th>Not Very True</th>
<th>Not at All True</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scientists make a meaningful difference in the world.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. My family has encouraged me to study science.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3. Having a science career would be interesting.</td>
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<td></td>
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<tr>
<td>4. A career in science would enable me to work with others in meaningful ways.</td>
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<tr>
<td>5. I would enjoy a career in science.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Having a science career would be challenging.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. My family is interested in the science courses I take.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I would like to have a career in science.</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

You could have a science career one day. Think about this possibility and answer the questions below as if you really will choose to pursue a science career. For each question, check the box to show how confident you are that the experience described would really happen to you.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very Confident</th>
<th>Somewhat Confident</th>
<th>Not Very Confident</th>
<th>Not at All Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. You will make it into a good college and major in the area needed for this career.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. You will graduate with a college degree in the major area needed for this career.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. You will get a job in a science-related area.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. You will have a successful professional career and make substantial contributions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. When you tell others about your career, they will respect you for doing scientific work.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MAHALO!  

* p.3 of 3