EFFECTS OF FAMILY SCIENCE NIGHT ON ALTERNATIVE HIGH SCHOOL STUDENTS

by

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The last two years would not have been possible without the patience and understand of my children and husband. My daughter was my partner in "grime" in my stream side science course. My family watched me put in long hours at the kitchen table with papers strewn all around and a look of deep concentration on my face. My parents and in-laws also helped out with support and encouragement. My own students were constantly on the receiving end of all these new and awesome ideas I was learning, so they deserve a shout out! Finally, the support and encouragement of my professors and teacher's aides really put the wind in my sails. Their kind and supportive words helped get me through. The list includes, Carl Graves, who helped me start this journey, and Walter Woolbaugh and Megan Hopkins who helped me finish it. My science reader Amber Kirkpatrick also deserves thanks and praise for her support and helpful ideas. I also need to honor my colleagues, they put up with all sorts of ramblings about cool science stuff from me. I certainly can't forget Dr. Peggy Taylor and Diana Paterson, whom I bothered on a regular basis with e-mail questions.

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INTRODUCTION AND BACKGROUND

The value of familial support in student achievement is without measure. I wanted to find a way to increase family support for my students. I currently work with credit deficient students in an alternative school setting. My students all have a personal educational plan, in any of the following subjects: physical science, biology, environmental science, health and occasionally anatomy and physiology. Our program is predominately fed by Kankakee School District #111, so I used their demographic data as a representative of our school population. According to Illinois Interactive Report Card, Kankakee, Illinois, has 1,175 students (Northern Illinois University, 2015). Seventy-nine percent of these students are considered low-income, which means we qualify for all students to receive free lunch. The school has an 89% attendance rate, with a 4% dropout rate and only a 69% four-year graduation rate.

The majority of the students I have contact with are in the 10^{th}-12^{th} grade. Some of our biggest educational struggles have revolved around students that do not have a lot of support at home. Compound that with work that they do not find "interesting" and you have disengaged students. I have always tried to make learning fun and interesting for my students. We have done everything from cooking in the classroom to making soap and working in our nature center. When I first started with the program, we had guest speakers from the community come in to talk to students about some of the careers that may be available to them in the future. In the beginning, I thought that was enough. Now that I am working on my personal educational growth, I am seeing ways to make my teaching even more meaningful or impactful for my students. I have recently begun

working with the Next Generation Science Standards (NGSS) as a curriculum guide for Illinois schools. Through my work, I have also become more immersed in the push to bring STEM (Science, Technology, Engineering, and Math) into the classroom. We are finding that our students are underrepresented in colleges and in STEM careers. Some also include art as a component of STEM, turning it into STEAM, which is what I am doing for my students. I have found that many of my students are very artistically inclined, and they need to be able to showcase that skill to feel successful.

Our administration is always looking for avenues to engage and motivate our students and increase family involvement. We do things like offer refreshments and extra credit to students that have parents attend parent-teacher conferences. When I approached our director with the idea of a STEAM themed series of family science nights, she was very supportive. I hope to grow an after school program that encourages parents to take a more active role in their student's education, especially at the high school level. I decided to add an art night in hopes of breaking down barriers between art and science that exist for some people.

Art and science can go hand in hand, and do quite often. In the short term, these nights will be encouraged, not required. As we move into future years, we may need to incorporate it as part of the community service requirements in order for parents and students to take it seriously. It is my hope that the students will become so interested in what is happening after school, that they will want to attend such activities. This is also a great way to present a positive image to our community and engage business and academic partners. I approached multiple universities and they all expressed interest in

helping me get a program started at our school. Universities are very willing to help, especially when the objective is to create engaging science and engineering opportunities.

Focus Questions

My primary focus question is: "How can increases in positive science experiences help increase student motivation?" This is supported by three sub-questions: #1, "What impacts does a STEAM family science night have on student, teacher and family involvement and participation?" Sub-question #2 is: "How can increases in positive school experiences build family relations in order to increase learning?" Sub-question #3 is: "What are the challenges of having a family science night for alternative school students?"

I have been extremely fortunate throughout the evolution of my research project. I have had support at every turn. My administration is always supportive of events that increase student interest and participation. We really try to hold on to things that put education in a positive light. I was able to start dialogues this summer with professors at local universities, which was helpful to get a jump start on ideas for the rest of the year. My science reader, Amber Kirkpatrick, is also extremely supportive. So far, it seems like her ideas really blend with the feedback I have received from my professorial support team of Walter Woolbaugh and Megan Hopkins. I am fortunate that everyone in my corner is also on the same page. Our English teacher was also invaluable to me as a proofreader. She made sure everything was print worthy.

CONCEPTUAL FRAMEWORK

Family involvement in academics is not a new subject; where family involvement is lacking, students are the ones with the greatest potential to experience negative effects.

Research in the field of parental involvement versus student achievement is a tricky subject, because it is difficult to measure. What is the baseline? Do we look at past records? Can we ask some parents to be involved and at the same time ask others not to be involved? Fortunately, the work of Mitchell, Drobnes, Colandina-Trujillo and Noel-Storr (n.d.) helps support family involvement by providing us with a summary of a series of family science nights held at NASA Goddard Space Flight Center in 2006-2007. This was an event run by NASA, not the schools themselves. Information in the article supported the idea that family involvement promotes student achievement, and was helpful in my pursuit of creating a Family Science event at my school. The NASA science nights were monthly and were also limited to 15 families. Each event was full to capacity. At the time of the article, NASA hoped to continue the project.

Perhaps one of the largest undertakings in the area of parental involvement took place in the Chicago Public School System over the course of ten years. Children and their families were studied and many different aspects of achievement were measured. Multiple parameters were also looked at, such as gender, race, family characteristics, etc. The study tracked how many students dropped out or completed high school, and the highest grade completed (Barnard, n.d.).

This study did not give any insight on how to involve parents or families; it simply served to demonstrate that parental involvement does appear to have a positive effect on student achievement. No data was offered, as this was simply a summary of a ten-year study, however, only 1,100 of the 1,500 students who started the study remained at the end.

Paying teachers more or reducing class sizes is not a guarantee of student achievement; however, the more involved parents are in their student's learning, the higher the level of achievement, regardless of socio-economic status (Perera, Bomhoff, Lee, 2014). This statement was the conclusion of international research conducted on 15 year olds from 14 different countries ranging from developed to developing. One flaw to this tremendous study is that no base line testing was conducted to compare against data gathered. Students were only tested when they were 15 years old and several factors were taken into account which led to the conclusion that parental attitude is influential in student science achievement.

I have repeatedly come across articles in support of parental involvement dating back to the 1980's, which leads me to believe that I have not stumbled onto something new. We know that parental support is crucial to a child's life. When schools provide opportunities for parents to be involved in the educational process, the attitudes of the parents typically become more positive, which in turn, is reflected onto the children (Beecher, 1984).

The National Science Teachers Association (NSTA), has declared that schools themselves, are valuable science resources, but the parents or caregivers are the true nurturers of curiosity. In this case, we are choosing to focus on scientific curiosity. However, this simple concept presents a huge challenge. Some parents are ready, willing and able to lend a hand and others are shy, and lack confidence (Cervone, O'Leary, 1982). Many have no idea how extremely valuable they are to their child's learning process. One of the key pieces of information that needs to be considered is; how do we

get the parents involved in order to get the students involved? This is not an easily answered question.

As students get older, the amount of parental involvement declines, specifically, at middle school and high school levels (Cotton, Wikelund, 2001). It is unclear whether parents feel they can no longer support their students, or they think students are too old and no longer need help. However, research by multiple sources, including, Henderson and Mapp (2002), show that parental support is beneficial at every age or grade level, and from all socio-economic back grounds. The students in our program are the very ones that are the focus of research because they are becoming the norm in many educational settings and we need to find ways to keep these kids interested in school.

The National Science Teachers Association (NSTA) website is full of ideas to help a person build a nice program. There is a forum I was able to post questions to other teachers in similar situations. It involved resources for ideas to make the science nights more enriching for both the parents and the students. Such as, student led activities, and bringing in community volunteers, because, this is also a time to be able to foster community relationships. (Bigelow, 2012). In our area, we need all the positive interactions we can get.

One inspiring educator, Vivian Smith, a middle school teacher from Greenville, North Carolina was featured on the website for LEARN NC, K- 12 Teaching and Learning From The UNC School of Education, (Harrell, n.d.). She works in an area with many under privileged families, many of whom do not have transportation to the school. She was able to get a grant allowing her to use a public space closer to many of these

students. She currently has about 15 families out of her 160 attending, which is a great place to start. Her success and enthusiasm is encouraging to me and my situation. I need to address our transportation issues if I am ever going to get a regular group of families to attend. We have a local community center that I will approach for next year.

The Harvard Family Research Project did some research to find out what things make a successful afterschool program (Lauver, 2004). Idea number one was rather than handing out flyers or making announcements like I did, I will have personal contact with everyone. This will most likely happen when each student registers. Another idea, was to try and get groups or pairs of kids to come, because they tend to move in peer groups at this age. The final point that we will be able to address for next year is the ability to offer community service hours or leadership credit to the students that attend. So much great research is out there to address the benefits of a family science night, now I need to put it into action and build a powerful program.

METHODOLOGY

For our first science night, in November, we printed up postcards and sent them to all 46 families. I also hung up flyers around the hallway and made announcements leading up to the event. Unfortunately, we had a very low turn-out (n=5). One student brought her two-year-old daughter and the director of the program came with her children, ages 10 and 18. There were five stations in the room all centered around paper. Station one was a challenge to build an index card bridge that could support the most weight using only using one card and nothing else. Station two was a paper airplane and hoopster flying loop plane competition. Once students built their flying objects, they

launched them at a target for points. Station three was a challenge to build a chair entirely out of newspaper and tape capable of supporting the weight of a stuffed animal. The challenge of station four was to build a tower out of one sheet of paper and a limited amount of tape. The only guidelines were that it had to be a minimum of 50cm and it could not be taped to the table. The final station was a paper chain challenge. Students were again given one sheet of paper and glue and tasked with creating the longest paper chain possible. The dismal turnout allowed me to run the activities in class a couple days later. I wanted students to know what kinds of activities they were missing so they might try a little harder to show up at the next event.

Our second night, "technology", was at our local university, Olivet Nazarene University, in December, 2015. This time I handed out flyers to each student before they left school a few days before the event, and I hung flyers up around the hallway (I used this method for all the following nights as well). My mom came with my two oldest children. None of my students were able to attend. It was rather disappointing, but also an eye opening learning experience for me. The only explanation anyone offered the next day, was a transportation issue. Even though none of my students attended, my family and I participated and one of the electrical engineering students, Whitney, led us through a circuit building activity. We attempted to wire up a bread board with a flashing LED. The idea behind holding the session at the University was to give the students a taste of college life. Many of them have never been on a college campus, and I wanted them to see that it could be fun and exciting, and hopefully not intimidating.

Fortunately, I was able to have Whitney and two of her classmates come to my classroom and redeliver the circuit activity with my students. I was hoping to spark their interest in the hopes that they would attend more science nights in the future. I would also like to keep the connection to Olivet going, because it helps build positive community relations. This is a young idea in a small program; it might take time to grow.

The third night, February 24th, should have been engineering, but we switched up the order and put Art before engineering because of scheduling conflicts. Participants were given the opportunity to create artwork utilizing two different marbling techniques. The first method was food coloring and shaving cream, and the second method was acrylic paint and liquid starch. We cut out shapes using water color paper and dipped them into the dye. The results were beautiful. This night was the most successful to date; two different families attended (N=9), and the same student that attended the first night brought her entire family. This night was the most successful because of the timing. It simply worked out that two different families were free the same night. Neither of them were able to come again, and transportation was the issue. Based on their reactions and enthusiasm, they had a lot of fun.

The fourth night, math, was held on April 5th. I conspired with the math teacher from one of our programs to provide opportunities for hands on math experiences. One activity involved laying out dominoes into a 6" x 5" grid without any continual fault lines. This is harder than it seems and involves a bit of engineering as well. The second activity center was a Serpinski's triangle team building activity. Serpinski's triangle is an

example of a fractal, or repeating pattern. Each group of four pyramids can be combined into a larger and larger sculpture. I provided one dimensional coloring sheets as well as three dimensional pyramids in order to build a giant group pyramid. The final math activity was another three dimensional shape building experience. This time, students were tasked with creating the five platonic solids, tetrahedron, octahedron, cube, dodecahedron, and icosahedron.

I am certain students would have enjoyed this event, if any had been able to attend. My mother was able to bring my eight-year-old nephew and my 4 and 5-year-old children. The eight-year-old was the most impressed and he even built two of the Serpinski triangles. The domino brick building held their attention as well. He later told his mom, "I feel bad that nobody came to Aunt Becky's school. It was really neat."

I plan on using these activities in class in order to reinforce the concepts that students missed out on, as well as show them that they are actually missing out on fun activities after school. I re-did the art night with my afternoon class and they really enjoyed it. There were 7 kids in that class, and they enjoyed exploring the art concepts. We also had three Olivet engineering students come and do the circuit activity with all of my students. We were not able to do the platonic solids or the bridge building activities in class, because we needed class time for other things. Graduating seniors needed to complete work and other students were trying to squeeze out one last credit before the end of the semester. I also had engineers from the Illinois Department of Transportation (IDOT) as guest presenters. As part of a statewide, grant funded program I participated in this summer, I was happily obligated to invite our business partner, IDOT to come to

our classroom and present an activity to our students. Since this was an interactive engineering experience, I hoped it would pique the students' interests and entice them to attend future family science nights. The students enjoyed the activity, but it was not enough to get them to ask about more after school activities. This particular activity was challenging. Each group of students needed to design an image for a smart phone app, that could be built out of the provided supplies (balloons, pipe cleaners, stickers, coloring pencils). What the students did not know is that they were going to be in charge of creating another groups design. This was a good exercise to demonstrate why engineers have to be precise in their designs. As the students get more comfortable with these sorts of experiences, perhaps they will want to come after school, because they will no longer be intimidated.

The final night, "engineering" was held on April 18th, 2016. The activity for the evening was toothpick bridge design. The students were given toothpicks and marshmallows to create bridges. Once the bridges were created, we placed a lid on them and filled it with as many glass marbles as it could hold in order to test the integrity. One student attended, and she brought along her sixth grade sister, "the nerd of the family" according to the girls. The girls worked diligently on their projects and the younger girl chatted about the exciting things she was doing in her class at school. She was looking forward to our after school night all day. Once the bridges were completed, the girls predicted the total number of marbles each could hold.

In addition to the bridges, we also worked to create some of our Serpinski's triangles from the math night. I thought the connection between bridge building with

triangles and the paper triangles was a natural connection. When the evening was over, I gave each girl a three question questionnaire in order to get some solid feedback. One of the most interesting things I observed throughout the evening was during bridge construction; the younger sister was studying her bridge and really thinking about it when she said, "I feel like I learned something in math that could help." I wanted to shout for joy at the intentional connection being made between math and science. It was so natural. I felt like that spoke volumes in support of these cross-curricular activities.

My final treatment that happened at the end of the study was to go to the literature and find examples of family science night programs that were successful. I also interviewed other teachers of science to find out what they might be doing in their family science nights, and I in turn could use. I wanted to obtain ideas that I could use in the future to increase my parental involvement in my future programs.

Research Design and Instrumentation

Data was collected from multiple sources. My first data collection method was parent interviews. I was able to interview seven parents at parent-teacher conferences. This number seems extremely low; but I only had eight parents attend the conferences. The six question interview and probes can be found in Appendix A. I wanted parents to understand that their role in their child's education is important and that we value their input and opinions, especially if they had a negative experience in school. These activities are about the entire family, not just the student.

I chose to give all students (N=27) a semantic differential survey (Appendix B). By reaching out to all the students, I was able to ensure some amount of validity, and

students were able to engage in some self-reflection before the actual series of activities. It is important to get feedback from both parents and students in order to gain a deeper understanding of each group's perspectives. Parents were only given six direct questions, but the probes gave them a chance to explain themselves in depth. In comparison, students were given ten questions with no probes. Daily interaction with students usually provides a sufficient window into their opinions.

I created a Likert survey on Google Docs (Appendix C) that I gave to all students (N=25) during the school day before the Art night event. It was my intention to raise awareness for the event and see if I could get more students to attend. Each statement related to a photo or emoji, and students were asked to rate how the image made them feel. The multiple pieces of paper evidence, the surveys and interviews, were used to look for inconsistencies in order to verify or validate the data. No one method of data collection would have been sufficient in any case, but especially in this situation, where I had so few participants and no one consistently came to the nights. The data collection methods matrix is found below in Table 1.

Table 1
Data Collection Methods for Research Questions

Question	Survey	Interview	Observation, summative assessment	Formative assessment	Behavior
How can increases in positive science experiences help increase student motivation?"	X	X	X	X	X
What impacts a STEAM family science night has on student, teacher and family involvement or participation?	x	x	x		
How can increases in positive school	x	x			x

experiences build family relations?					
How can an increase in positive school experiences increase learning?	X	X	X	X	X

During each of the science nights, I was able to closely observe how students worked through the different STEAM experiences. I was able to watch them struggle and succeed with very little direct influence from me. The point of these experiences was to show them they had the ability to do the work or accomplish the task set out before them. Since no grades were given, it took some of the pressure off students and allowed them the freedom to explore and discover without fear of failure. While the low attendance was disheartening, it enabled us to have more in-depth conversations. My vision for the future, is that I will not be having the conversations with the students, the parents will. And they will work with their student to solve problems and/or accomplish tasks together.

The formative assessment piece really came into play in the form of the students' creations each night. The paper airplanes were a challenge, but the kids enjoyed trying to modify their designs. They really enjoyed creating the little chair for the stuffed animals. The marbled paper designs were interesting. The students quickly learned that mixing too many colors makes for some muddy designs. Simple designs are better. Both girls' bridges supported some amount of marbles. One was better than the other, but they both worked hard at their initial designs and continued to make modifications. The students and other participants were able to accomplish the tasks set out before them in a fun and

non-threatening way. It was fun to sit back and watch them all work through their tasks and achieve varying degrees of success.

In our program, the students are working on their own individualized packets of work. The students' work is not compared to others in the class, but to themselves. The activities that each student participated in at each night was enriching, however, I was unable to find much of a correlation between their attendance and their classroom work. Each of the students continued to work at their normal rate.

The behavior piece was a challenge to monitor because we had very few families attend, and the girls that attended are not behavior problems. However, it was nice to see family members interacting with each other at school. Brothers and sisters helping each other with art work, sisters building bridges, literally and figuratively. The sister interaction was one of the coolest for me to observe. The mom wasn't able to come, but the little sister was excited when she heard about the activity at home, which means that they were talking at home about something positive at school. That is what it is all about. Even if the conversation only happened in three households all year, that is three more positive science and school conversations than before.

Each of the surveys and interviews were created in order to gather data and gain insight into the minds of students and their parents. The intention of the parent interview was to try and quickly gain insight into the parents' comfort level and see if they were willing to take a more active role. The six questions were short and to the point with follow-up questions (probes) in order to try and get deeper explanations. The parent interviews would not have been as reliable without the probes. I was able to collaborate

with peer colleagues and my instructor in my graduate class, in addition to my critical friend, another graduate professor in order to ensure that my data collection tools were valid.

At the conclusion of the first science night, I handed out a Likert survey. At this same time, I asked the participants three open-ended questions. The results of open-ended survey were easier to interpret and more useful with a small population. In the future, when I have larger numbers, I will employ the Likert survey.

Research methodology for this project received an exemption by Montana State University's Institutional Review Board (Appendix D) and compliance for working with human subjects was maintained.

Demographics

Students that attended the family science nights all come from single parent homes, whether through divorce or death. One student, my graduating senior, came because she is court ordered to do community service hours, and she chose to come to science night as part of those hours. She also works for a local fast food restaurant, often more than 40 hours a week. The fact that she took time out of her extremely full work schedule to drive twenty miles back to school with her younger sister is amazing.

My junior student is the one who is a parent herself. She has been struggling to find a job, which will make her the only adult in the house working. She is also the only one who brought her mom with her to the third night, along with her younger siblings. My last student that attended any night is a sophomore. She is a singer in her own band

and is trying to promote herself and go to school. All of these students have maintained A-B grades in science throughout their time in our program.

DATA ANALYSIS

When only one or two participants show up to an after school event, it is a challenge to acquire meaningful data. This next section displays what data I was able to collect, and discusses future data collection methods as I move forward with this project. Table 2 is a compilation and analysis of the data gathered as a result of the student semantic differential survey.

Table 2

Student Semantic Differential Survey Results (N=19)

Question	most positive	semi positive	Neutral	semi negative	negative
I enjoy a learning challenge.	5	4	6	2	2
I like school.	1	2	7	5	5
I like science.	3	5	4	3	5
I like science labs.	7	4	3	3	2
I understand my teacher.	8	5	3	1	2
I understand the work I am doing in class.	5	2	7	4	0
I learn best by reading.	2	5	4	3	4
I learn best by doing hands on activities.	9	5	3	0	1
I could see myself in a job that has a science connection.	1	1	4	4	8
The skills I am learning as a science student will help me in the real world.	1	2	6	6	3

I categorized responses from positive to negative. In some instances, responses were rather evenly split across categories, while in other cases the majority of students responded with similar answers. The second prompt “I like school”, unfortunately shed some light on what these students are carrying around before they even come in the door. Only three of the 20 respondents even kind of like school, seven were neutral, and ten were in the negative. This is a huge and complex problem, which could lead to never-

ending research. Many students do not see themselves in a career using science, nor do they think the skills they are learning in class will help them in the real world. In contrast, many of the students felt like they understand the teacher, and many feel they learn best by doing hands on activities. It seems many of these students are carrying around some measure of defeat before they even give themselves a chance anymore. Hopefully, with things that are non-confrontational, like a family science night, they will be able to let go of some of their baggage and start to be more confident in their abilities.

The parents were my big challenge. I was only able to talk with seven parents at parent teacher conferences and considering that only one parent attended an after school night, and I was never in touch with her again, the parent piece was challenging. All things considered, the parent interviews were very interesting; many of them appeared to be comfortable telling me exactly how they felt, which was helpful in getting to the truth of the matter. Even though I only spoke with seven parents, the information was insightful. Two of the parents had negative experiences in high school. One mom told me point blank that "it sucked". One parent was definitely not comfortable helping with homework, and disclosed that her kids have to help each other. Another mom is not from the United States, English is not her first language, and she only completed school through the sixth grade. With her limited educational experiences and her language barrier, she struggles to help her children.

I also asked parents what they thought we, the school, could do to help their students. One great suggestion was, "more hands on labs", which is exactly what STEAM family science nights are all about. Another parent said, "teach him, give him

good advice". The one comment I interpreted as negative was, "it's up to them if they want to learn." I felt this was negative because it did not appear to be a supportive response. Often times we need to be encouraging, especially when things get tough, like they do in school.

Many parents do see that their student would probably use science in the real world and a couple thought "maybe", although they did not elaborate on that thought. Through these conversations, it is easy to see the misconceptions that people have about science in the real world. Science goes beyond a person in a laboratory in a white lab coat measuring chemicals that could either blow something up or infect the world with a weird virus. One mom only came to get out of the house and do something cool with the kids, but it is a place to start. She thought this would be worth getting out of the house for a while. The parents all want to see their children succeed, many of them just don't know how to support them in that effort.

This was a good place to start, however, as the project moved forward, I wanted to have data to compare. One suggestion from my science reader, was to give a short survey to the families within five days of each science night in order to get their fresh impressions of the event. This proved to be difficult because I only ever got one parent to attend with her student and was never able to get in touch with her after the event. They attended the art night in February. I know transportation is an issue for this family, as with many others. Considering the small number of attendees at any particular event, it was easy to have informal question and answer sessions without any formal survey attached. Students always enjoyed the activities and usually asked if we would do the

same activities in class so that others could participate. Perhaps the two rays of light in the entire experience were Kim W. and LaShay G. LaShay, a young, single mother herself, attended the first night with her own daughter and brought her entire family the second night. She was unable to attend the other three due to scheduling and transportation issues. However, her bringing the entire family was a big step in the right direction. She is hoping to go to college for nursing and she is a hard working student, that often lacks confidence in her abilities. I am hoping that more students like her can boost their self-esteem with events like these.

Kim attended the final night and brought her little sister. This was a huge deal, because she lives almost thirty minutes out of town and works more than forty hours a week at McDonalds. She often falls asleep in class because of her late nights at work. The fact that she was sharing the experience at home and her sister wanted to be a part of it was a big positive.

I used a Likert survey to try and dig deeper into some of the feelings that students truly have about school. The Likert survey results are presented in Figure 1.

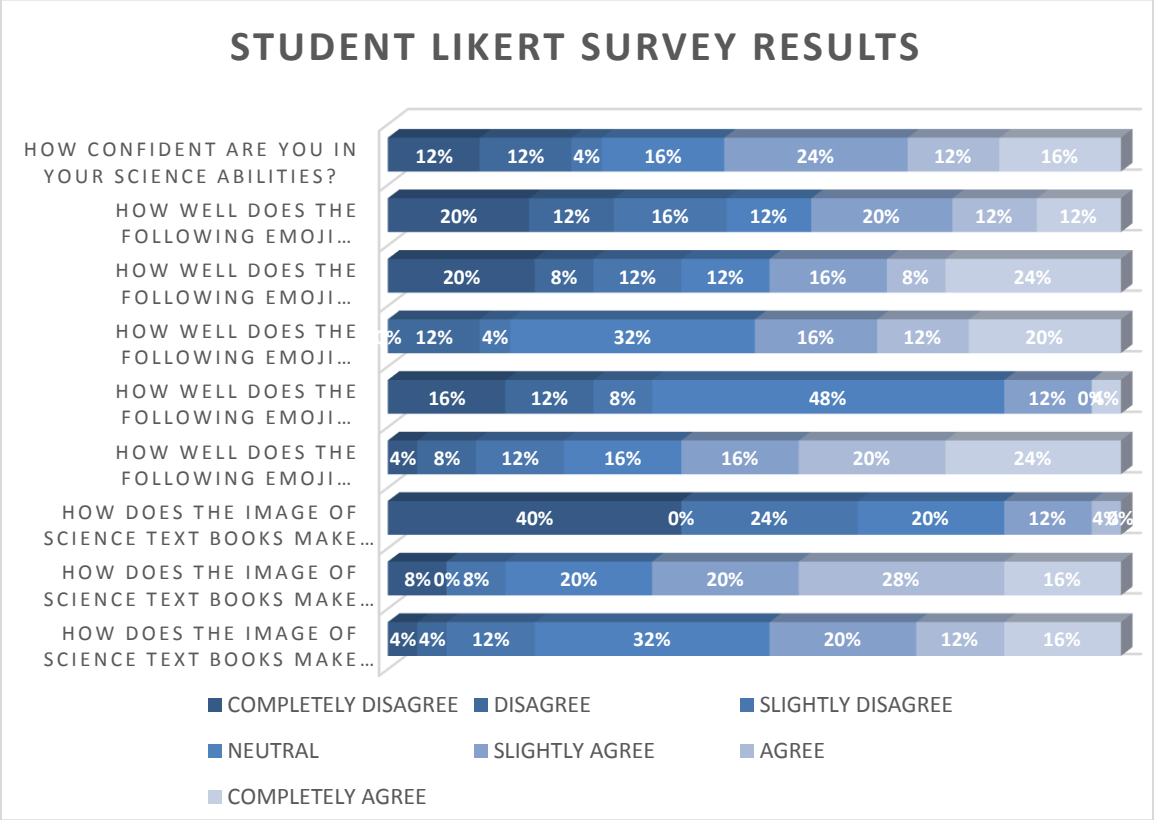


Figure 1. Student Likert Survey results, (N=25).

Many responses to images of text books or a science lab were neutral to not too bothersome; indicating, books and classrooms are not particularly stressful to the students. Maybe it has more to do with the actual work involved. However, there was an overwhelming negative response to a smiley face correctly describing their feelings about school, and a neutral to negative response to a nervous face (12 of 25); suggesting neither face was an appropriate description of their feelings on school. Thunder cloud and sunshine emoji were used to assess how students were feeling at that particular time. There was a wide range of responses for both. Some of the students have confided in me that they do not see a point to high school. They do not care if they graduate, and they do not plan on going to college. Some of them are just trying to survive day to day, knowing

their only hot meals are served at school and wondering if they will have heat when they get home or not.

Finally, 12 students responded positively when asked if they were confident in their abilities. Basically, these students are all in our program because they are deficient in credits, or not on track to graduate with their class. In some unusual cases, we have students sent here from a home school because they moved into a district late in the semester and they are sent to us. I call many of our students "reluctant learners" because they do not particularly feel successful in school or are not comfortable in a school setting. "I don't get it." Is something we hear frequently. "When am I ever going to need this?" and "I ain't gonna to be a scientist." are two more comments I hear quite often in my room. These are some of the feelings and statements that prompted me to begin this study. As a teacher, it is almost painful to see your students struggle and give up on themselves. If we can come up with ways to help them feel successful and to actually be successful, then maybe we can work to make change in our schools.

One other very interesting quote I hear multiple times a year is: "I am going to be the first one in my family to get a high school diploma." This may be the most telling of all; If you didn't graduate high school yourself, or had a bad experience with it, how can you know how to support your children's efforts to graduate? If you are a student in this situation, who are your role models? Some have negative experiences in school, and others have very tumultuous home lives. We were recently discussing attendance issues, and one of our students has to walk over a mile to catch her school bus to come to our

program because her family does not have a reliable vehicle, so she is often absent. It is these daily struggles that many of us take for granted because they are not our struggles.

Student responses to textbook images were neutral and didn't seem to affect anyone too much one way or the other. Perhaps, they are so accustomed to seeing and using textbooks, that they no longer find books stressful. It could also be that students do not feel they can learn much out of a book, many of my students are reluctant to even carry them around.

Throughout the duration of the project, I monitored and recorded student classroom work, and I was unable to make a strong correlation due to lack of consistent involvement. This piece of evidence will be more powerful in the future when I can get more consistent involvement. Each time a student participated in an event, there was an apparent slight increase in enthusiasm for a day or two. Several students expressed interest in attending different nights, but were unable to due to work conflicts, or they simply forgot. Some students expressed that they would not ever come to school outside of the required daily expectation, however, they often participated when we would work on the activities during class time. With so few attendees and a change in the current curriculum, it is unclear whether or not the family science nights had an impact on student work. No apparent links were evident in correlation between attending a family science night and school performance. I emailed an informal survey to a group of twenty-three science teachers from Illinois. They are members of an NGSS training cohort. These are teachers that are passionate about science and are working to train over 500 teachers throughout the state of Illinois. My focus was family involvement in

science nights. The overwhelming response, thirty-five percent suggested food as an incentive. As that is already one of my incentives, I moved on to other responses. One suggestion was to hook them on parent-teacher conference night with something cool, like a telescope. It might get them interested and make science seem more approachable. Another suggestion, was to have the students present some of the activities. I think that is a great goal for this project. In the future, I envision the students acting as student-teacher leaders and facilitating activities. It is important to keep lines of communication open amongst my professional peers, in order to not lose sight of my goal, increased family participation in science education.

Perhaps if we can start small and reach a few more students, they will begin to shift their views and attitudes. With an activity like a Family Science Night that to enhance family support and increase student engagement, perhaps we can begin to break down the barriers. It has been my experience that parents who are turned off by school can inadvertently pass that feeling along to their children.

INTERPRETATION AND CONCLUSION

In response to my questions as to how positive science experiences help increase student motivation, I found that when the families are able to attend the extra-curricular events, it allows a different kind of interaction to take place. It is a positive interaction, one not bound by expectations or time limits. I was able to see slight improvements in all three students that attended the different events, and I would like that growth to continue. It was difficult to measure the impacts on student, teacher, and family involvement, however, each night brought on positive interactions amongst the three. Measuring

students' achievement was a challenge. Attending one or two science nights gave me very little to measure. As I continue to move forward and present these experiences to my students, they appear more interested. This is only year one and it will probably take five years before it is up and running. They ask to do more activities and they ask when and what the next event will be. They really do want to learn. Right now I am trying to answer some what's and how's? One of the most challenging questions to answer is "How can increases in positive school experiences build family relations?" Another important question I hope to answer is "How can positive experiences increase student performance", and "what are those positive experiences?" I am already seeing an increase in interest levels, which is a positive change amongst students that are typically resistant to learning. The semantic differential survey provided good insight into the thinking of high school students. If we can get some of them to expand their thinking, perhaps they will be able to see the real world value of a science education and begin to see themselves in careers that involve science. Daily struggles for some of these families can make it difficult to do extra things like attend a family science night. However, I think more people will make an effort if we have ways to make it more accessible; like holding it right after school. In a perfect world, we would see a steady increase in parental involvement for each science night, but this project is far from over. It has turned into a long term research project and while it won't take long to see the positive effects, it may take a long time to see majority participation.

I have watched my teaching evolve over the course of this project, and have been forced to do some great things for my students that I might otherwise have declared I

didn't have time for. I am finally implementing an afterschool program that these students have needed since I started working at this program. I am trying to come up with ways to entice parents to attend, in addition to infusing the science nights with student community service opportunities. I am confident that this is a valuable experience for my students as well as their families and the community in general. One of the most powerful interactions was the involvement of younger siblings. This was a great opportunity to bring family members together. I am especially hopeful to build a relationship with our Local University, Olivet Nazarene University (ONU) and local community college, Kankakee Community College (KCC). The students of ONU were able to help this year, and I am confident they will be able to continue to assist us. KCC was unable to help this year, but indicated they would be interested in helping in the future, once they build up membership in their school science clubs. I contacted professors from the Engineering and Mathematics and Science and Technology Education departments at the University of Illinois (U of I), Urbana Champaign. This school is not local, but it is a highly respected institution. We are going to work together over the summer and next fall to develop activities for year two. I would like to reach out to one more university in our area, Governor's State University, University Park, IL. They are a growing University that would be easily accessible to all our students as a secondary school option. If you can engage kids in positive experiences, how can that be bad for a community? I hope positive effects of this kind of work can ripple out for years to come. I know that is rather grandiose, however, as teachers, we like to think what we are doing makes a difference.

As we move forward next year, I plan on reaching out to members of the trades in our community. It would be a great way to increase student knowledge on the careers that are available to them and the skills necessary to obtain those careers. We have mechanics, plumbers, electricians and even medical professionals that could reach out to the students in our program. One of the largest employers in our area is CSL Behring, a medical supply company that manufactures immunizations for distribution world-wide.

The foundation has been laid for a powerful study. One of the most challenging questions that I struggled with throughout the duration of this experience was "How do I get the parents to attend?" It would be next to impossible to bus everyone to the event and the funding does not exist for that sort of endeavor. However, our public library and our Community Recreation Center are two places more centrally located. Both of these locations have rooms available for public use, which would assist those with transportation issues. This is a strategy used by Vivian Smith and she has found it to be successful. If the event is more accessible, then we have eliminated one hurdle. I also might need to move beyond cookies and juice. One suggestion was a pizza night. Maybe each night will have a snack theme; sundae bar, nachos, etc.

I have had many great suggestions both from colleagues and in my literature reviews. Next year, I can take it to the next level by possibly playing down the "Science" part of family science night and just have a Family Fun Night. The students would still know it was facilitated by me, the science teacher, but it might take some of the academic shadow off of the experience. I might even employ the herd mentality, by encouraging groups of kids to attend and making things a competition, like a scavenger hunt.

Eventually some students might be able to facilitate a station, which would be a huge confidence boost for that students who may have previously lacked self-confidence.

Before a student can begin our program, they have a meeting with a parent and our director. The rules and guidelines of the program are all laid out and paperwork is signed. I would like to tell the families about the science nights at that point and make it a requirement to come to at least one of the five. Special accommodations can be made if someone absolutely can't attend, however, they would need to speak with me, and it would be a case by case basis. This would be a way to incorporate their community service obligations into a fun learning experience. I have had conversations with other people in the building about the attendance issues, and we have concluded that at larger schools' parental involvement can be lacking. However, if you have a school with 300 kids and twenty percent attend an event that is still 60 families.

The next step in this project is to continue to move forward. The little data I was able to gather supports the idea that many students in our program are not completely tuned in to their education; whether from negative past experiences, lack of support at home, or some other reason. Providing more positive opportunities for students will help nurture both mind and their spirit, and perhaps we can break down some of those barriers. It is going to be a slow process, but I hope to continue these activities next year and possibly integrate a credit or reward system that makes attendance even more enticing. I will continue to monitor progress through evaluations and surveys as well as classroom performance. I would also like to find a way to reach out to the parents and help them understand how important they are to their child's educational success. Perhaps by

impressing this upon my students, they will become educationally supportive parents. It is my hope that the success of this project is felt for years to come.

In an attempt to move forward, through the enriching discussions I have had with my NGSS colleagues, Dr. Woolbaugh and the information I have found in online articles, I know that I need to continue this work. This program will get stronger every year. I will also pursue members of the community to come and be featured at different nights. When I first started working with high school students, I would invite people from all different walks of life to talk to the students about careers. I even had an art teacher come more than once to hold mini art lessons. It is time to revive my teaching and the students' learning. I am looking forward to the new school year and all the positive changes for the students.

VALUES

Personally, this was both enlightening and deflating. I was nervous about hosting each night, but then when students didn't show up, I was disappointed. I really wanted to give up. If it hadn't been for this class and the fact that I was doing this as a research project for a grade, I probably would not have even had the last two events. I was very excited about each night's events and I plan on keeping them and building on them for next year. I know even though numbers were miniscule; an impact was made on families that did attend. LaShay's mom was able to sit back and enjoy her kids running around doing things. She laughed and smiled the entire evening. Kim and her sister had a nice quiet moment to bond. They talked to each other and it was pleasant. Even though I do not have large numbers to tell me that this was a successful event, I know that it made an

impact. No one left a blank on the questionnaire for, "what was your favorite part of the event?"

Next year, we will certainly push Family Fun Night during student registration. Data indicates we really need to push family involvement to get results. It is fun to do these hands on activities in the classroom and the students enjoy them, however, familial involvement would help push achievement even further. I will continue to find other model programs and use their success to inspire and motivate me those evenings when only four or five attend. We could offer more incentives, maybe even prizes, for attendance and look into a better time frame for students and parents. I will continue to build relationships with the local colleges and universities in order to support students' awareness to their future educational opportunities.

I hope that other educators can learn from my experiences. I would like to see other alternative schools trying these types of programs and would like to know if they experience positive effects as well. I could envision creating a presentation out of this to take to a professional development venue, such as NSTA, National Science Teachers Association or ISTA, Illinois Science Teachers Association. I would like to focus on how to get a program like this running and how rewarding is it for everyone involved. I would be able to speak to my struggles and hopefully, how I was able to overcome them. In Illinois, we also have an ICEARY group, which stands for; Illinois Coalition for Educating At-Risk Youth. This would be the ideal setting to bring to the public my STEAM science night experiences. The biggest change this has been for me, is that it

forced me to go outside of my comfort zone, take a risk, and even though it didn't have the amazing success I envisioned, I want to continue to move forward.

I am continuing to build up a network of support from the local community, which will help me continue to create enriching experiences for these students. I have also been able to reach out to a nationwide network of teachers for support. It is through these relationships that I hope to continue to assist the growth of my students both academically and emotionally.

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APPENDICES

APPENDIX A

PARENT INTERVIEW QUESTIONS

1. What is the first thought that comes to mind when you think back to your high school science experience?

   Probe: Can you tell me a little more about that?

2. How do you feel when your student asks for help with homework?

   Probe: Can you give me an example?

3. What could the schools do to help support or encourage your student to succeed in science?

   Probe: Can you give me an example?

4. How could you help the teachers to motivate your child to succeed or excel?

   Probe: Can you say more about that? Or “Let me see if I understand what you are saying…?”

5. Will your student use a science education in the real world?

   Probe: Why do you think that is the case?

6. Would you be willing or able to attend a series of family science nights?

   Probe: What time of day is best?

APPENDIX B

STUDENT SEMANTIC DIFFERENTIAL SURVEY

1. I enjoy a learning challenge.

I love a challenge	O	O	O	O	O	Just give me the answer

2. I like school.

I wish I could be a student forever	O	O	O	O	O	I wish I could quit school yesterday.

3. I like science.

I look forward to science class.	O	O	O	O	O	I will be glad when this torture is over.

4. I like science labs.

I wish we had labs everyday.	O	O	O	O	O	No, I get nervous just thinking about it.

5. I understand my teacher.

I have no problems.	O	O	O	O	O	I feel like my teacher is talking in a different language.

6. I understand the work I am doing in class.

I got this!	O	O	O	O	O	I have no clue.

7. I learn best by reading.

I have to read it.	O	O	O	O	O	It doesn't help at all.

8. I learn best by doing hands on activities.

I am ready to get my hands dirty.	O	O	O	O	O	Not at all

9. I could see myself in a job that has a science connection.

Absolutely	O	O	O	O	O	No way.

10. The skills I am learning as a science student will help me in the real world.

Definitely	O	O	O	O	O	Absolutely not

APPENDIX C

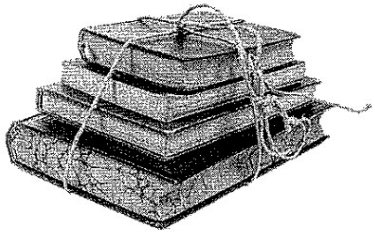
STUDENT LIKERT SURVEY

Family Science Night: Art

1. **How does the image of science text books make you feel?**
   Mark only one oval.

	1	2	3	4	5	6	7	
extremely tense	⬭	⬭	⬭	⬭	⬭	⬭	⬭	completely relaxed, no big deal

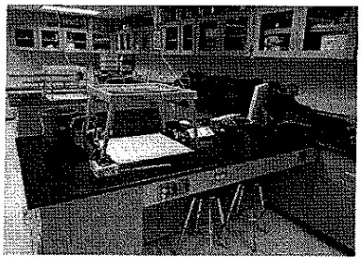
science books



2. **How does this image of a school science lab make you feel?**
   Mark only one oval.

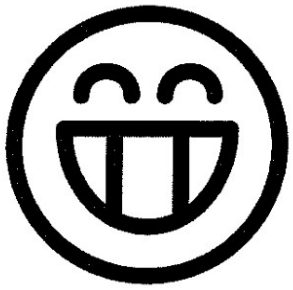
	1	2	3	4	5	6	7	
extremely tense or nervous	⬭	⬭	⬭	⬭	⬭	⬭	⬭	completely cool

science lab



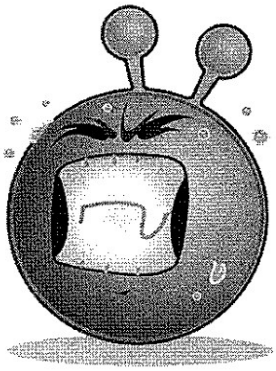
3. **How well does the emoji describe how you feel about school?**
Mark only one oval.

	1	2	3	4	5	6	7	
no way	◯	◯	◯	◯	◯	◯	◯	absolutely



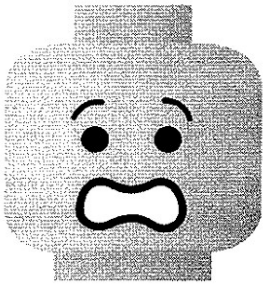
4. **How well does the following emoji describe how you feel about school?**
Mark only one oval.

	1	2	3	4	5	6	7	
not at all	◯	◯	◯	◯	◯	◯	◯	absolutely



5. **How well does the following emoji describe how you feel about school?**
Mark only one oval.

	1	2	3	4	5	6	7	
not at all	◯	◯	◯	◯	◯	◯	◯	absolutely



6. **How well does the following emoji describe how you feel about science class?**
Mark only one oval.

	1	2	3	4	5	6	7	
not at all	◯	◯	◯	◯	◯	◯	◯	absolutely



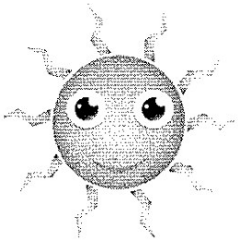
7. **How well does the following emoji describe how you feel right now?**
Mark only one oval.

	1	2	3	4	5	6	7	
not at all	◯	◯	◯	◯	◯	◯	◯	absolutely



8. **How well does the following emoji describe how you feel right now?**
Mark only one oval.

	1	2	3	4	5	6	7	
not at all	◯	◯	◯	◯	◯	◯	◯	absolutely



9. **How confident are you in your science abilities?**
Mark only one oval.

	1	2	3	4	5	6	7	
not at all	⬭	⬭	⬭	⬭	⬭	⬭	⬭	very confident



APPENDIX D

IRB EXEMPTION LETTER

INSTITUTIONAL REVIEW BOARD

For the Protection of Human Subjects
FWA 00000165

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MEMORANDUM

TO: Rebecca Ann Schumacher and Walter Woolbaugh

FROM: Mark Quinn Mark Quinn CTJ

DATE: November 4, 2015

RE: *"The Effects of Monthly Family Science Nights with a Science, Technology, Engineering, Art, and Mathematics (STEAM) Theme [RS110415-EX]*

The above research, described in your submission of **November 4, 2015**, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

_X_ (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

_X_ (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

____ (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

____ (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.

____ (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

_____ (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

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