

The attached seminar paper, by Lisa Bowen, entitled, Attending a Family STEM Night Will Improve Parents' Understanding of the STEM Disciplines, when completed, is to be submitted to the Graduate Faculty of the University of Wisconsin-Platteville in partial fulfillment of the requirements for the Master of Science in Education Degree, for which 3 credits shall be allowed, is hereby

Approved: *Jodean E. Grunow, Ph.D.* (Electronically Signed) Date: *November 9, 2018*

Attending a Family STEM Night Will Improve Parents' Understanding of the STEM Disciplines

A Seminar Paper

Presented to

The Graduate Faculty

University of Wisconsin-Platteville

In Partial Fulfillment of the

Requirement for the Degree

Masters of Science

in

Education

by

Lisa Bowen
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ABSTRACT

The study seeks to determine if exposing parents to the STEM disciplines and STEM careers through a Family STEM Night will improve their understanding of both. In doing so, they will encourage their children to participate in STEM curricula in school and in informal settings. “It is safe to say, however, that the sheer number of hours in which individuals encounter scientific information outside school over the life span is far greater than the number of hours of science education in formal classroom environments” (National Research Council, 2009, p.99). With more exposure to STEM, more students will choose STEM careers. “...a STEM education provides individuals with a wage advantage and higher employment security throughout their careers, even if they pursue non-STEM occupations” (Thomasian, 2011, p.19).

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CHAPTER 1

INTRODUCTION

STEM is the new “buzz word” in education right now. Why? According to research, there are more STEM jobs in our country than qualified STEM workers (Moore, Johnson, Peters-Burton, 2016). “Increasing the number of high school, college, and postgraduate students majoring in STEM subjects is critical for economic prosperity” (Thomasian, 2011, p. 17). “Contemporary STEM originated in the 1990’s at the National Science Foundation (NSF) as an acronym for science, technology, engineering, and math” (Bybee, 2013, p.1).

Thus, school districts like mine are joining the efforts to include STEM in our curriculum. I have been involved in professional development of STEM for the past three summers and continue to learn the best practices of teaching STEM in the elementary classroom. This fall we planned a STEM Night for elementary families. Knowing how important parents are to their child’s education, we wanted to expose parents to STEM disciplines and the importance of STEM to career choices for their children.

Statement of the Problem

“Engaging students with exposure to these fields in elementary school could motivate them to be proficient in math and sciences, encourage college-readiness, and inspire them to practice such expertise in our modern economy with a fulfilling STEM career” (Kim & Preissig, 2016). Will attending a Family STEM Night improve parents’ understanding of the STEM disciplines? According to Jackson & King (2016, p.3), “Families play an essential role in helping their student navigate educational choices on the path toward a fulfilling career. Families are the links to enrichment opportunities, as well as influencers of students’ perceptions of what is possible for their future.” Organizing and implementing a Family STEM Night at

Highland Community School will help us promote the STEM disciplines and their role in our students' future careers.

Definition of Terms

STEM: an acronym for science, technology, engineering, and math (Bybee, 2013.)

PLTW: an acronym for Project Lead the Way

21st Century Skills: define and illustrate the skills and knowledge students need to succeed in work, life, and citizenship (P21 Framework for 21st Century Learning)

Habits of Mind: an identified set of 16 problem solving, life related skills (Costa & Kallick, 2000)

Purpose of the Study

STEM education is new in the elementary wing of our school and is being supported by Project Lead the Way (PLTW), inquiry projects, and STEM investigations. Introducing parents to this curriculum is important if we want their support, not only in supplying materials for investigations, but in encouragement of further study by their children in the STEM career fields. We want to improve parent understanding of the STEM disciplines by providing a Family STEM Night which includes STEM investigations and the 21st Century Skills such as collaboration, communication, creativity, and critical thinking (P21) and Habits of Mind such as persistence, thinking flexibly, etc. (Costa & Kallick 2000). "Several benefits of STEM education include making students better problem solvers, innovators, inventors, self-reliant, logical thinkers, and technologically literate" (Morrison's work as cited by Stohlmann, Moore, Roehrig, 2012, p.2).

Significance of the Study

“In addition to educational and political pressure to improve overall student performance in mathematics and science, elementary school leaders are increasingly recognizing that STEM curricula may have the greatest impact at the elementary school level (Daugherty et al., p. 46). From this study, I thought if providing elementary parents with information about the STEM disciplines, through a Family STEM Night, would improve their understanding about STEM curriculum and its importance in their child’s future career.

Since interest in STEM subjects and STEM careers is largely formed by the time children reach the upper elementary and middle school level, it becomes increasingly critical that children’s interest in these areas be captured and encouraged during the early to middle elementary grades, long before the point at which they enroll in courses leading to eventual career paths during high school and college (Archer’s work as cited by Daugherty, et al., p. 46).

Delimitations of Research

The study was done at the Highland Elementary School which has a population of about 150 students. The research for this study was limited to the parents who attended the Family STEM Night in the fall and who completed a survey. The sources for this paper are primary and secondary sources found online and written in the past 10 years.

Method of Approach

Research for this project was done online using search engines such as Elton B. Stephens Co (EBSCOhost) and Educational Resources Information Center (ERIC) using keywords such as STEM, family nights, careers. Many sources were found online and books were read about the importance of STEM curriculum in elementary school. Collaboration with other teachers who have held STEM Nights occurred. Information for the study was collected in the form of a pre/post event survey from parents who attended the STEM Family Night.

Chapter 2

What is STEM?

During the summer of 2015, I learned about STEM while taking the class, “Intelligent Integration of STEM Components to Build Educator Effectiveness and Student Proficiency (I² STEM) Grant Program.” STEM is an acronym for science, technology, engineering, and math (Bybee, 2013, p. 1). Problem-, project-, or design- based assignments are utilized in STEM instruction to help students solve complex tasks (National Academy of Engineering and National Research Council, 2014). “Integrated STEM education is an effort to combine science, technology, engineering, and mathematics into one class that is based on connections between the subjects and real world problems” (Stohlmann, Moore, Roehrig, 2012, p. 30).

It is not only important for students to learn about the STEM disciplines (science, technology, engineering, and math), but be able to apply what they have learned in finding a solution to a problem that is meaningful to them (Bybee, 2018, pp.80-81).

Parent Involvement in Their Child’s Learning

Parents are the most influential people in their child’s life. “Research suggests that certain parenting behaviors, such as increased involvement, encouraging interest in learning, and supporting children’s autonomy tend to positively influence children’s development and lead to higher academic achievement and more studying...” (Cooper & Lindsay, 2000; Gottfried et al., 2009, as cited by Niu, 2016, p. 37). “Decades of research proves that effective family engagement supports student success” (Jackson & King, 2016, p.3).

A Family STEM Night was held on September 27, 2018 at the Highland Elementary School for 4K-5th grade students and their parents. Children and parents completed STEM investigations together and were exposed to STEM careers through a display at the event.

“Research shows that no matter what the family income or background may be, students with involved parents or caretakers are more likely to earn higher grades, pass their classes, attend school regularly, have better social skills and graduate and go on to postsecondary education” (Henderson & Map, 2002, as cited by Jackson & King, 2016, p.5).

” ...many families view STEM careers as unobtainable or impossible because of their lack of understanding of the depth of STEM education, careers and opportunities” (Jackson & King, 2016, p.8).

Our goal was and is to increase parent understanding of what the STEM disciplines are and how they can affect their child’s learning, acquisition of the 21st Century Skills, and ultimately, a career in a STEM field.

Learning in an Informal Environment

Out of school STEM programs should offer students the following things: the STEM investigations should engage the students, be presented in a supportive learning environment, show them that STEM is relevant, support collaboration and leadership, and connect STEM learning in all settings (National Research Council, 2015, pp. 18-19). “Research has demonstrated that one of the best ways to learn STEM is to engage in the practices of doing STEM” (National Research Council, 2015, p.18). In an informal learning environment, such as a library, Family STEM Night, a Girl Scout Meeting, etc., students need time to explore, make mistakes, and make corrections when engaging in meaningful STEM investigations. The STEM learning must be meaningful so that the students can make connections between their daily lives and what problem they are trying to solve (National Research Council, 2015, p.17). “Supporting youths to take ownership of their learning may be especially important in out-of-school settings, where young people are developing new interests and deepening existing ones that can be further pursued in other settings including school” (National Research Council, 2015, p.23).

When offering STEM activities in informal settings, recognize that the activities should not only be fun and engaging, but also should be related to instructional goals and grounded in a practical and realistic understanding of what is involved in pursuing an interest in the topic or field involved. (National Council of Teachers of Mathematics, p.5)

As educators, we should not only be offering STEM opportunities to our students at school, but we should help organize them outside of school as well, to give students a greater opportunity to engage in STEM investigations and interactions with STEM experts.

Chapter 3

Method

Our STEM Night was organized for four- year olds through fifth grade students and their families. As families entered the school, they encountered a bulletin board titled “What is STEM,” that included a definition, vocabulary, and pictures of students engaged in STEM investigations. Families were greeted by staff, and students were asked to write their name on a piece of paper and add it to a bar graph with their class. Parents were asked to fill out a survey about their experience at STEM Night and return it, with motivation for a chance to win a gas card.

The families then went into the gym where hands-on investigations were set up by the preservice education students from UW Platteville. Parents and their children were able to take their time at each station exploring each investigation. Some families spent over an hour at one station. We also had storyboards about STEM careers, created by our middle school students, for our families to enjoy. Having the middle school students involved also brought them to STEM Night and they also participated in the investigations. Through the time spent exploring STEM investigations and STEM careers, our parents had a better understanding of what STEM means to their child’s future.

Materials and Measurement

Parents were asked to fill out a 10 question Likert Scale survey. The first three questions asked parents about their prior knowledge about STEM and the last seven questions asked about knowledge they gained from attending STEM night. There was also an open-ended question at the end asking parents to give us feedback on how we could make Family STEM Night better. Thirty-four surveys were returned.

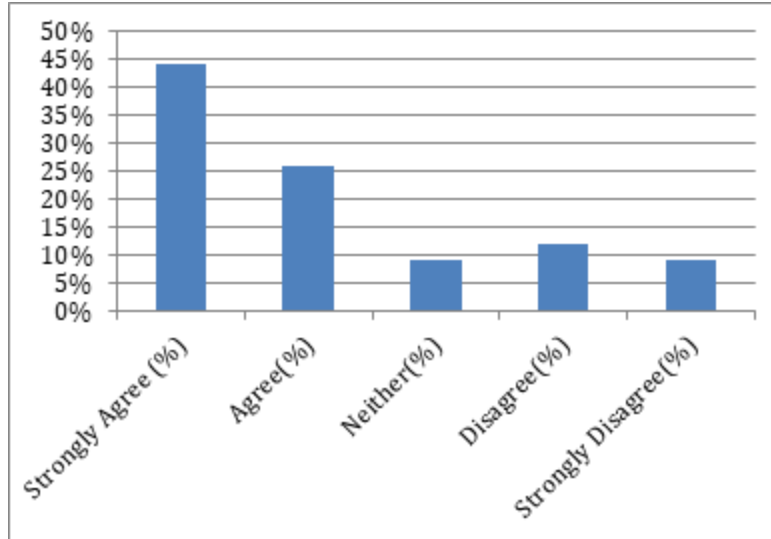
Procedure

The answers from the Likert scale were entered into an Excel spreadsheet, tallied, and changed into percentages. The percentages were made into a table, and then each question was made into a bar graph.

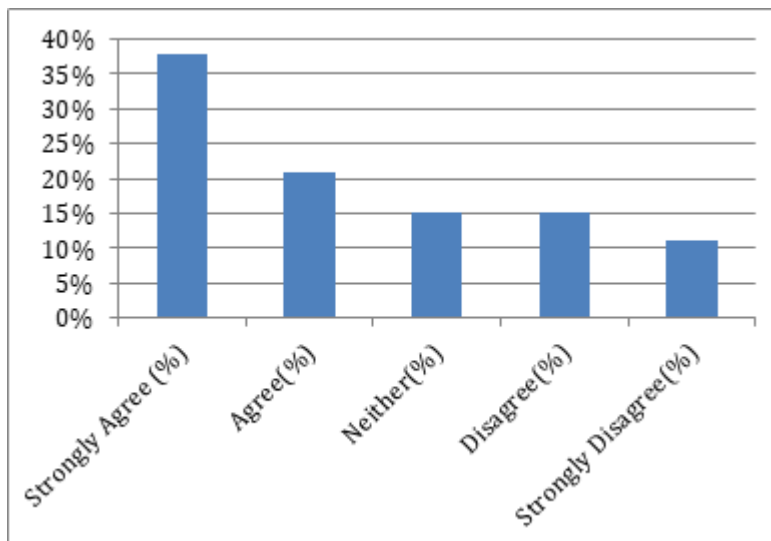
Chapter 4

Analysis of Data

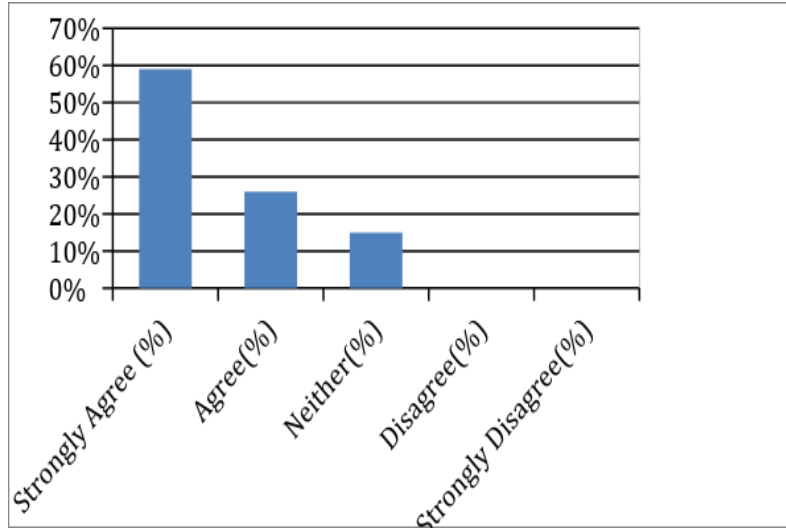
After analyzing the data collected from parents of elementary children who attended our Family STEM Night, there were positive results to all questions. Before attending STEM night, thirty-eight percent of parents strongly agreed that they were familiar with STEM careers. After STEM night, fifty-percent of parents strongly agreed with that statement. Ninety-seven percent of parents said they could see themselves coming to more STEM events at the school.



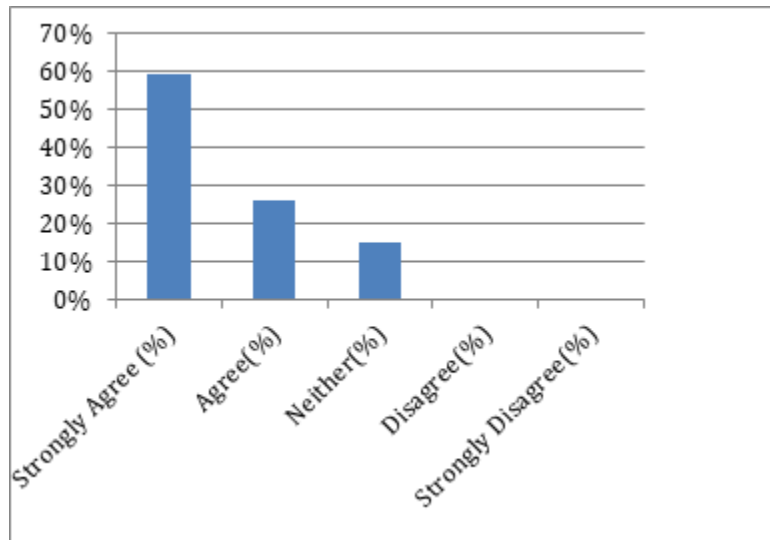
Question 1-I am familiar with STEM.



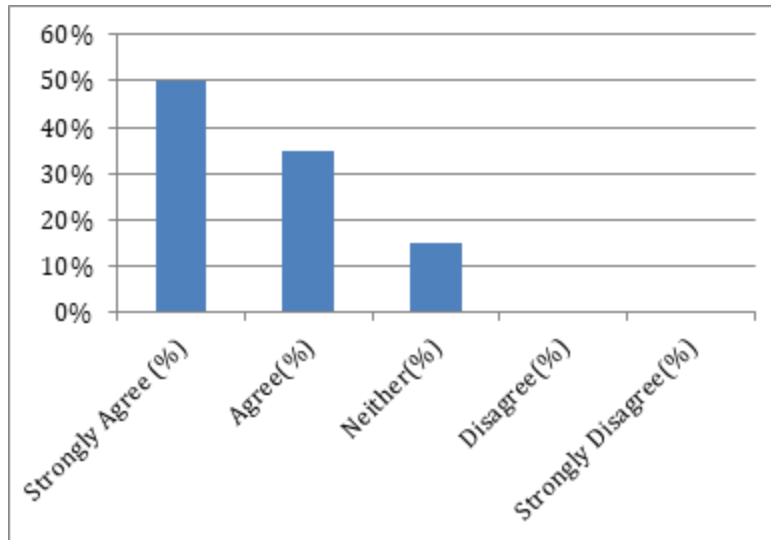
Question 2-I am familiar with STEM careers.



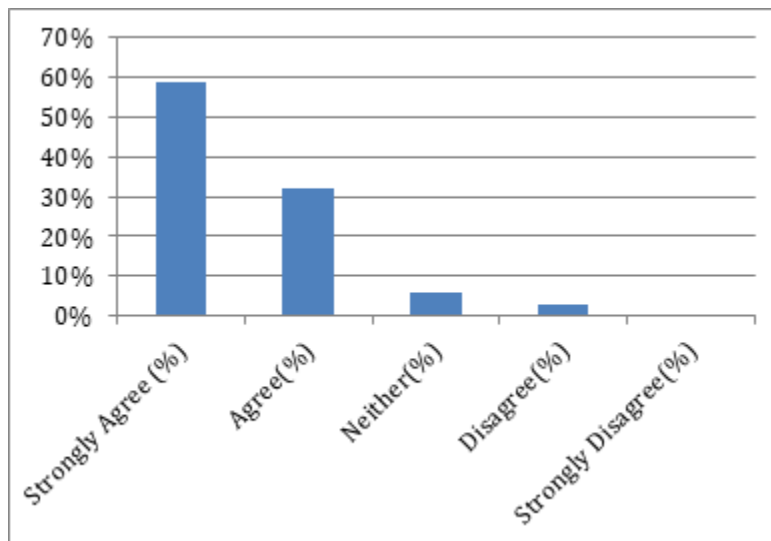
Question 3-My child is interested in STEM.



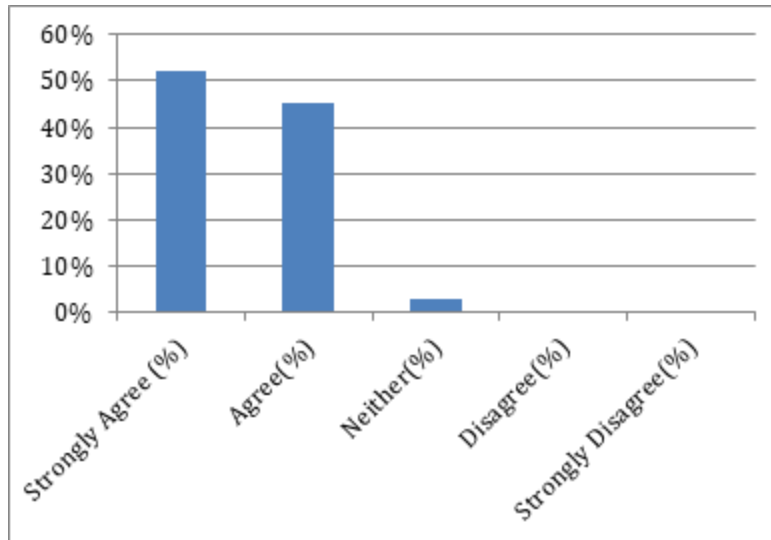
Question 4-My understanding of the STEM disciplines has increased after attending STEM night.



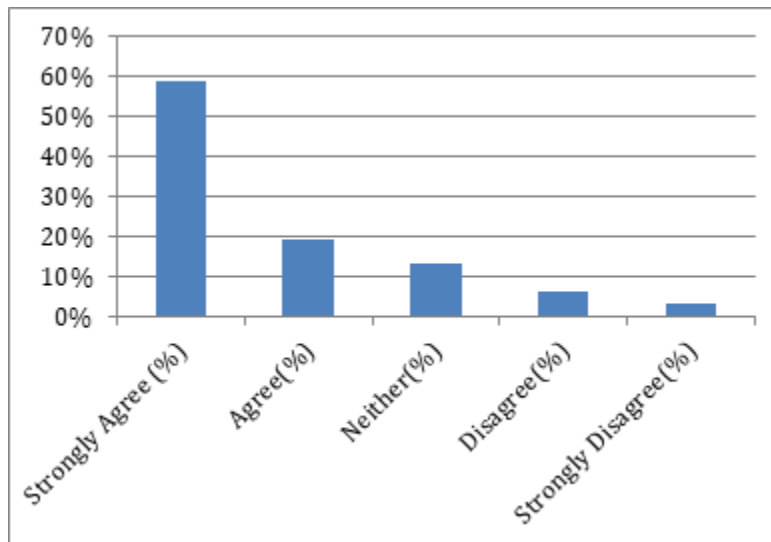
Question 5-My awareness of STEM related careers has increased after attending STEM night.



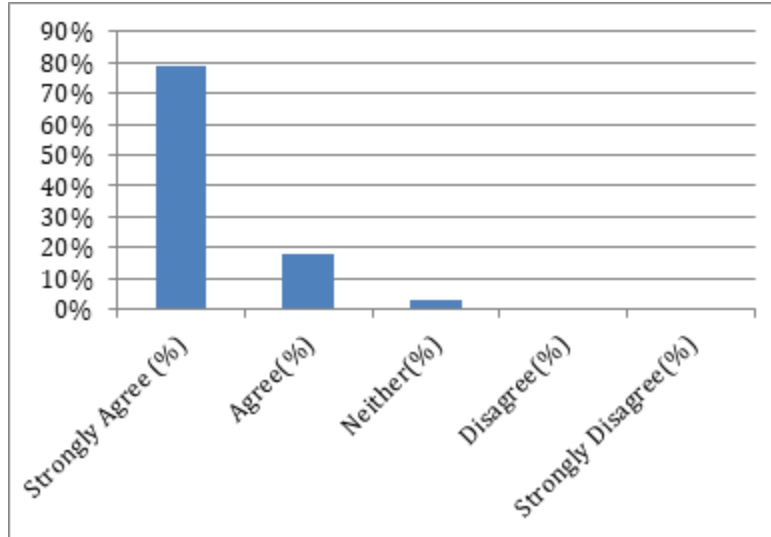
Question 6-I learned something new about my child's interest in STEM investigations.



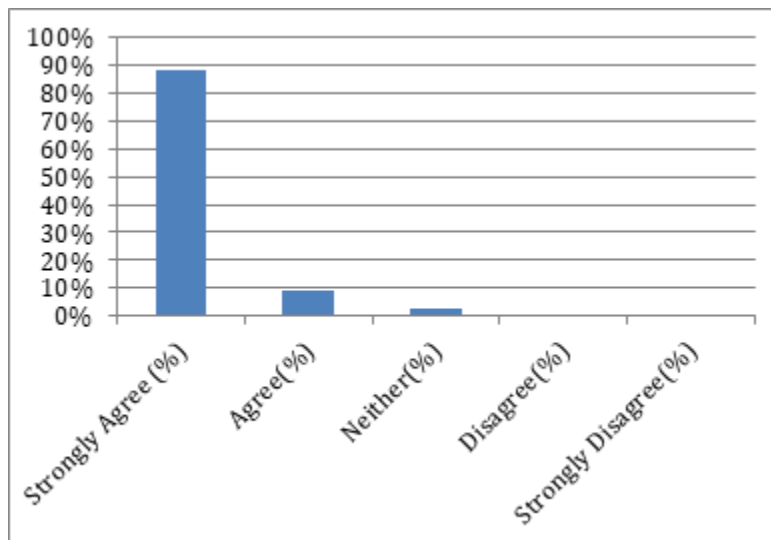
Question 7-I feel comfortable doing STEM related activities with my children at home.



Question 8-I have new helpful materials to use with my children at home



Question 9-I see myself coming to more STEM events at this school.



Question 10-STEM Night was well organized.

Chapter 5

Summary, Conclusions, Recommendations

The Highland Elementary Family STEM Night was a major success. Over seventy students, grades 4K through middle school, attended. Over fifty adults signed up and thirty-four completed the survey. All of the survey questions showed that parents are interested in their child learning more about STEM. The majority of parents that attended would come to more STEM events held at school. All of the written comments were positive and many included a suggestion to have this event annually. The support for this event has led to another STEM event that will be held in the summer of 2019. The first annual Highland STEM Academy will be held for one week and be open for grades K-2 in the morning and grades 3-5 in the afternoon. Our STEM curriculum will continue to grow at Highland.

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FAMILY STEM NIGHT

CONSENT FORM FOR PARTICIPATION OF HUMAN PARTICIPANTS IN RESEARCH UNIVERSITY OF WISCONSIN – PLATTEVILLE

PLEASE DO NOT PUT YOUR NAME ANYWHERE ON THIS SURVEY.

There is no need to identify yourself. You are being asked to complete this survey to help researchers better understand whether attending a Family STEM Night will improve parents' understanding of the STEM disciplines. Please be as honest with us as possible and answer all questions to the best of your knowledge.

Once the study is completed, a summary of the results will be used in a seminar paper for the completion of my master's degree in science education.

Your participation in this survey is entirely VOLUNTARY. By completing this survey, you are giving your consent to be involved in the research. If at any point you decide that you do not want to complete the questionnaire, please return it and inform the administrator.

Your participation should present you with no risks, other than the time and effort involved in completing the materials. Further, you may benefit from your participation by learning about the research methods employed in the social sciences.

Please feel free to ask any questions you may have of the person who is giving you this survey, especially if there is a word or phrase you do not understand. Feel free to write in the margins, if you feel you need more space to express or explain an answer.

Thank you for your cooperation and the time that you have put into helping me complete my research project.

If you should have concerns about your treatment as a participant of this research, please call or write:

Barb Barnet, Chair, UW-Platteville IRB

(608) 342-1942

barnetb@uwplatt.edu

Again, PLEASE DO NOT PUT YOUR NAME ANYWHERE ON THIS SURVEY.

Thank you,

Lisa Bowen, Researcher

Dr. Jodean Grunow, Faculty Sponsor

Department of Mathematics

University of Wisconsin-Platteville

(608) 342-1009

Family STEM Night PARENT Survey

Thank you for coming to Family Stem Night! We hope you found this experience rewarding and fun! We appreciate you taking the time to fill out the survey.

Your answers are anonymous and appreciated!

Please complete both sides of the survey.

For each of the questions below, circle the response that best characterizes how you feel about the statement.

1= strongly disagree 2=disagree 3=neither agree or disagree 4=agree 5=strongly agree

I am familiar with the term STEM.	1	2	3	4	5
I am familiar with STEM careers.	1	2	3	4	5
My child is interested in STEM.	1	2	3	4	5
My understanding of the STEM disciplines has increased after attending STEM night.	1	2	3	4	5
My awareness of STEM related careers has increased after attending STEM night.	1	2	3	4	5
I learned something new about my child's interest in STEM investigations.	1	2	3	4	5
I feel comfortable doing STEM related activities with my children at home.	1	2	3	4	5

I have new helpful materials to use with my children at home.	1	2	3	4	5
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I see myself coming to more STEM events at this school.	1	2	3	4	5
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STEM Night was well organized.	1	2	3	4	5
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Please add comments that will help us make our next STEM Night even better!

Turn your survey in before you leave for a chance to win a prize!

Thank you for your participation!

Survey organization and questions were patterned after a survey created by the National PTA STEM+Families.