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The Effects Of Informal Science Education On Students' Attitudes And Academic Performance

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THE EFFECTS OF INFORMAL SCIENCE EDUCATION ON STUDENTS’ ATTITUDES AND ACADEMIC PERFORMANCE

By
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ABSTRACT

Will student attitudes towards science change when they are given a chance to explore an area of science in which they have indicated an interest? This action research thesis investigated this question over a period of nine weeks. The subjects of this study included twelve students enrolled in the same seventh grade physical science class. The school was located in a suburban setting in the Southeast United States.

Data for this study was collected with anecdotal notes, participation grid, science attitude survey, student interviews, and student journals. This study found that when students are given the opportunity to pursue an area of science in which they demonstrate an interest, they are more likely to participate in their regular curriculum and increase positive attitudes' towards science. As a result of this increased engagement and improved attitudes' towards science, students academic performance in science also improved.

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I dedicate this thesis to my wife Christine, the friend of my soul.

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CHAPTER ONE: INTRODUCTION

Rationale for Study

I am a science teacher who is increasingly concerned about the epidemic of disinterest in traditional core science education. In the years that I have been teaching, I have observed a switch in interest from traditional sciences like environmental biology to more technical sciences like computer science and graphic designing. In previous years, the first day of school was often filled with questions from students inquiring about the possibility for dissections and other hands-on activities. At the beginning of this year, the participants of this study asked questions about the potential to explore and use new technologies.

While I encourage my students' growth in technical education, I realize that when students spend more time in front of the computer, the less time they will spend outside. Less time outside might equate to less time observing, interacting and reflecting on science. I estimate that in my previous years of teaching, roughly 50% of the class would be immensely interested in biological and environmental sciences while about 25% will be interested in physical sciences. About 25% of the participants of this study indicated any interest in biological and environmental science, 0% of the participants indicated any interest in physical science. Twenty-five percent of the participants of this study identify themselves as being interested in pursuing a career in a traditional science.

Students who have a positive attitude towards a particular subject tend to perform better academically in that subject (Papanastasiou & Bottiger, 2004). This action research is an attempt to improve students' attitudes towards science by exposing them to informal science programs in which my students demonstrate an interest. Furthermore, the creation of a "club-like" atmosphere while students pursue the aspect of science they are interested in might be beneficial. Fredricks & Eccles (2006) found that students who participate in clubs benefitted academically. To this end, participants will be encouraged to explore their interest in and out of the classroom.

My goal is not to substitute our current curriculum; rather, my goal is to enhance our curriculum by giving students the opportunity to explore areas of science that they are not required to learn but that might be of interest to them. For example, since many of the participants have indicated an interest in gardening, they will be provided with an opportunity to explore gardening while concepts contained within the nature of science are reinforced.

Purpose for the study

The purpose of this study is twofold. First, I am researching my students' attitudes towards science after they are given positive exposure to science. Secondly, I am studying if my students' academic performance in science will improve after they participate in a science activity that they have demonstrated an interest.

If a relationship between students' attitudes towards science and their academic performance in science are confirmed, curriculum change that would better enable students to demonstrate their full potential might be warranted. For example, if student attitudes towards science are proven to be linked with academic achievement the role of field trips and extra-curricular activities might be reexamined.

In order to confirm the before mentioned relationship, a variety of instruments including an attitude survey, student journals, teacher field notes, academic performance, student interviews, and a participation grid will be employed. The manner of which the instruments of this study are used will be examined in further detail in chapter three.

Definitions

For the purpose of this study, I define the following terms as follows:

Administrative Dean: My title in the school is administrative dean. As the 8^{th} grade administrator, I serve in a leadership role to our grade level teachers, staff and students. Moreover, I handle the discipline of all 8^{th} grade students.

Attitude: An individual student's view and/or association with an object or experience. In this study, student attitudes will be defined as positive, negative, or neutral.

Constructivism: The process by which students learn a body of knowledge by building on their previous knowledge. Constructivism is a form of student-centered learning where students are expected to explore and take ownership of their learning.

ESE: Exceptional Student Education

ESOL: English to Speakers of Other Languages.

FCAT: Florida Comprehensive Assessment Test

Groups: Groups consist of four students who sit and work together. Students were given the opportunity to choose their own groups.

Hands-on science – When students learn science while performing a related activity.

Inquiry: A process by which students pose questions and then use the scientific method to investigate phenomena (National Research Council, 2004).

LEP: Language Enriched Pupil /Limited English Proficiency

Nature of Science: A unit in our curriculum where students learn the scientific method and inquiry process.

Order of Instruction: District mandated curriculum calendar. The district order of instruction is aligned with the Sunshine State Standards.

Participation: Student participation is measured with a participation grid. Students are considered to be participating if they are actively involved in the lesson and/or learning process. Student participation was documented every ten minutes.

Rotation: Five stations are set up around the room with each station containing a unique activity where the student had the opportunity to explore an area of science in which they are interested. Students rotate to a different station every three days.

Student Journals: Student journals were a regular part of the class prior to the inception of this research. Students are expected to reflect on their learning in the journals and document their contributions to their group throughout the various classroom rotations.

Sunshine State Standards: A list of what students Florida public school students should know (Miami Museum of Science, 2000).

Teacher Field Notes: The informal, anecdotal notes kept throughout the research. Contained within these notes are my classroom observations, teacher reflections, etc.

Research Questions

Question # 1

How will student attitudes towards science change when they are given the opportunity to explore an area of science in which they have indicated an interest?

Question # 2

Will a change in my students' attitudes correlate to a change in their academic performance?

Limitations

As an Administrative Dean, I have one class, 7th grade science, which I teach. Even though I am the 8th grade administrator, all administrators are expected to provide supervision to the entire school. However, while another dean handles the discipline of all participants of this study, my students still see me primarily as a school administrator and disciplinarian. Therefore, students might respond differently to a full time teacher than they would to a person they view as a school disciplinarian.

With only one class of students, the availability of participants is limited. For this study, only 12 students from the target population chose to participate. The instruments used in this study also have limitations imbedded in them. For example, while the student survey used in this study was adapted from a commonly used survey in our district, the survey itself has never been formally tested for validity. Also, the participation grid was teacher generated, and it too has never been formally tested for validity.

One possible limitation is the truthfulness of participants. For example, the research assumes that all study participants answered survey questions honestly and to the best of their ability. The research also assumes that all participants act naturally throughout the study and are not motivated to participate simply because the researcher is taking field notes. The limitations of this study will be discussed in further detail in Chapter five.

CHAPTER TWO: LITERATURE REVIEW

Introduction

For the purpose of this study, student attitudes are identified as positive, negative or neutral. Students who show a positive attitude towards an activity are more likely to be intrinsically motivated to engage in that activity. Students who are intrinsically motivated perform a task due to an internal drive not related to an external stimulus (Durik & Harackiewicz, 2007).

Situational interest is the type of interest educators most often focus on because educators can influence it to a certain degree. After all, situational interest is broken up into two catagories: “catch and hold (Mitchell, 1993). In otherwords, experienced teachers know that in order to be successful educators, they must obtain and keep students’ attention for the duration of the class.

In order for students to have a positive attitude towards school, students must have an “affective identification with school life (Cheng & Chan, 2003).” One way of engaging studentss and getting them interested in science is through science competitions and clubs. Current research shows that students often find science competitions like the Science Olympiad “fun and engaging” (McGee-Brown, 2004).

Activities in science competitions such as the Science Olympiad are inquiry based (McGee-Brown, 2004). That said, hands-on science does not equate to inquiry science;

inquiry requires the use of "critical and logical thinking" (National Research Council, 2004).

Question # 1

How will student attitudes towards science change when they are given the opportunity to explore an area of science in which they have indicated an interest?

Intrinsic Motivation

Students are more likely to become engaged in an activity if they have a personal interest in the subject (Durik & Harackiewicz, 2007). According to Ryan (2000), you are motivated when you "are moved to do something." When a student is interested in a subject and is moved to pursue a subject for its own sake, it is called intrinsic motivation (Taylor & Nikos 2007). While we are able to encourage students' intrinsic motivation, it should be noted that intrinsic motivation will drive a student to pursue something without external rewards (Ryan & Deci, 2000). Taylor et al (2007) writes "...most self-determined regulation is intrinsic motivation."

Deci et al. (2001) found that while verbal praise may enhance intrinsic motivation, the use of expected tangible rewards may actually undermine it. Moreover, Ryan and Deci (2000) write:

> "…research revealed that not only tangible rewards but also threats, deadlines, directives, pressured evaluations, and imposed goals diminish intrinsic motivation because, like tangible rewards, they conduce toward and external

perceived locus of causality. In contrast, choice, acknowledgment of feelings, and opportunities for self direction were found to enhance intrinsic motivation because they allow people a greater feeling of autonomy (Deci & Ryan, 1985). "

Situational Interest

Situational interest is the interest that is caused by "environmental stimuli" (Hidi & Renninger, 2006). Situational interest can be attributed to two separate forces – catch and hold (Mitchell, 1993). Whereas catch can be described as the stimulus that attracts one's attention, hold is the stimuli that keeps students engaged (Mitchell, 1993).

Little can be gained with catch if hold does not follow. Dewey (1913) states that, "little can be accomplished by setting up 'interest' as an end or a method by itself." However, according to Randler and Bogner (2007), even if situational interest does not lend a persisting individual interest, it is still "beneficial for learning processes."

Constructivism

Teachers who teach with constructivist methods attempt to learn students preconceived notions about a subject and help to facilitate the students' growth and acquisition of accepted knowledge (Wilke et al, 2007). Lane (2007, p. 161) wrote: "A constructivist teacher is one who uses teaching methods that help students develop, reflect on, evaluate, and modify their own internal frameworks." In study involving 4th grade students, investigators found that students were better able to learn material with constructivist teaching as opposed to direct instruction (Dean & Kuhn, 2006). At the collegiate level, an investigation involving nursing students found that constructivist style teaching allowed the students to discover value and meaning in advanced mathematics (Francis & Pope, 2008).

Inquiry

The National Science Education Standards state that:

> "Scientific inquiry refers to the diverse ways in which scientist study the natural world and propose explanations based on the evidence derived from their work. Inquiry also refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientist study the natural world (National Research Council, 2004)."

In a latter publication, the National Research Council stated that "inquiry is in part a state of mind – that of inquisitiveness (National Research Council, 2000). Inquiry teaching engages students by drawing on their natural curiosities and interest. Dewey (1938) wrote

> " The utilization of subject-matter found in the present life-experience of the learner towards science is perhaps the best illustration that can be found of the basic principle of using existing experience as the means of carrying learners on to a wider, more refined, and better organized environing world…"

In the science education community, inquiry is a popular topic of conversation and debate. Rudolf (2005) states that "few things in science education are as popular these days as inquiry."

One of the benefits of inquiry based learning is that it allows students to learn multiple areas of curriculum simultaniously (National Science Resources Center, National Academy of Sciences and Smithsonian Institution, 1997). For example, a student might be able to investigate botany while reinforcing concepts within the nature of science.

Nature of Science

The National Science Education Standards call for the teaching the Nature of Science (National Research Council, 2004). Unfortunately, there is not a specific set of guidelines that define the Nature of Science that all educators and scientist agree on (Khishfe & Lederman, 2007).

The National Research Council states that the nature of science includes times when scientist "…formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models (National Research Council, 2004). In a study that analyzed five high school biology textbooks for the presence of the Nature of Science, researchers found all five textbooks to contain the themes of investigation and reflection (Chiappetta & Fillman, 2007). Another suggested way of teaching the Nature of Science is by connecting historical accounts of science endeavors to the Nature of Science (Reeves, Chessin, & Chambless, 2007).

Question # 2

Will a change in my students' attitudes equate to a change in their academic achievement?

Science Competitions and Clubs

The National Research Council suggests that science assessments are more authentic when they are similar to tasks that scientist perform (National Research Council, 2004). It was found that when students engage in science competitions such as the Science Olympiad, they feel the science to be "real" and "challenging (McGee-Brown, 2004). Even with external pressures in place, students typically report being engaged and enjoying their competition experience (Abernathy & Vineyard, 2001).

In a study investigating the potential of math clubs, it was concluded that students might be motivated to excel in mathematics simply so they can perform well for the club at competitions (Papanastasiou & Bottiger, 2004). Moreover, clubs allow for out-of-classroom science activities. Braund & Reiss (2006) list five ways that out-of-classroom activities benefit the learning:

1. Improved development and integration of concepts.
2. Extended and authentic practical work.
3. Access to rare materials and to "big" science.
4. Attitudes to school science: stimulating further learning.
5. Social outcomes: collaborative work and responsibility for learning.

Summary

The importance of motivation and student attitudes towards science were discussed. Moreover, previous research shows that students who engage in out-of-classroom experiences are more likely to have positive experiences in science (Papanastasiou & Bottiger, 2004) (Braund & Reiss, 2006).

Chapter 3 will discuss the methodology used to investigate the effect of student driven out-of-classroom experiences to attitude change and if attitude change will equate to a change in academic achievement. Chapter 4 will analyze the results of the study. Chapter 5 will conclude this action research with a discussion of the results with recommendations for future research.

CHAPTER THREE: METHODOLOGY

Participants

The participants of this study are all students enrolled in the same 7th grade science class. The participants share many of the same classes throughout the day. In this class, 12 students elected to participate in the study and completed proper assent and consent documentation. The participants identify themselves as follows:

Hispanic: 8; African American: 4; Male: 4; Female: 8

All of the participants live in Central Florida. Their school is a new building that was built to answer the demand of a higher population of students coming from newly constructed housing developments. The median household income for this community was roughly $50,000 in 2005 (City Data, 2008).

The classroom environment for this study was a unique one. Since the school was only in its second year of operation, the students had access to brand new equipment. Moreover, the students of this science class had exclusive use of the classroom. Therefore, students had the ability to continue investigations from day to day without the worry of other classes coming in behind them. Lastly, as the only class that used that classroom space, the students had the opportunity to arrange and decorate the classroom as they chose. Some students elected to bring in pictures and hang them on the wall.

Materials

The curriculum used for this course is the inquiry based course InterActions©. The use of this curriculum is in accordance with our school district's task analysis and order of instruction. This district task analysis states that in addition to other benchmarks, the following benchmarks under Strand H, "The Nature of Science," must be met throughout the year (OCPS, 2008).

SC.H.1.3.1: The student knows that scientific knowledge is subject to modification as new information challenges prevailing theories, and as a new theory leads to looking at old observations in a new way.

SC.H.1.3.2: The student knows that the study of the events that led scientists to discoveries can provide information about the inquiry process and its effects.

SC.H.1.3.3: The student knows that science disciplines differ from one another in topics,

techniques and outcomes, but they share a common purpose, philosophy and enterprise.

SC.H.1.3.4: The student knows that accurate record keeping, openness, and replication are essential to maintaining an investigator's credibility with other scientists and society.

SC.H.1.3.5: The student knows that a change in one or more variables may alter the outcome of an investigation.

SC.H.1.3.6: The student recognizes the scientific contributions that are made by individuals of diverse backgrounds, interests, talents and motivations.

SC.H.1.3.7: The student knows that when similar investigations give different results, the scientific challenge is to verify whether the differences are significant by further study.

SC.H.3.3.1: The student knows that science ethics demand that scientists must not

knowingly subject coworkers, students, the neighborhood, or the community to health or property risks.

SC.H.3.3.6: The student knows that no matter who does science and mathematics or invents things, or when or where they do it, the knowledge and technology that result can eventually become available to everyone.

Instruments

Science Attitude Survey

An attitude survey was employed to gauge student's attitude towards science. The attitude survey was given to students before and after all other forms of data collection. The survey itself was adapted from a survey used by Orange County Public Schools to evaluate the effectiveness of a science grant. In another action research project, reference to the validity of the original survey was stated as:

> "Face validity for the survey was obtained by having a panel of science specialists, independent of those who developed the survey, examine the survey. The specialist were three county level science coordinators and two national science grant and survey specialist all of who had extensive experience working with science surveys." (Perlmutter, 2007 p.32)

Participation Grid

A participation grid was used to keep track of student time on task. Every ten minutes, the researcher would scan the room to see if the participants were on task. If the students were on task they would receive a check mark; if students were off task they would receive an "x" in the appropriate box.

Anecdotal Notes

As part of my regular teaching practice, I write notes to myself so that I can later reflect on the lesson and make appropriate modifications. Anecdotal notes consisted of informal observations collected while class was in session. The importance of these notes is that they enabled me to record observations including student interactions and comments made throughout the study. This instrument also helped to explain anomalies in the data such as "Student # 2 was very ill today and therefore was unable to participate."

Student Journals

Student Journals are a regular part of my teaching practice. Student journals allow the students to both reflect on their learning and to communicate with me. Students often write questions to me that they are embarrassed to ask in class. Students also use the journals to communicate concerns with me. For example, a common statement found in student journals is “Mr. Ashley, I do not want to work with…” All journals are checked and responded to. The journals are used as way to facilitate teacher/student communication. In the context of this study, the journals were used to gauge student interest in both topics and their delivery methods.

Student Interviews

Throughout the data collection period, students were asked some of the questions that appeared on the Science Attitude Survey. For example, question # 9 on the survey asks: Do you want to have a job in science someday?” Two weaknesses of the survey became apparent in this question. First, the survey does not inform the student of the vast number of jobs in science. Second, it does not allow students to elaborate on their answers. However, when I ask a student if they want to have a job in science someday the answers are returned with explanations and insight. If students asked if certain jobs fell in the category of science I would answer them yes or no. The interviews consisted of one to three questions at a time and were recorded in the anecdotal notes.

Lastly, after a student had an interview they would often return to their table and talk about the questions I asked them with their peers. These conversations between students provided insight to student attitudes towards science and were also recorded in the anecdotal notes.

Content Mastery Rubric

At the end of every learning cycle, the students were expected to do a project to demonstrate their mastery of the concept that was taught. Students were given the freedom to demonstrate their mastery of the content in a way that they choose so long as it is approved by the instructor first. Typically, all project requests were approved as long as they are relatable to the content, safe, and compatible with schedule and budget constraints.

Procedures

Data Collection

Data collection for this study began 05 November 2007 and concluded 23 January 2008. Attitude surveys were administered 05 November 2007 and 23 January 2008. Anecdotal notes, participation grid and student journals were evaluated every Tuesday, Thursday, and Friday. Lastly, content mastery was evaluated with a rubric at the conclusion of every learning cycle.

For the last 10 minutes of class Tuesdays, Thursdays and Fridays, students were given the opportunity to explore an area of science in which were interested. For example, one student indicated an interest in the life cycle of venus fly traps. That student spent his time researching venus fly traps and attempting to propagate venus fly traps in our classroom. At one point, a student began talking to his classmates about his experience in boy scouts performing an egg drop activity. The class was intrigued by this activity and a couple of students asked if we could use the last 10 minutes of class to work on an egg drop competition. After a class vote was performed, all except one student in the class voted to have an egg drop competition. For three weeks, everyone except the opposing student engaged in the egg drop activity.

Egg Drop Activity

Students were tasked with creating a vessel that would protect an egg from breakage after it was dropped from a height of 25ft onto concrete. The class agreed that in order to be fair everyone's vessel must fit inside a box that measured eighteen inches long, eighteen inches high, and eighteen inches wide. Students were challenged to integrate physical science concepts into the design of their vessels.

Analysis

Inductive reasoning was used to analyze the following qualitative data sources: anecdotal notes, student journals, student interviews. The science attitude survey, participation grid, and the content mastery rubric was analyzed and communicated as means and percents.

Credibility for this research was obtained by using both qualitative and quantitative data sources and triangulating them to check for reliability. Johnson (2008, p.102) writes: "Triangulation ensures that you are seeing all sides of the situation. It also provides greater depth and dimension thereby enhancing your accuracy and credibility."

CHAPTER FOUR: FINDINGS

Introduction

This action research project studied student attitudes towards science after they were given the opportunity to explore and investigate an area of science they were interested. Moreover, it was important to see if there was a direct correlation between student attitudes and academic achievement. Interest in this topic arose during a class conversation regarding the allocation of school funds to non-academic field trips and clubs. To define this study, two research questions were established:

Question # 1

How will student attitudes towards science change when they are given the opportunity to explore an area of science in which they have indicated an interest?

Question # 2

Will a change in my students' attitudes correlate to a change in their academic performance?

Data collection for this study included student journals, anecdotal notes, student interviews, participation grid, science attitude survey and a content mastery rubric. To answer the questions for the study, a triangulation table was established.

Table 1: Data Sources and Triangulation Applicability

	Question # 1	Question # 2
Anecdotal Notes	X	X
Content Mastery Rubric		X
Participation Grid	X	
Science Attitude Survey	X	
Student Interviews	X	
Student Journals	X	X

Question # 1

How will student attitudes towards science change when they are given the opportunity to explore an area of science in which they have indicated an interest?

The results of science attitude survey # 1 were fairly positive. Eleven of twelve participants stated that they look forward to coming to science class (Question # 4). However, only 7/12 participants indicated that they would like to pursue a job in science (Question # 9). Moreover, it is to note that only 6/11 students indicated that they enjoy watching science programming on television.

With eleven of twelve participants indicating that they look forward to coming to science class, it is important to note that the other questions might indicate the students have a more positive attitude towards science class than to the science curriculum.

When I first introduced the concept of self guided explorations to my class, the class greeted the news with mixed reviews. During the first week of data collection there were a lot of negative comments being made between the students. Some of the negative comments made include:

- I don’t understand why we have to do this.
- I don’t have the supplies to do what I want to do.
- Why doesn’t Mr. Ashley just tell us what to do – its too hard trying to come up with something to explore.

There were also some positive comments made throughout the first week. Some examples of positive comments made include:

- This is my favorite class.
- I’ve always wanted to see if different music will help plants to grow faster.
- I can’t wait to see what kind of bugs the venus fly trap eats.

The participation grid also told an interesting story. For the two weeks of the study, students were unlikely to remain engaged in an activity for a very long period of time. When students were off task and were prompted for a reason why, the most common response was “I don’t have…” It seemed that a lack of materials had plagued our efforts. One student wrote in her journal “Mr. Ashley, I would like to study sunflowers but my mom said she don’t have money for seeds.”

Refusing to allow a lack of supplies taint the action research, I asked the students to write a “grocery list” of supplies they needed on the front board. When everyone was finished writing I told the class that I would see if I could send a letter home and request the materials in a parent newsletter in the form of a classroom wish list. One of the items on the board was garbage bags. A student raised her hand and said that she could bring in garbage bags. Following her gesture, other students fell in suit and offered to bring in some of the items on the board. There were a few items left on the board, and I purchased those remaining items that evening.

It took about a week for all of the supplies to make it into the classroom. However, a positive trend in student attitudes had begun. Some students were becoming very excited about their projects and their positive energy was infectious. Students were researching their projects at home and working on them in class. For example, four students chose to work on a project to find what effect music had on plant growth. Daily, the students would alternate the music on IPods attached to growing chambers. For one student, her excitement came from wanting to prove to her friends that heavy metal would make plants grow faster because heavy metal was “energetic.”

For one student, the excitement of the exploration project actually had a very negative impact on his academic performance. The effect of the individual project had a positive effect on student # 12 until he became too engulfed in his project. Students were given ten minutes a day three days a week to work on their project. Some days that we were not scheduled to work on the project, student # 12 would shut down and refuse to be an active learner in class. He would refuse to remain on task and seemed to be angry for the majority of the class period. When asked what was bothering him he would indicate that he just wanted to work on his project. This negative attitude was amplified one day when a student yelled across the room that he needed to "man up and stop pouting."

The survey given at the end of the data collection showed an increase in positive attitudes for students. Interestingly, the biggest differences from data collected in survey 1 and survey 2 referenced questions that indicate the "doing" of science. For example, Questions # 13 & # 19 referenced the importance of doing research in science. Throughout this study, students would run into "problems" with their projects and ask for a solution from the teacher. Students soon learned that they would have to find their own solutions and would often ask if they could get a pass to the media center to perform their pertinent research.

One day of the study, I chose one survey question and decided to ask everyone in the study the same question. The question I asked all of the participants was (Question # 9) "Do you want to have a job in science someday?" That day, all 12 of the participants were present and so I decided to ask six of them the question while they were working on worksheets for their regular curriculum and I asked six of them the question while they were working on their individual projects; the results are shown in figures # 1 & 2.

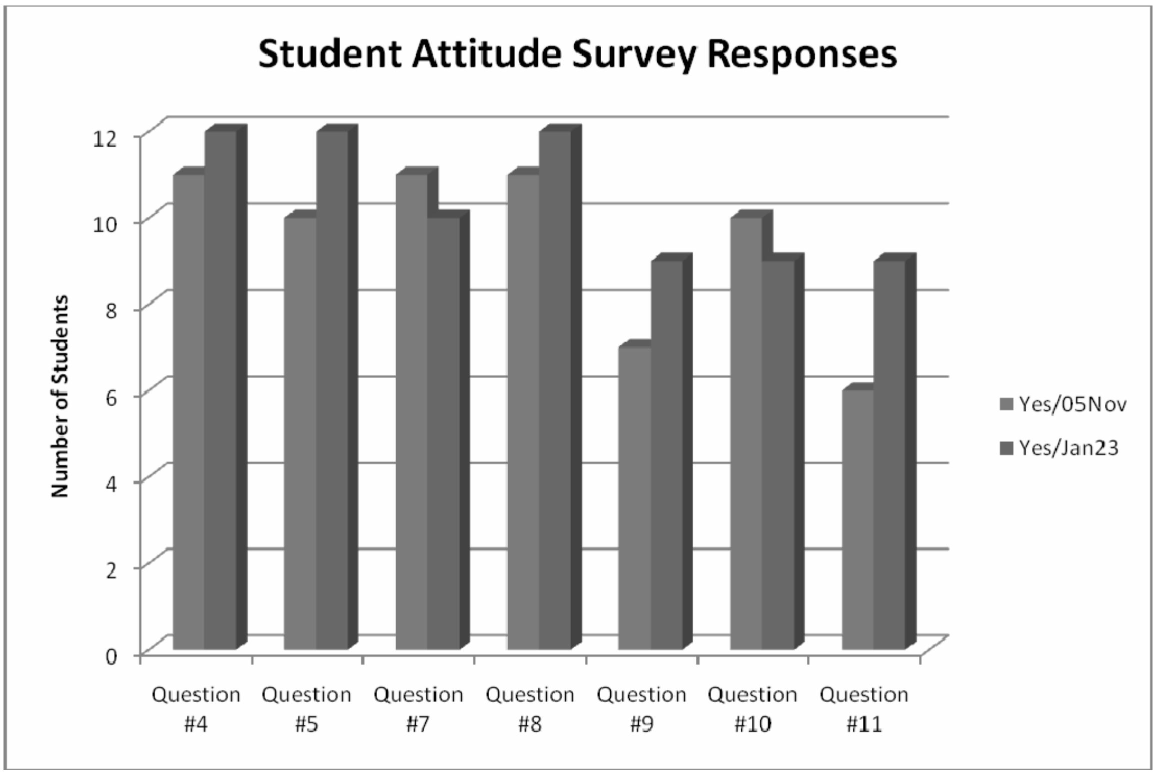

Figure 1

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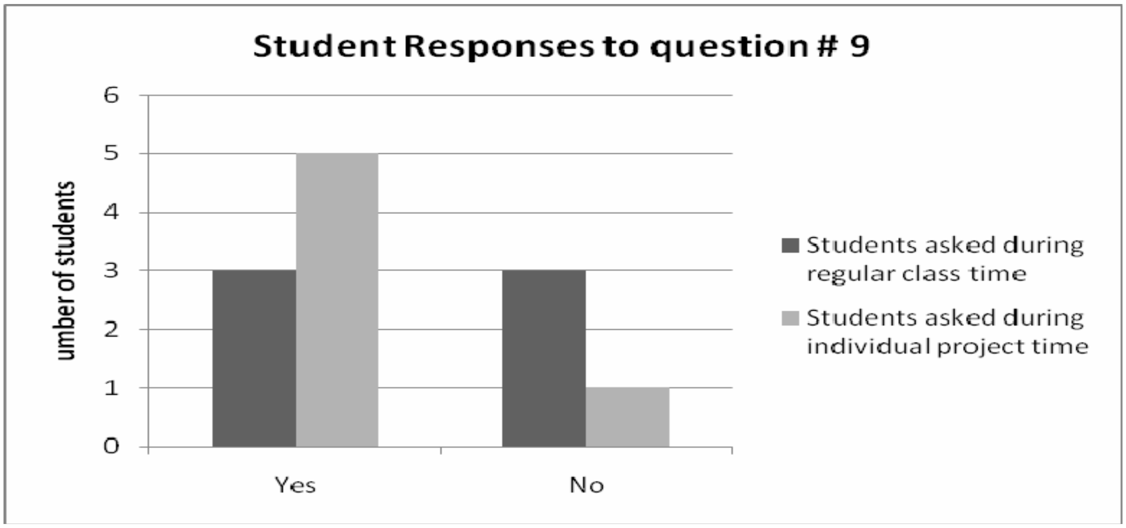

Figure 2

The results of these student interviews showed that students are more likely to view themselves working in the science field if they are activily engaged in an inquiry project. Moreover, when Question # 9 was examined on Survey 1 and Survey 2 a confirming trend developed. These results indicated that student interest in science as a career might be highly influenced by situational interest as described by Mitchell (1993).

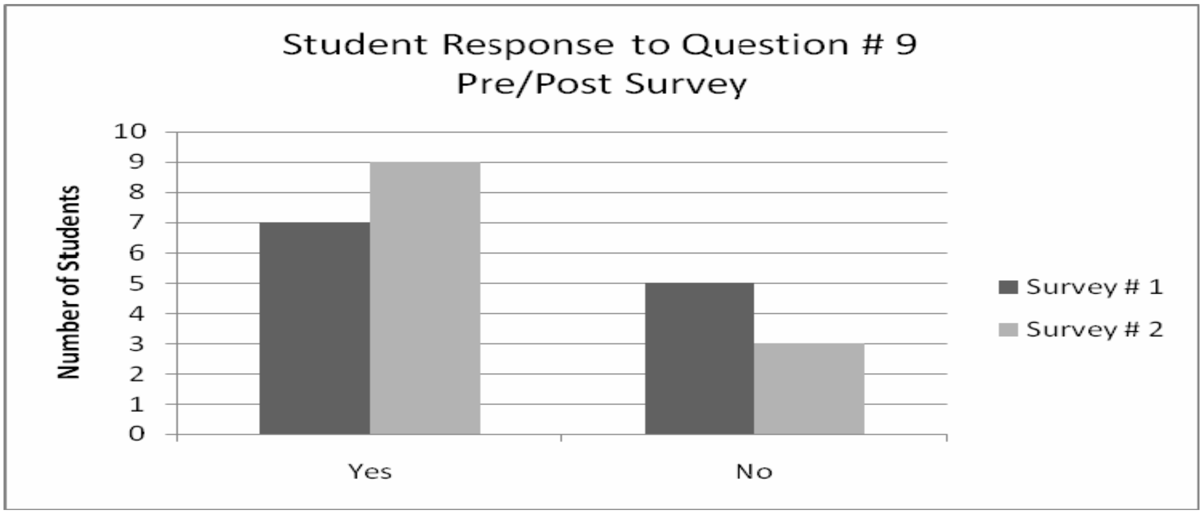

Figure 3

Question # 2

Will a change in my students' attitudes correlate to a change in their academic performance?

All of the participants except participant # 12 showed improvement in their attitudes towards science. Student # 12 actually developed a more negative attitude towards science as a result of the individual projects. When he chose to not engage in the activities of the prescribed curriculum, his academic achievement decreased. Even when the prescribed curriculum included inquiry based projects, student # 12 was not interested. His obsession with the individual project led to disappointment whenever he could not work on it. His disappointments led to a negative attitude and ultimately lower academic achievement as demonstrated in his content mastery projects.

The rest of the class showed an increase in positive student attitudes towards science. With the change in student attitudes came a change in determination levels; students became determined to find answers in their investigations. Typical student comments included:

- I know I can find the answer.
- We should see if extra water makes them grow faster.
- This does not make sense. There must be a variable we are not thinking about.
- Lets test it again to make sure it's right.
- (to another student) I don't get this, can you explain it to me?
- We should Google it to see if somebody else did this before.

Student journals also indicated a level of competitiveness and determination. One participant wrote: "I hope my vessel is the only one that works. I think I have worked harder than anyone else." For the students who showed a change to a more positive attitude, they became more engaged and determined. These students showed gradual increases in academic achievement as demonstrated by the content mastery projects.

Summary

Through analysis of the data provided by the studies instruments, the research questions were answered and there were also some unexpected results. In this action research it was found that given the opportunity to explore an area of science they are interested in, students' attitudes will change. The reliability of this conclusion was obtained after triangulation of the data sources. This will be discussed further in chapter five.

The data also indicated a link between student attitudes and their academic achievement. Just as a positive attitude led to higher academic achievement in most students, one student's negative attitude led to lower academic achievement. These results and a thorough discussion of this studies limitations and conclusions will be conducted in Chapter Five.

CHAPTER FIVE: DISCUSSION

Overview of the Study

The purpose of this action research project was to find if students would have a change in attitude towards science after they were given the opportunity to investigate a science topic they were interested. Moreover, this research attempted to find if a change in attitude would correlate to a change in academic achievement. More specifically, would the gaining of a positive attitude towards science result in higher academic achievement in science class? The research questions for this study were posed as follows:

Question # 1

How will student attitudes towards science change when they are given the opportunity to explore an area of science that they have indicated an interest?

Question # 2

Will a change in my students' attitudes correlate to a change in their academic performance?

To answer these questions, students were given a pre science attitude survey and were allowed to explore and area of science they were interested in for the last 10 minutes of class, three days a week. On days that we were collecting data, I used a participation grid to track if they were on-task throughout the period. Anecdotal notes, student journals and student interviews provided insight to the reasons students were responding the way they were.

To track academic achievement, a content mastery rubric was employed at the conclusion of each learning cycle. At the conclusion of the study, a post science attitude survey was given to the students. The qualitative data of this study was analyzed using inductive analysis. To achieve reliability and validity in this study, the data was triangulated across the all applicable instruments.

Summary of Findings

As the data was analyzed, certain trends and themes began to emerge. The majority of students showed an increase of positive attitude as a result of being able to explore an area of the science they were interested. One participant gained a negative attitude towards science. However, this one student gained a negative attitude because he only wanted to work on his individual project. When this student was not given permission to work on his individual project, he would shut down and become disengaged with the classroom lesson/activities.

We also found there to be a direct correlation between student attitudes and academic achievement. Students who gained a positive attitude demonstrated academic gains, and the one student, student # 12, who gained a negative attitude had lower academic achievement. Future research might include a case study of student # 12.

Conclusions

Anytime the participants of this study were conducting an investigation the students were reinforcing concepts found within the nature of science. As the students gained proficiency in the benchmarks contained in the nature of science, as indicated in the content mastery rubric, students became more confident and determined to find answers when we were learning the regular curriculum. It seemed as though a light bulb went off and students suddenly realized that real science was not difficult to understand and boring to learn. Students began to realize that science is about inquisitiveness and the process to gain understanding (National Research Council, 2000).

Another aspect of this study that cannot be underestimated is the environment in which this study took place. The participants of this study had ownership of a classroom that nobody else used. Therefore, students could leave their projects on a bench and not worry that anything would happen to it when they left. One student put it this way: “this is OUR classroom.”

With ownership comes responsibility and the majority of students began to take responsibility for their learning and growth. I believe this is an indicator of situational interest. Hidi & Renninger (2006, p. 113) wrote “situational interest refers to focused attention and the affective reaction that is triggered in the moment by environmental stimuli, which may or may not last over time.” There appeared to be a carryover effect from interest in science during the individual projects to an interest in science during normal classroom instruction.

Through the course of this study, the content mastery projects became increasingly complex and was evidence that higher order thinking was evolving to the norm. For example, the projects at the beginning of the study consisted mainly of posters and one page research papers. At the end of the data collection phase, two projects of interest were in process. One student was investigating the potential of elastic energy to prevent an egg from being broken during the egg drop. Another student was investigating the effect of drought on sunflower seed germination.

During the first two weeks of this study it became apparent that there might not be any benefit to individual explorations if students do not have access to their chosen materials. Students seemed almost resentful when it was suggested to them that they use substitute materials for the unobtainable materials for which their original project design called. One student was able to articulate it this way: "if I can't use the materials in my drawing then it's not really what I want to explore." Therefore, I believe that had I been prepared for this problem, we might have seen gains in positive attitudes towards science sooner.

Recommendations

This action research project has solidified my belief that teaching cannot simply be the covering of facts. Rather, we must take into consideration that student attitudes towards science can affect their academic achievement in science. Moreover, when students are disengaged from the learning process, it might be beneficial to give them an opportunity to explore aspects of the curriculum they are interested. When students are given the opportunity to produce work they can be proud of, the quality of their work will improve (Glasser, 1998).

As a result of this action research project, I will always incorporate individual explorations into my lessons. Even though the participants were not allowed to work on their individual projects for more than 30 minutes a week, the result of this activity was a complete change in student morale.

For the students, exploring an area of science they are interested in helped to reverse their previous assertions and negative attitudes towards science. Fredricks & Eccles (2006, p. 711) wrote: “participating in a range of extracurricular contexts may be beneficial because it may help a youth to compensate for negative experience in one particular activity.” Participants in the study often made comments that reinforced research. Samples of student comments include:

- I like this kind of science class.
- I like the fact that we are not just taking notes.
- This is the only class we are allowed to talk in.
- This is the first time I’ve ever had fun in science.
- I like how we can make our own labs – its tight!

Therefore, while not all teachers might have 30 minutes a week to devote to individual projects, teachers might compensate by encouraging students to join a science club. Again, while all of the projects reinforced the nature of science, the individual projects were rarely relatable to the prescribed science curriculum.

Limitations of Study

As an Administrative Dean, I have one class of 7th grade students. Even though I am the 8th grade administrator, all administrators are expected to provide supervision to the entire school. That being said, while another dean handles the discipline of all participants of this study, my students still see me primarily as a school administrator and disciplinarian. Therefore, students might respond differently to a full time teacher than they would to a person they view as a school disciplinarian.

Another limitation of the study included the scheduling of the data collection. Data collection for this action research began during the second marking period. Therefore, the participants had already been in this class for nine weeks when the study began. When the data collection began, students had already had multiple inquiry based labs and already comfortable with the format of the class.

Unfortunately, my current position only allowed me access to one class of students and of those students, 12 of them chose to participate in the study. The small sample size has limited implications to other teachers who do not share the same class demographics. For example, the 12 students included five students who required assent and consent forms in Spanish. These LEP students had unique needs that another teacher with a different class demographic profile might not find applicable.

This study had imbedded in it a series of assumptions. First, this study assumes that all students will remain truthful and will answer questions to the best of their ability. During the administration of the pre science attitude survey, one student did not answer all of the questions. Therefore, this oversight slightly alters some of the conclusions made from the pre and post surveys. This study also assumes that all student comments are sincere and that journal entries reflect students honest reflection on growth.

Two of the study's instruments, the science attitude survey and participation grid, have not been research tested for reliability and validity. However, in a previous study the science attitude survey had face validity established by being examined and approved by an independent panel of science specialist (Perlmutter, 2007). The face validity was altered when additional questions were added to the survey.

While this action research study was able to answer the two research questions, it has left me with more questions than answers. For example while there is current research supporting the implementation of academic clubs e.g.(Abernathy & Vineyard, 2001) (Braund & Reiss, 2006) (Fredricks & Eccles, 2006) (Hee-Sun & Songer, 2003) there seems to be a shortage of adequate research comparing the benefits science clubs with the benefits of allowing student led explorations during class time. While research shows that both are benefifical, I suggest future research compare the two to see which initiative results in higher academic achievement.

Over half of my class speaks Spanish on a regular basis. Therefore, my normal teaching practices include multiple ESOL strategies. I suggest that future research focus on the applicability of the results to different demographics of students. For example, if my participant demographic was primarily white, would I have observed similar gains in positve attitudes?

APPENDIX A: UNIVERSITY OF CENTRAL FLORIDA IRB APPROVAL

University of Central Florida

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Notice of Expedited Initial Review and Approval

From : **UCF Institutional Review Board**
FWA00000351, Exp. 5/07/10, IRB00001138

To : **Sam Ashley**

Date : **October 30, 2007**

IRB Number: **SBE-07-05202**

Study Title: **The Short Term Effect of Informal Science Education on Student Attitudes**

Dear Researcher:

Your research protocol noted above was approved by **expedited** review by the UCF IRB on 10/30/2007. **The expiration date is 10/29/2008.** Your study was determined to be minimal risk for human subjects and expeditable per federal regulations, 45 CFR 46.110. The category for which this study qualifies as expeditable research is as follows:

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

The IRB has approved a **consent procedure which requires participants to sign consent forms.** Use of the approved, stamped consent document(s) is required. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Subjects or their representatives must receive a copy of the consent form(s).

All data, which may include signed consent form documents, must be retained in a locked file cabinet for a minimum of three years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained on a password-protected computer if electronic information is used. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

To continue this research beyond the expiration date, a Continuing Review Form must be submitted 2 – 4 weeks prior to the expiration date. Advise the IRB if you receive a subpoena for the release of this information, or if a breach of confidentiality occurs. Also report any unanticipated problems or serious adverse events (within 5 working days). Do not make changes to the protocol methodology or consent form before obtaining IRB approval. Changes can be submitted for IRB review using the Addendum/Modification Request Form. An Addendum/Modification Request Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at http://iris.research.ucf.edu .

Failure to provide a continuing review report could lead to study suspension, a loss of funding and/or publication possibilities, or reporting of noncompliance to sponsors or funding agencies. The IRB maintains the authority under 45 CFR 46.110(e) to observe or have a third party observe the consent process and the research.

On behalf of Tracy Dietz, Ph.D., UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 10/30/2007 11:24:21 AM EST

Joanne Muratori

IRB Coordinator

APPENDIX B: ORANGE COUNTY PUBLIC SCHOOLS PERMISSION TO CONDUCT RESEARCH

APPENDIX C: PRINCIPAL APPROVAL

Greg Moody, Principal
3801 Wetherbee Rd.
Orlando, FL 32824
Phone(407)251-2413
Fax (407)251-2464

September 20, 2007

Institutional Review Board
Office of Research and Commercialization
12201 Research Parkway, Suite 501
Orlando, FL 32826

To Whom it May Concern:

I am aware of the thesis proposal by Sam Ashley.

I fully support Mr. Ashley in his Educational pursuits and herby grant permission for him to conduct research with our students at South Creek Middle School

If you have any questions, please contact me.

Regards,

Greg Moody
Principal
South Creek Middle School

http://southcreek.ocps.net

APPENDIX D: SCIENCE ATTITUDE SURVEY

Science Attitude Survey

This questionnaire is being conducted with students to find out how they feel about science. Your answers are very important. We will use your input to improve science programs at the school.

To complete these questions, please follow the directions and circle your confidential responses.

The first part asks you to describe yourself.

1. What is your grade level?

   Grade 6 Grade 7 Grade 8

2. What is your race or ethnicity?

   Asian African American Hispanic Caucasian Other

3. What is your gender?

   Female Male

4. Do you look forward to science time at school?

   Yes No

5. Do the things you learn in science help you understand things that happen in the world around you?

   Yes no

6. Do you think science is more useful for boys than girls?

   Yes No

7. Does a learning new thing in science help you answer questions?

   Yes No

8. In science, does your teacher appreciate it when you ask questions?

   Yes No

9. Do you want to have a job in science someday?

Yes No

10. Is it important to know science to get a good job?

Yes No

11. At home, do you talk about science activities that you have learned at school?

Yes No

12. In science, how often do you follow written directions to do an activity?

Never Few Times Many Times Always

13. In science, how often do you use manipulatives such as blocks, rulers, cubs or a magnifying glass to solve a problem?

Never Few Times Many Times Always

14. In science, how often do you work in groups to learn an idea or solve a problem?

Never Few Times Many Times Always

15. In science, how often do you read from a book or printed material?

Never Few Times Many Times Always

16. In science, how often do you discuss how science is used in everyday life?

Never Few Times Many Times Always

17. How often do you discuss how science is used in everyday life?

Never Few Times Many Times Always

18. How often do you learn about people who are scientist or mathematicians?

Never Few Times Many Times Always

19. How often do you use the internet to find information for science?

Never Few Times Many Times Always

20. Do you enjoy watching science programs on television?

Yes No

21. Do you enjoy being outside in nature?

Yes No

22. Have you ever been camping?

Yes No

Thank you for participating in the science questionnaire. Your answers are very important.

APPENDIX E: SCIENCE ATTITUDE SURVEY, SPANISH

Encuesta Actitud hacia Ciencia

Este cuestionario a sido creado con el motivo de saber como se sienten los estudiantes sobre la materia de Ciencia. Tus respuestas son muy importantes, ya que basadas en ellas vamos a mejorar nuestro programa de Ciencia en la escuela.

Para completar estas preguntas favor de seguir las instrucciones y circula tu respuesta confidencialmente.

La primera parte te pregunta que te describas.

1. ¿Que grado cursas?

grado 6　　grado 7　　grado 8

2. ¿Cuál es tu raza o etnicidad?

Asiático　　Afro Americano　　Hispano　　Anglo　Otro

3. ¿Cuál es tu sexo?

Femenino　　Masculino

4. ¿Te motiva ir a la clase de Ciencia en tu escuela?

Si__　No__

5. ¿Lo que estas aprendiendo en la clase de Ciencia te ayuda aprender a entender el mundo que te rodea?

Si__　No__

6. ¿Crees que la clase de Ciencia es mas beneficioso para los niños o que para las niñas?

Si__　No__

7. ¿Cuándo aprendes algo nuevo en la clase de Ciencia te ayuda aclarará tus dudas?

Si__ No__

8. ¿En la clase de Ciencia, el maestro se muestra interesado cuando haces una pregunta?

Si__ No__

9. ¿Te gustaría algún día un trabajo en Ciencia?

Si__ No__

10. ¿Es importante saber de Ciencia para conseguir un trabajo?

Si__ No__

11. ¿En tu hogar hablas de las actividades aprendidas en tu clase de Ciencia?

Si__ No__

12. ¿En tu clase de Ciencia con que frecuencia sigues las instrucciones escritas en la escuela?

Si__ No__

13. ¿En la clase de Ciencia con cuánta frecuencia utilizas bloques, reglas, cúbicos o una lupa?

Nunca__ Pocas veces__ Muchas veces__ Siempre__

14. ¿Con cuanta frecuencia trabajas en grupos para aprender una idea o resolver un problema?

Nunca__ Pocas veces__ Muchas veces__ Siempre__

15. ¿En tu clase de Ciencia con cuanta frecuencia lees de un libro o algún material imprento?

Nunca__ Pocas veces__ Muchas veces__ Siempre__

16. ¿En tu clase de Ciencia con cuanta frecuencia ustedes discuten como la Ciencia es utilizada en tu vida diaria?

Nunca__ Pocas veces__ Muchas veces__ Siempre__

17. ¿Con cuanta frecuencia tu discutes como la Ciencia es utilizada en ti vida diaria?

Nunca__ Pocas veces__ Muchas veces__ Siempre__

18. ¿Con cuanta frecuencia tu aprendes sobre personas que son científicos o matemáticos?

Nunca__ Pocas veces__ Muchas veces__ Siempre__

19. ¿Con cuanta frecuencia utilizas la red cibernética para buscar información sobre Ciencia?

Nunca__ Pocas veces__ Muchas veces__ Siempre__

20. ¿Disfrutas viendo programas de Ciencia en la televisión?

Si__ No__

21 ¿Disfrutas estar afuera en la naturaleza?

Si__ No__

22. ¿Has ido alguna vez acampar?

Si__ No__

Gracias por participar en esta encuesta de Ciencia. Tus respuestas son muy importate.

APPENDIX F: PARENTAL CONSENT AND STUDENT ASSENT FORMS

Dear Parent or Guardian:

My name is Sam Ashley and I am your child's Science Teacher. I am also a graduate student in the Lockheed Martin K-8 Mathematics and Science program at the University of Central Florida. I am currently conducting research on student attitudes towards science after they are given positive exposure to science through informal science programs. The goal of my research is to find ways to increase student interest in science.

With your permission, I will video/audio tape your child while they are participating in the various activities in the class. I will also ask them to fill out a questionnaire so that I can gauge their current attitude towards science class. Participation in this study is voluntary and your child may participate in the activities even if you do not wish for them to participate in the study. Lastly, I will track your child's progress in science class for both academic and participation performance.

Your child's identity will be kept confidential during this study. All information that links your child to the data collected will be destroyed at the competition of the study. I do not anticipate any risks to your child while they are participating in this study. The purpose of this study is not to analyze your child. Rather, the purpose of this study is to evaluate the effectiveness of informal science education in our classroom and I plan on using the results of this research to improve my teaching strategies.

If you have any questions about this study, you may contact me at 407 251-2413x2322. You may also contact my research chair, Dr. Robert Everett, at (407)823-5788. You may withdrawal consent at any time. Questions or concerns about participant's rights may be directed to the UCF IRB Office of Research and Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32806. The hours of operation are Monday through Friday, 8:00a.m. – 5:00 p.m. The phone number is (407)823-2901.
Thank you!

I have read the procedure described above and understand what is being asked of my child as a participant of this research study. I voluntarily agree to allow my child to participate in the study and to be video/audio taped during class and interview sessions. I have received a copy of this form.

- O I give consent for my child to participate in the study and to be video/audio-taped during class time.
- O I would like more information about this study.

Name of Child________________

________________________ Name of Parent/Guardian (Printed)

________________________ Name of Researcher (Printed)

________________________ Name of Parent/Guardian (Signed)

________________________ Name of Researcher (Signed)

________________________ Date

________________________ Date

Querido padre o encargado:

Mi nombre es Sam Ashley y soy el maestro de ciencia de su hijo(a). Me gradué de la Universidad de la Florida Central con concentración en Matemáticas y Ciencia. Actualmente estoy realizado una investigación sobre la manera de pensar de los estudiantes hacia la clase de ciencia, después de haber sido expuestos de manera informal a un programa en la materia. Mi meta en esta investigación es el de aumentar el interés del estudiante en ciencia.

Con su autorización, le estaré tomando videos a su hijo(a) mientras está participando en diferentes actividades en el salón de clase. Los estudiantes también llenarán un cuestionario para poder determinar su interés hacia la clase. La participación en esta investigación es voluntaria. Su hijo(a) podrá participar en las actividades de la clase aunque usted no quiera que participe en la investigación. Y por último, seguiré el progreso de su hijo/a en la clase de ciencia y evaluaré su participación y desempeño académico en la misma.

La identidad de su hijo(a) estará protegida ya que todo se hará de manera confidencial y toda la información será destruida al concluir el estudio. Yo no anticipo ningún riesgo para su hijo(a) mientras participa en esta investigación. El propósito de esta investigación no es el de analizar a su hijo(a). Mi propósito es el evaluar la efectividad del programa y utilizar estos resultados para mejorar mis estrategias de enseñanza.

Si tiene alguna pregunta acerca de esta investigación, por favor comuníquese conmigo al 407-251-2413 ext. 2322. También se puede comunicar con el encargado de la investigación, el Dr. Robert Everett al 407-823-5788. Usted puede retirar su consentimiento en cualquier momento. Preguntas o preocupaciones acerca de los derechos de los participantes pueden ser dirigidas a la oficina de investigaciones llamada "UCF IRB Office of Research and Commercialization." La dirección es 12201 Research Parkway, Suite 501, Orlando, Fl. 32806. Las horas de oficina son de lunes a viernes de 8:00 a.m. – 5:00 p.m. El teléfono es 407-823-2901.
Gracias!

Yo he leido el procedimiento descrito previamente y entiendo lo que se le pide a mi hijo(a) al participar en esta investigación. Yo, voluntariamente estoy de acuerdo en que mi hijo participe en este estudio y que le tomen video durante la clase y sesiones de entrevistas. Yo recibí una copia con está información.

- O Yo doy mi consentimiento para que mi hijo(a) participe en este estudio y que sea grabado en video

- O Me gustaria tener mas información acerca de este estudio/investigación

________________ Nombre de mi hijo(a)	________________ Nombre del investigador
________________ Nombre del padre o encargado (en letra de molde)	________________ Firma del Invetigador
________________ Firma del padre o encargado	
________________ Date	________________ Date

September 20th, 2007

Dear Student:

Like you, I am a student. I am a graduate student at the University of Central Florida. Like other scientists who conduct research, I am conducting research on how I teach our class. I am studying how students view science after they have had fun doing science.

I would like you to participate in the study. However, your participation is not mandatory and if you choose not to participate in the study, you can still participate in the activities we will be doing. There will not be any benefit to participating in the study; extra credit will not be given.

If you would like to participate in the study, please fill out the form below and return it to me.

Thank you!

Mr. Ashley

By signing below, I am saying that I understand my role in the study to be conducted by my teacher. I have asked any questions that I may have had, and those questions were answered so that I understand what I will be expected to do. By signing, I am saying that I am willing and would like to participate in the study.

____

Student Name (Printed) Student ID

____________________________ ____________________

Student Name (Signature) Date

September 20^{th}, 2007

Querido estudiente:

Al igual que tu, yo también soy un estudiante. Soy un estudiante de estudio graduado de la Universidad Central de la Florida. De igual manera que otros Maestros de Ciencia hacen estudios, yo también estoy haciendo un estudio sobre la enseña en un salón de clase. Mi estudio se basa en la forma que los estudiantes ven la Ciencia, después de haber participado de una clase de Ciencia divertida.

Me gustaría que fueras parte de este estudio. Sin embargo, tu participación no es mandataria y si no quieres participar del estudio, eso no te privaría de participar en otras actividades que vamos a estar realizando. No habrá ningún beneficio por participar en el mismo y no se dará créditos extra.

Si quieres participar del estudio, por favor encasilla la forma que se encuentra adjunta a esta carta y devuélvala a este servidor.

Gracias,
Mr. Ashley

Firmando este documento, yo estoy confirmando que entiendo mi rol en este estudio conducido por el maestro. Toda pregunta que tuve la hice y fue contestada, para yo poder entender y saber que hacer en el momento dado. Firmando este documento confirmo que estoy dispuesto y quiero participar de este estudio.

Nombre del estudiante (Letra de molde)	Número de estudiante
Firma del estudiante	Fecha

APPENDIX G: PERMISSION TO USE SURVEY INSTRUMENT

1 October 2007

To Whom It May Concern:

I, James Perlmutter, hereby grant Samuel Ashley to use as is or to alter to his specific needs the Attitude Survey, that I helped to write for the SMART Grant and used in my 2006 thesis, The Effect of an Inquiry-Based Science Curriculum on Student Attitudes and Participation. Samuel has permission to use the survey in any way he sees fit for his current UCF thesis.

Sincerely,

James M. Perlmutter

APPENDIX H: PERMISSION TO USE PROJECT LEARNING TREE MATERIALS

Ashley, Samuel A.

From: Seitz,Jennifer A [jacohen@ufl.edu]
Sent: Friday, September 28, 2007 5:45 PM
To: Ashley, Samuel A.
Subject: RE: PLT - Thesis

Hi Sam,

Yes, I remember you! Thank you for asking permission to use PLT materials in your research. I'm excited about your research- yes you have Florida PLT's permission.

I do ask that you provide a copy of your abstract or executive summary, regardless of what you find out in the end. It's good for us to know what the research shows.

Best of luck,
Jenny Seitz
State Coordinator

APPENDIX I: CERTIFICATION OF ACCURATE TRANSLATION

Greg Moody, Principal
3801 Wetherbee Rd.
Orlando, FL 32824
Phone(407)251-2413
Fax (407)251-2464

September 25th. 2007

To Whom It May Concern:

I have reviewed the documents that are being attached and hereby certify that they accurate translations from English to Spanish.

If you have any questions, please contact me.

M. Rosa.
Matilde Rosa-Jimenez
BA.ED.MA. TESOL, CAGS. ED. ADM
South Creek Middle School-ESOL CCT

APPENDIX J: PARTICIPATION GRID

Participation Grid

Date___________________________

Project Title____________________

Notes____

____

____

____

____

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