

Informal Learning Environment: Summer Outdoor Science Experience

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Abstract The Spring Mill State Park field trip was organized through university-community partnership in the summer of 2011 to expose students to outdoor learning environment. Informal Learning in outdoor environment, like all learning, can be categorized into the domains of concept knowledge, how students view themselves as learners, and the skills they require to engage in the activities of scientists. The purpose of this field trip was to give students outdoor science experience, to expose them to science learning environment outside the laboratory setting. Sixty-five, third-fifth grade students along with their parents participated in the field trip and completed the survey response. Results suggested that 49.15% student participants indicated that they have never visited a state park before this field trip. 90% of student participants indicated that the Spring Mill State Park field trip was a great experience for them. 50% student participants indicated that the Nature Center activity was their most favorite activity. 38.3% student participants indicated that they have never seen a space capsule or space suite before this field trip. Furthermore, Pearson's Chi-squared test of independence was conducted to test the hypothesis if the learning attitudes were different between male and female student participants. Free statistical software "R" version 3.0.2 (2013) was used to analyze the data. The results suggested that as the p-value was greater than the .05 significance level, the null hypothesis was not rejected that the male participants' response to all learning attitude questions was independent of female students.

Keywords: *informal learning, Chi-square test, contextual model, Spring Mill State Park*

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1. Introduction

Literature over the last several decades has demonstrated that field trips can be designed to effectively support student learning experiences and that field trips are valuable learning experiences student (Anderson & Lucas, 1997; Bamberger & Tal, 2008; Davidson, Passmore, & Anderson, 2010; Hurd, 1997; Luehmann, 2009; Sturm & Bogner, 2010). Studies conducted by (Falk & Dierking, 1997; Wolins, Jensen, & Ulzheimer, 1992; Stavrova & Urhahne, 2010; Pace & Tesi, 2004) suggest that students can recall their field trip experience even after a long time. Studies have also suggested that it can increase student interest in science (Bonderup Dohn, 2011; Jarvis & Pell, 2005; Zoldosova & Prokop, 2006) and can also influence their career choice (Salmi, 2003; Cosmos Corporation, 1998) and increase positive feelings toward a topic (Csikszentmihalyi & Hermanson, 1995). "Field trip importance is supported by professional organizations such as the National Science Teachers Association which asserts field trips can "deepen and enhance" classroom study (NSTA 1999) and the National Research Council who assert a quality science curriculum is one that extends beyond the walls of the classroom (1996)" (CAISE, 2013).

The main purpose of this field trip was to provide students an experiential learning by being connected with the natural world. According to (Braund & Reiss, 2004) retrieved from Bloom et. al. (1965), there are three domains of learning science outside the classroom (1) Cognitive Domain: the development of knowledge and intellectual skills including: recall of knowledge, comprehension of meaning, application of knowledge, analysis of data, synthesis of new meaning, and the evaluation of process, artifacts or solutions; (2) Affective Domain: the manner in which we respond to and show appreciation of and enthusiasm for phenomena and events. The ways in which we develop attitudes and values and how these relate to those of other people; (3) Psychomotor Domain: the how sensory inputs are filtered and lead to actions. Learners' actions become more skillful, coordinated and adapted as experience and expertise develop. Learning in informal setting gear more toward the first two domains as oppose to third domain. Falk, & Dierking (2000) developed Interactive Experience Model which was later modified as Contextual Model helps us understand learning in informal setting rather than formal school setting. By "informal setting" (Falk, & Dierking, 2010) refer to students having some freedom of choice in what they do, the directions of learning or the amount of time and effort spent. In the present study the

affective domain was adopted where students were given opportunity to explore Virgil I. Gus Grissom Memorial Museum, The Pioneer Village, The nature walk and snake presentation, and the Twin Caves at the Spring Mill State Park and finally expressed what they have experienced.

2. Assessing Affective Domain in Informal Outdoor Science Learning Environment

The affective (in Latin, meaning "feelings") domain includes a host of constructs, such as attitudes, values, beliefs, opinions, interests, and motivation (Krathwohl, Bloom, & Masia, 1964). Despite the importance of affective domain in science education and science learning, not much research has been conducted in this domain as compared to cognitive domain (Carleton NAGT Workshops, 2014). This disparity may be because "archetypal image of science itself," where reason is separated from feeling and the "long-standing cognitive tradition" of science education research (Alsop & Watts, 2003, p. 1044). A contemporary view is that the "affective dimension is not just a simple catalyst, but a necessary condition for learning to occur" (Perrier & Nsengiyumva, 2003, p. 1124). "Attitude and motivation are indeed the most critically important constructs of the affective domain in science education" (Carleton NAGT Workshops, 2014). Informal Learning in outdoor environment, like all learning, can be categorized into the domains of concept knowledge, how students view themselves as learners and the skills they require to engage in the activities of scientists. The purpose of informal learning environment is to provide positive non-intimidating and fun filled opportunity to students to increase their interest in science. Affective domain as commonly known as "Methodology for Creating a Quality Learning Environment," is part of a system that was published in 1964 (Krathwohl et. al., 1964) for identifying, understanding, and addressing how people learn. As the affective domain describes learning objectives that emphasize a feeling tone, an emotion, or a degree of acceptance or rejection, the current study will assess, especially, receiving, responding, and valuing components of affective domain, however, organization and characterization assessment could not be addressed as it is beyond the scope of the present study.

There are a large number of such objectives in the literature expressed as interests, attitudes, appreciations, values, and emotional sets or biases (Krathwohl et al, 1964). In this field study, we were interested in student participants' response as to what they learn, and whether they value what they learn and be able to think themselves as young scientists. We are also interested in students' attitudes toward science, scientists, learning science and specific science topics. Affective domain is essential for learning as it includes learning styles and motivation, communication as some of their factors, in the present study, we used outdoor learning experience and learning with nature as motivational tool to increase students interest in science. Our goal as an educator is to use positive reinforcement tool as stated operant conditioning learning theory (Skinner, 1938) or communications that go straight to the affective domain and prevent students from becoming engaged. In formal classroom teaching,

the majority of the teacher's efforts typically go into the cognitive aspects of the teaching and learning and most of the classroom time is designed for cognitive outcomes. As we are aware that we have challenge of addressing diverse group of learners, some students just cannot learn in a regular classroom setting, they are more observational learning. Using this kind of learning environment, we are able to capture those students who otherwise would not have opportunity to express their science learning interest. Thus, there is significant value in realizing the potential to increase student learning by tapping into the affective domain. Similarly, students may experience affective roadblocks to learning that can neither be recognized nor solved when using a purely cognitive approach.

3. Methods

3.1. Research Design

This study used a non-experimental exploratory research design. In non-experimental research design, control of independent variables is not possible (Kerlinger & Lee, 2000). Since this research design is commonly used in educational research, it is seldom possible to have full control over variables or to randomly select subjects (Sadler & Tai, 2000). Likewise, this research did not attempt to seek cause-effect relationships, therefore, non-experimental research design was appropriate to use. **Data Collection:** Sixty-five, third-fifth grade students along with their parents participated in the field trip. The total student participants consisted of 33 male and 32 female. There were all together 12 chaperon which included community partners, university staff, and parents. The field trip was to Spring Mill State Park in Indiana. Participants were all students who were enrolled in Martin University NASA Science Engineering Mathematics Aerospace Academy (SEMAA) Program. Field trip satisfaction survey, which consisted of nine questions, was administered at the end of trip on way back to campus to assess students experience with outdoor science learning. All entered data were examined and checked for accuracy and completion. The data were entered into spreadsheet and then crosstabs were run for coding verification. Data screening was also conducted by running a series of frequency distributions. Pearson's Chi-squared test of independence was used to test the hypotheses if the learning attitude was significantly different between male and female participants. For chi-square test, variables were cross-tabbed with the dependent variable to ensure adequate cells' frequencies. If any cell had a value less than five, then the response categories were collapsed and recoded. A thorough review of the collected data was conducted to assess accuracy incomplete information. Free statistical software "R" version 3.0.2 (2013) was used to analyze the data.

4. Results and Discussion

The field trip to the Spring Mill State Park was a wonderful learning opportunity for our summer SEMAA students. This not only gave students a chance to

experience new things, but also allowed them to be able to explore, investigate, inquire, analyze, predict, and make real life connections to a number of concepts they learned through our NASA SEMAA Summer Program. The Pioneer Village was an excellent chance for the students to compare and contrast engineering achievements past and present. The aqueduct, water wheel and working mill enabled our students to see water as an energy source, as well as many simple machines at work. Students related their Rube-Goldberg project experiences, the Scientific Method, and trial and error, to the struggles of early pioneer life. They were then able to make connections about how early pioneers were a lot like NASA's early astronauts; courageous, willing to take risks, and early explorers of the unknown. The Twin Caves boat ride was also a great learning experience for our students. The total darkness, temperature of 54°F, (when the temperature outside was 98°F), different living organisms, and unusual geologic formations provided more insight to the many different types of environments we have here on our own planet. It was exciting to see students compare this experience to their Biome projects, and then to engage in conversation about what might be possibly found under the surface of other planets in our solar system. The Nature Center and Snake presentation was a favorite of many of our students. Prior to the presentation several students had expressed a fear of snakes, and many had preconceived ideas about snakes; such as they are slimy, and they all are poisonous. The presentation and discussion was very informative, and it helped them to understand and identify different types of snakes, and understand their importance to our ecosystems. The Nature Center also provided an opportunity for students to observe, read about, and ask questions about different plants and animals found in the park. The highlight of our field trip was the Virgil I. Gus Grissom Memorial Museum. In addition to the many artifacts related to Grissom's early years growing up Indiana, students were able to engage in several different hands on and computer activities. A favorite was flying a model plane by controlling pitch, yaw and roll. Our students were familiar with the function of the parts of the airplane from doing an earlier project, so they were able to do this interactive with great success. At the end of the field trip a satisfaction survey was administered to determine student participants' satisfaction with field trip. Results suggested that 49.15% student participants indicated that they have never visited a state park before this field trip. 90% of student participants indicated that the Spring Mill State Park field trip was a great experience for them. 50% student participants indicated that the Nature Center activity was their most favorite activity. 38.3% student participants indicated that they have never seen a space capsule or space suite before this field trip. The above results indicate students' response to their outdoor learning experience. The author was further interested in knowing if these responses varied with respect to gender. To test this hypothesis, chi-square test of independence was conducted and the result is shown below. As the p-value 0.7112 is greater than the .05 significance level, the null hypothesis was not rejected that male students responding to nature activity as one of their best activity was independent of female students. The result is depicted on [Table 1](#).

Table 1. Student participants indicated that the Nature Center activity was their most favorite activity

	Yes	No	Total
Male	18	15	33
Female	15	17	32
Total	33	32	65

N =65, $\chi^2 = 0.1371$, df=1, p =0.7112

As 90% of student participants indicated that the Spring Mill State Park field trip was a great experience for them, we further hypothesized if this was true for both male and female participants, the chi square test showed as the p-value 0.99 is greater than the .05 significance level, the null hypothesis was not rejected indicating that male students responding to that the Spring Mill State Part field trip was a great experience for them was independent of female students. The result is depicted in [Table 2](#).

Table 2. Student participants indicated that the Spring Mill State Part field trip was a great experience for them

	Yes	No	Total
Male	30	3	33
Female	30	2	32
Total	60	5	65

N =65, $\chi^2 = 0.00$, df=1, p =0.99

The result from the survey showed that 49.15% student participants indicated that they have never visited a state park before this field trip. To test if this was true for both male and female participants; the chi square test was conducted, the result indicated that difference was not statistically significant between male and female participants. The result is shown in [Table 3](#).

Table 3. Student participants indicated that they have never visited a state park before this field trip

	Yes	No	Total
Male	17	16	33
Female	16	16	32
Total	33	32	65

N =65, $\chi^2 = 0.00$, df=1, p =0.99

As survey response showed that 90.77% student participants indicated the twin caves boat ride was the best experience. The chi square test indicated as the p-value 0.9914 is greater than the .05 significance level, the null hypothesis was not rejected indicating that male students' response to twin caves boat ride was the best experience was independent of female students. The result is depicted in [Table 4](#).

Table 4. Student participants indicated the twin caves boat ride was the best experience

	Yes	No	Total
Male	31	2	33
Female	29	3	32
Total	60	5	65

N =65, $\chi^2 = 0.00$, df=1, p =0.9714

The chi square test showed as the p-value 0.09983 is greater than the .05 significance level, the null hypothesis was not rejected indicating that male students' response regarding if the space room was their favorite activity was independent of female students. The result is depicted in [Table 5](#).

Table 5. Reponses regarding if the space room was their favorite activity

	Yes	No	Total
Male	18	15	33
Female	10	22	32
Total	28	37	65

N =65, $\chi^2 = 2.7082$, df=1, p =0.09983

As 79.23% student participants indicated snakes activity was best experience. The chi square test showed as the p-value 0.8281 is greater than the .05 significance level, the null hypothesis was not rejected indicating that male students' response regarding if the snakes activity was their favorite activity was independent of female students. The result is depicted in Table 6.

Table 6. Student participants indicated snakes activity was the best experience

	Yes	No	Total
Male	24	9	33
Female	25	7	32
Total	49	16	65

N =65, $\chi^2 = 0.0471$, df =1, p =0.8281

The following Table 7- Table 11 show the overall all responses regard the outdoor learning experience.

Table 7. Showing Student Participants' Response Regarding two facts about Gus Grissom Museum Visit

Types of Response
He died because he could not get out of the fire.
He got average grades.
He had a lot of confidence.
Never gave up.
He died on a launch pad inside a space ship.
He worked at NASA.
He was a boy.
He wanted/loved to fly.
He was a pilot.
He was so good to a point.
He was in the Navy.
Died on January 23.
Second man to orbit the earth.
Fighter plane pilot.
Flew in World War 2.
Died in 1873.
Had three siblings.
Died on Glacier 3.
Went to space twice.
He was an astronaut.
Died on January 3.
Made a rocket called Liberty Bell.
Died in 1967.
He flew plane.
He got an F in 2 semesters.
He was the wing man.
Had two children.
Died at a young age.
Was the first to go to space
In July 21, 1981 Gus and two other people went in a shuttle for test.
Born in 1926.
He landed in the middle of the ocean.
He died in an oxygen explosion.
He lived up the road.
He died with three other men.
Joined the air force.
Died when the spark went off.
Married to Betty Moore.
Second captain to go into space.
First to go to space twice.
Almost drowned in the Atlantic Ocean.
Went into space and circled for fifteen minutes.
Died while testing the Apollo.
He was in the Mercury project.
He was one of the seven who made it.
Had kids.
First person to orbit the earth.
Flew to space.
He was the only man to fly to outer space.
Traveled a lot.
Went to college at last minute.
Raced in space to see who could orbit earth first.
Rode in the Molly Brown

Table 8. Showing Comparison of two challenges that pilgrims faced in the past that astronauts are facing now

Types of response
They couldn't take anything with them.
Ships that go to different planets.
They didn't have money.
Food.
Had a problem with stuff not functioning.
Ways of making better things.
Finding things.

Table 9. Showing Student Participants' response on their two observations that they had from either the cave or snake activity

Types of Response
There are milk snakes.
Milk snakes are not venomous.
Never knew about milk snakes.
Never knew about water snakes.
The snakes were smooth.
Snakes shed.
Milk snakes eat mice.
Only four snakes in Indiana are venomous.
Water snakes' scales are rougher than most
Water makes the caves form.
Land snakes have smooth skin.
Water snakes are smooth.
Land snakes are rough.
There are a lot of different types of snakes
Snakes may look poisonous, but are not.
Garden snakes are found around ponds.
Snakes are scaly.
The snakes were cool.
If red touches yellow you're a dead fellow.
One snake was soft/smooth.
One snake was rough/hard.
There are three venomous snakes in Indiana.
They were all small.
A copper head lives in Indiana.
The snakes were scary.
Snakes are wiggly.
Only deadly snakes in the United States.
Diamond Head snakes are poisonous.
Two snakes were asleep.
One snake was hiding.
The cave was awesome.
One snake was slimy.
The cave had a lot of cave kisses.
The snakes in the boxes were real.
There is a method on how you can tell if a snake is poisonous.
Some snakes are poisonous, while some are not.
Saw a leopard frog.
Saw a cave fish.
Water snakes are rough.
Snakes eat every two weeks.
Smell two different directions.
The cave is made of limestone.
The cave was 54° F.
There were water snakes.
Riddle about snakes

Table 10. Showing student participants' response regarding their favorite activity

Types of Response
Caves
Snakes
Pilgrim/Pioneer village
Memorial
Space room
Boating
Everything
Basketball
Playground
Nature center
Gus Grissom
Movie
Presentation
Journey/hiking

Table 11. Showing Student participants Explanations regarding their Favorite Activity

Types of Response
The space thing, cause it was fun.
Swimming in the river, it was hot.
Pilgrim village, no explanation.
Snakes, because they are cool.
The cave, no explanation.
I enjoyed everything.
Memorial, we got to see Molly Brown.
Twin caves, no explanation.
Snakes, no explanation.
Basketball, an active activity
The playground, no explanation.
Snake touching, no explanation.
The cave, because I got a lot of cave kisses.
Snakes, because they are cute.
Snake presentation, because I learned about all different types of snakes.
Snakes, because we got to touch them.
Nature center, because I saw a coyote.
Pilgrim village, because it's national history.
Pioneer village, because we got to see what it was like back then.
The Gus Grissom, because it was fun.
Grissom memorial, no explanation.
The presentation, no explanation.
Snake activity, because I saw one up close.
Seeing the houses, no explanation.
I think it goes with pioneer village
Shooting hoops, no explanation.
The movie, it was fun.
Snake, because I love animals.
Snake, because I like the milk snake.
The cave, learning about the limestone.
Journey.
Gus Grissom memorial.
Hiking.
The memorial.
The big wheel house

5. External and Internal Validity

The term external validity refers to the extent that results of a study can be generalized to the intended population (Fraenkel & Wallen, 2003). Internal validity means that observed differences on the dependent variable are directly related to the independent variable and not due to some other unintended variable (Fraenkel & Wallen, 2003) such as a poorly constructed instrument. A major limitation of this study involved the samples used. The students in our study were 100% minority student population residing in low income minority neighborhoods, so it is unclear how well the results would generalize to students residing in affluent or mixed racial neighborhoods. Our sample may represent a reasonable cross-section of predominantly minority student population. We believe, however, it would be most prudent to generalize these results to specific neighborhoods we collected data from. An additional study with mixed racial or other minority group of students would be required to infer the external validity of the model for this population.

6. Conclusions

Human learn many things for many reasons and in many different ways. Just telling someone to learn to read, memorize the facts, finish homework, pass the exams will not make them learn. Or just telling them to not to

learning will also not prevent them from learning. We educators must make learning, especially science learning fun and experiential. The purpose of this field trip was to give students outdoor science experience to expose them space learning environment outside the laboratory setting. Field trip was organized through community and university partnership in the summer of 2011. Sixty-five, third-fifth grade students along with their parents participated in the field trip. Results suggested that 49.15% student participants indicated that they have never visited a state park before this field trip. 90% of student participants indicated that the Spring Mill State Park field trip was a great experience for them. 50% student participants indicated that the Nature Center activity was their most favorite activity. 38.3% student participants indicated that they have never seen a space capsule or space suite before this field trip. The Chi-square test of independence results suggested that there were no statistically significant difference in gender attitude towards learning outdoor science.

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Field trip picture: Pre, during and post field trip activities