Female Interest in STEM fields

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Introduction

Science, Technology, Engineering, and Mathematics (STEM) fields comprise a significant part of the American workforce. However, the United States currently has the lowest ratio of STEM to non-STEM bachelor's degrees in the world (National Science Board, 2012). The United States Department of Commerce recently did a study and found that during the beginning of the 21st century the number of employment opportunities in STEM fields had grown three times faster than any other field. It is estimated that within the next decade the United States will need an additional one million STEM professionals. With the explosion of growth in STEM fields women have more opportunities than ever to fill the growing demand of STEM related positions.

Research by Hill, Corbett, and Rose (2010) found that women are significantly underrepresented in computer science and engineering academic departments and STEM fields. According to (Beede et el., 2011) America's current non-STEM related work force is approximately 48% female while the STEM field workforce is less than 24% female. Females have been shying away from STEM fields even though they earn 38% more than women in comparable non-STEM jobs. The wage gap between male and female careers is an average of 14% less than that of non-STEM related jobs.

There are many theories that attempt to explain why this has been occurring. The theories include factors for plausible explanation of this decrease in interest and the pursuit of STEM related careers. The possible factors include; lack of female role models, gender stereotyping, the "leaky pipeline" metaphor, and the absence of a family-friendly work environment. This study is an attempt to understand why more females in a particular school

system are not consistently seeking to pursue STEM fields when there is evidence that proves there is a demand for their creativity, innovations, talent, and skills.

Purpose Statement

In looking at a particular school system determine female student's feelings about STEM fields and pursuing jobs or occupations within those fields. The purpose of this study was to examine the views of female students within a given school system at the elementary and middle school levels to determine perceptions and attitudes toward STEM fields.

Research Question

This study looked at answering the following research questions.

1. How do females perceive STEM fields?
2. Why are females not pursuing careers in STEM fields?
3. How can we increase female interest in STEM fields?

Importance of the Study

According to (Beede et el., 2011) the STEM workforce is crucial to America's innovative capacity and global competiveness. America continually struggles to increase and improve our competitiveness in STEM fields. Females are needed to help meet the growing demands and broadening careers of STEM fields. Even though females have made tremendous gains in education and the workplace over the last 50 years they are still underrepresented in careers that are in STEM fields. The gender-gap in STEM fields needs to be bridged. The importance of females filling the gap is evident in the fact that females currently make up nearly half of the U.S. workforce, half of the college-educated workforce, and less than 25% of the STEM work force. This study will help identify factors that dissuade females from choosing careers in STEM fields. The results of this study will be available to assist educators in determining courses of

action that can be taken to encourage females as they pursue careers in science, technology, engineering, and mathematics.

Definition of Terms

STEM is an acronym fairly specific in nature referring to science, technology, engineering, and math; however, there is no standard definition for what constitutes a STEM job (Beede et al., 2011).

Non-STEM refers to any job or occupation that is not classified in the fields of science, technology, engineering, or math.

Upper elementary school student refers to students who are currently enrolled in fourth and fifth grades.

Middle school student refers to students who are currently enrolled in sixth, seventh, or eighth grades.

Leaky pipeline metaphor is a metaphor used to describe how students progressing through the various educational stages. For example, moving from middle school to high school and then on to college.

Literature Review

The number of women earning advanced degrees in science, technology, engineering, and mathematics (STEM) has increased, yet women remain underrepresented at all ranks of academic hierarchy in these fields (Glass & Minnotte, 2010). Through the investigation of literature there are several identifiable theories that have emerged to explain why fewer females are entering STEM field careers. Among those theories are the "leaky pipeline" metaphor, gender stereotyping, and the lack of role models.

Leaky Pipeline Metaphor

Researchers have traditionally relied on the "leaky pipeline" metaphor to explain the underrepresentation of women faculty in STEM fields (Holmes & O'Connell, 2007; Leboy, 2008). Such arguments suggest that gender disparities result from a shortage in the supply of women seeking educational credentials and faculty careers in STEM fields due to cultural and structural barriers (Blickenstaff, 2005). The leaky pipeline metaphor is a way of describing students moving through educational levels. Students may begin their educational career interested in STEM fields and as they progress through various educational stages they are "leaking" out of the STEM field pipeline. Men, for the most part, travel smoothly from the beginning to the end of the pipeline and thus dominate STEM. The pipeline is said to be leaky because there is steady attrition of females at every level of STEM, from elementary school into the workplace, in most industrialized countries around the world (Clark, 2005). Women's percentages in STEM decrease as they progress through the pipeline.

Gender Steroptyping

Another theory that has been identified is gender stereotyping. (Warren et al., 2013) states that popular, attractive white girls do not choose calculus, physics, or other higher science and mathematics offerings in high school because they will be considered nerds by their peers. Gender stereotypes activated by either explicit reminders of a stereotype or more subtle implicit cues result in student's underperformance and low academic motivation (Stone & McWhinnie, 2008). Gender stereotype threat is a name given to a decrease in performance that occurs when in-group stereotypes are made salient. Gender stereotype threat can also come in various forms of media. The mere presence of posters or magazines in a STEM classroom or laboratory setting that are male typical can undermine women's interest and performance (Murphy, Steele, &

Gross, 2007). The majority of face time on STEM related TV shows tend to be monopolized by men (Kitzinger, et al., 2008). Females in supporting roles are generally portrayed as single. These characters inadvertently steer young women away from the idea of pursuing a STEM career because they lead some girls to believe that they cannot pursue a STEM career and have a family (Whitelegg, et al., 2010, Flicker 2005). Given the pervasiveness of the stereotype that women are incapable of math and science, it is no surprise that researchers have found evidence of this stereotype at an implicit level among both boys and girls (Steffens & Jelnec, 2011).

Lack of role models

The last theory that was identified is the lack of role models. A Congressional commission (2012) found that a greater proportion of women than men switched out of STEM majors, in part due to a lack of role models and difficulty obtaining academic guidance. Women cite a lack of role models as a significant reason for leaving the fields of physics, chemistry, electrical engineering, and computer science. (Goodman & Damour, 2011). Successful STEM role models encourage girls/women to continue academics in computer science and related classes, despite obstacles like social pressure, math anxiety, and lack of self-confidence (Hill, C., Corbett, C. and Rose, A., 2010).

This literature review has shown that there are initiatives beginning to be organized and implemented to encourage females in the fields of STEM. The Girl Scouts have started new programs with badges geared toward STEM fields. In 2009, the President launched a campaign called *Educate to Innovate* and in 2010 *Change the Equation*. These campaigns aim to broaden participation in STEM to all Americans, including women, girls, and minorities. The steps that administration have taken is focusing on underrepresented groups, exposing girls and young

women to STEM fields, setting the standard with exceptional role models, and promoting tech inclusion.

Methodology

Overview of research design

The research design for this study was a quantitative survey conducted at the upper elementary school and middle school levels. The survey was administered to determine the perspective interest of female students at various educational stages within the same school system. A S-STEM survey developed by the Friday Institute, National Science Foundation under Grant No. 1038154, the Golden LEAF Foundation, and MISO (Monitoring the Impact of STEM Outreach) was used during this study. The survey used measured student's perceptions and attitudes toward STEM and STEM careers. The S-STEM survey was administered by two elementary school teachers and one middle school teacher to all students within a particular class period using SurveyMonkey for anonymity, reliability, and validity.

Participants

The targeted population for this study included three classes of fourth grade students and one class of fifth grade students. The researcher's targeted number of upper elementary school participants for the study was originally 100 students; however, 82 upper elementary school students, 49 female and 33 male, completed the survey. Administration of the S-Stem survey was in a regular classroom setting with all students using their individually school system assigned MacBook airs. Participants in the study were mostly Caucasian students with a small minority of African American, Hispanic, and Asian students. Students were from varied academic abilities ranging from tier 1, tier 2, SST, 504, gifted, IEP, and economically disadvantaged.

The targeted population for middle school students included two classes. Participants in the study were prominently Caucasian students with a small minority of African American, Hispanic, and Asian students. Students were of varied academic abilities ranging from tier 1, tier 2, SST, 504, gifted, IEP, and economically disadvantaged. The researcher's targeted number of participants for the survey was 100 students; however, 105 students, 39 female and 66 male, were actually surveyed. Students were administered the survey in their computer career connections class using their individually school system assigned MacBook airs.

Data Sources/Instruments/Procedures

This study was done using a survey developed by the Friday Institute, National Science Foundation under Grant No. 1038154, the Golden LEAF Foundation, and MISO (Monitoring the Impact of STEM Outreach). The Institute gave me e-mail permission to use the instrument as is or with modifications with assurance that there would be proper credit given, appropriate use, confidentiality of all participants, and an agreement to allow them the use of data collected for additional validity and reliability analysis. There are two S-STEM surveys currently available for administration. One survey is designed for students in fourth and fifth grades upper elementary and the other survey is designed for students in sixth through twelfth grades. The Cronbach's Alpha for this survey is .85 for upper elementary school and .90 for middle and high school.

The upper elementary school S-Stem survey is comprised of 51 questions in six sections that include questions about math, science, engineering and technology, 21st century learning, questions about your future and about yourself. A copy of the administered survey is included in the appendix A.

The middle school survey is comprised of 55 questions in six sections that include questions about math, science, engineering and technology, 21st century learning, questions about your future and about yourself. A copy of the administered survey is included in the appendix B.

Reliability and Validity

The reliability and validity of the original STEM-Student Survey that was used in this study was tested using exploratory factor analysis, principal axis factoring, and promax rotation. Lawshe's content validity ratio was calculated for each item of the survey. Items that contained gender bias were removed from the original instrument. The Cronbach's Alpha showed that the average was .85 in the upper elementary school S-STEM survey and .90 in middle and high school S-STEM survey. The original instrument was piloted using 109 middle and high school students. Survey takers used suggestions for improvement and engineering education experts assisted in rewriting the engineering and technology attitudes section. The original instrument was edited based on factor analysis, expert feedback, participant feedback, and literature review. The revision of the original instrument resulted in the section "your future" which measures interest in twelve, broad, STEM career fields. Differential item functioning tests were conducted to assess the internal validity of the original survey. Results showed that measurement invariance held at all five levels.

Data Analysis

The S-Stem survey was administered to 104 upper elementary students. Of those, 49 students were identified as female and 33 male. There were 22 surveys not analyzed because gender was not selected, resulting in 82 actual surveys analyzed. At the middle school level the survey was administered to 105 students. Of those 39 were identified as female and 66 male.

The first set of questions in the survey dealt with how well students' perceived they will do in school this year in English/language arts, math, and science. Table 1, appendix C, shows that of the 49 upper elementary female students responding that 4% felt they would not do well in English/language arts, math, and science while 52% felt they would do very well and approximately 4.5% of upper elementary male students felt that they would not do very well in English/language arts, math, or science while 42% felt they would do very well. It is interesting that the upper elementary female student perception is that they would do better than males by 10% and that approximately the same percent of females and males felt they would not do very well. The middle school female student population felt that 9% would not do very well in math or science while an average of 52% felt they would do very well. In contrast, 8% of middle school male students felt that they would not do very well in English/language arts, math, and science while 47 % felt they would do very well. Again, females feel that they will do better than their male peers by about 5%.

The second group of questions, shown in table 2 for upper elementary students and table 3 for middle school students, asks students if they know adults working in STEM fields. The goal of this group of questions is to determine if female students having interest is possibly swayed based on knowledge of an adult in a STEM occupation. The upper elementary survey results show that 19% of female students while 16% of male students know adults who work as a scientists; 46% of females while 64% of males know adults who work as engineers; 55% of females while 50% if males know adults who work as mathematicians; and 62% of females while 47% of males know adults who work as technologists. The middle school survey results show that 23% of female students while 22% of male students know adults who work as a scientists; 62% of females while 66% of males know adults who work as engineers; 41% of

females while 37% of males know adults who work as mathematicians; and 53% of females while 51% of males know adults who work as technologists. It is interesting to note that both upper elementary school and middle school females know more adults who work as scientists, mathematicians, and technologists while more upper elementary school and middle school males know more adults who work as engineers.

Middle school students were asked questions about future plans to take advanced mathematics and science classes as well as their intent to attend college. It was interesting to note that while 94% of females plan to attend college only 41% plan to take advanced math classes and only 48% plan to take advanced science classes. There were 70% of males who plan to attend college with 40% taking advanced mathematics classes and 42% taking advanced science classes. The findings reveal that 24% more females are planning to attend college with 1% more planning to take advanced mathematics classes and 6% more planning to take advanced science classes.

In a closer look at student's perceptions upper elementary and middle school students were asked a series of questions related to math, science, engineering and technology, and 21st century skills. Each group of questions was looked at in its entirety rather than looking at individual questions. Tables 4-11.2 show findings for these survey questions.

The results indicate that upper elementary female students perceive their 21st century skills to be higher than other STEM skills. Their perception is that they have more aptitude toward engineering and technology than math or science. Upper elementary males perceive that they have a higher aptitude for engineering and technology. Their perception is that they have the lowest aptitude for math in the areas of STEM. This information shows that upper elementary females perceive they are better in math (0.02), worse in science (-.08), worse in

engineering and technology (-.42), and better at 21st century skills (.36) than their upper elementary males peers.

Middle school females perceive that they have better 21st century skills that other STEM related skills. Their perception is that they are weaker in math than other STEM fields. Middle school males perceive that they are stronger in 21st century skills. They perceive they are weaker in math. This indicates that both middle school males and females feel they are stronger at 21st century skills and they are weaker in math. When comparing middle school female perceptions to that of their male peers the females perceive that they are slighter stronger in math (.10), weaker in science (-0.17), weaker in engineering and technology (-.54) and stronger in 21st century skills (.06).

The female perceptions for STEM related questions of math, science, engineering and technology, and 21st century skills indicate an interesting finding. There were more upper elementary school female students surveyed than middle school female students and yet both upper elementary and middle school females perceived that they are slighter stronger in math, weaker in science, weaker in engineering and technology, and stronger in 21st century skills than their male peers.

The last area of both S-STEM surveys dealt with questions about interest in occupations in STEM related fields. This area yielded a great deal of information about student perceptions of the future career choices STEM related occupations. STEM related field questions included interest questions about physics, environmental work, biology and zoology, veterinary work, mathematics, medicine, earth science, computer science, medical science, chemistry, energy, and engineering. Tables 12-15 show findings for these questions.

Upper Elementary School Findings

The data shows that upper elementary school females are more interested in veterinary work and medical science than other STEM fields. They are interested in the STEM fields that would be considered service related while they are least interested in the STEM field of physics.

The data also shows that upper elementary male students are most interested in the STEM fields of engineering and energy while they are least interested in the STEM field of veterinary work.

Upper elementary school female students are more interested in science fields while male students are more interested in engineering. Female students show an increased interest in veterinary work and medical science over their male peers. Male peers show an increased interest in the remaining ten fields addressed in the survey.

Tables 16 and 17 below show the difference in interest of STEM fields between upper elementary female and male students.

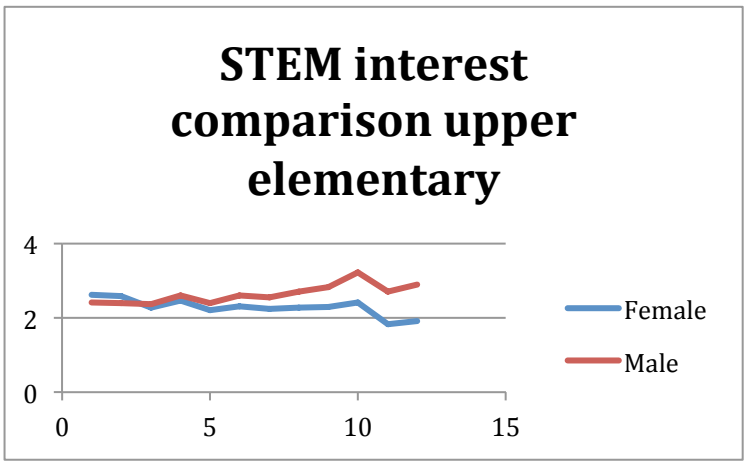
Table 16

Stem Interest comparison of Upper elementary females and males

	Female	Male	Difference
Veterinary work	2.62	2.41	0.21
Medical science	2.58	2.4	0.18
Medicine	2.27	2.37	-0.1
Biology and zoology	2.47	2.6	-0.13
Environmental work	2.2	2.4	-0.2
Mathematics	2.31	2.6	-0.29
Earth science	2.25	2.55	-0.3
Chemistry	2.27	2.7	-0.43
Computer science	2.3	2.83	-0.53
Engineering	2.41	3.23	-0.82
Physics	1.83	2.7	-0.87
Energy	1.91	2.89	-0.98

Table 17

Stem Interest comparison of Upper elementary females and males



Middle School Findings

Middle school female students are most interested in medicine and medical work while they are least interested in engineering. It appears that they are more interested in the maintaining health and preventing and treating disease.

Middle school male students are most interested in engineering and computer science while they are least interested in medicine. Male students are more interested in designing, testing, and manufacturing new products.

When comparing middle school females and middle school males it is interesting to note that females are more interested in STEM occupations that include nurse, physician's assistant, dentist, physical therapist, or doctor while middle school male students are interested in STEM occupations like architects, welders, and civil, industrial, agricultural, or mechanical engineers. Female middle school students show an increased interest in medical fields and their interest slowly declines as you look at other STEM fields in the survey.

Tables 18 and 19 are visual representations of these findings.

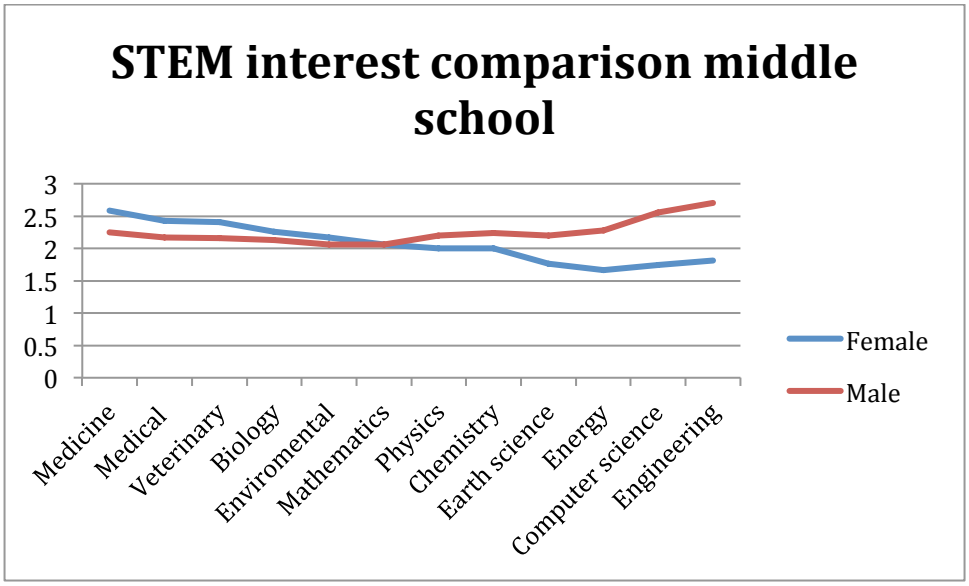
Table 18

STEM interest comparison for middle school students

	Female	Male	difference
Medicine	2.58	2.25	0.33
Medical	2.43	2.17	0.26
Veterinary	2.41	2.16	0.25
Biology	2.26	2.13	0.13
Environmental	2.17	2.06	0.11
Mathematics	2.06	2.06	0
Physics	2	2.2	-0.2
Chemistry	2	2.24	-0.24
Earth science	1.76	2.2	-0.44
Energy	1.66	2.28	-0.62
Computer science	1.74	2.55	-0.81
Engineering	1.81	2.7	-0.89

Table 19

STEM interest comparison for middle school students



Upper elementary and middle school females are both more interested in medical fields than their male peers. Upper elementary school female students are more interested in veterinary medicine while middle school females are more interested in medicine. Upper elementary school females want to work with animals while middle school females want to work with people. Both fields are care giving, service related STEM fields. Both upper elementary school females and middle school females score their interest in medical science higher than their male peers. The both have many STEM occupations where they scored their interest much lower than their male peers. Both upper elementary and middle school females rank engineering, energy, and computer science near the bottom of their STEM interests.

Conclusion

Do female students perceive themselves as successful in areas of STEM? Yes, the findings of the survey show that an overwhelming majority of females feel that they will be successful in STEM related classes.

Are female students in this school system interested in STEM fields? Female students in this school district are exposed to adults who have entered STEM related fields; however, their interest is concentrated mostly in science. There were 62% of upper elementary school females that indicated they knew adults working as technologists; however, they indicated they were mostly interested in veterinary work and there were 62% of middle school females that indicated they knew adults working as engineers; however, they were more interested in medicine. This indicates that even though they knew someone working in a specific STEM field their interest toward that field was not necessarily increased. The question that was not asked was did they know a female or male in who worked in the field. More research needs to be done in the school system to determine if this is a factor in their interest. One recommendation for increasing

interest among female students is utilizing the adults that students in the school system know that are in STEM fields and having them mentor and speak with students.

What other initiatives can be implemented to increase interest in STEM in this school system? To increase female interest in STEM one recommendation is to implement female coding and/or computer clubs. Through Girl Scouts, Educate to Innovate, and other organizations there are new programs available for adults to use in promoting girls' interest and skills in STEM fields.

Based on the findings of this study the females in this school system need a program that will raise their interest in STEM fields beyond science. One such program that has been developed through Google, Girl Scouts, and other organizations is called Made with the Code. If implemented, a program such as this would aid in enlightening females in this school system.

In order for females in this school district to become inspired by STEM we must begin at the elementary school level by raising their curiosity and creating an environment where that curiosity can flourish.

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Appendix A

Original S-STEM survey

Upper Elementary School Student Attitudes toward STEM (S-STEM) – 4th -5th

Directions:

There are lists of statements on the following pages. Please mark your answer sheets by marking how you feel about each statement. For example:

Example 1:	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I like engineering.	○	○	○	○	○

As you read the sentence, you will know whether you agree or disagree. Fill in the circle that describes how much you agree or disagree.

Even though some statements are very similar, please answer each statement. This is not timed; work fast, but carefully.

There are no "right" or "wrong" answers! The only correct responses are those that are true for you. Whenever possible, let the things that have happened to you help you make a choice.

Please fill in on only one answer per question.

Recommended citation for this survey:

> Friday Institute for Educational Innovation (2012). *Upper Elementary School Student Attitudes toward STEM Survey*. Raleigh, NC: Author.

Math

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. Math has been my worst subject.	○	○	○	○	○
2. I would consider choosing a career that uses math.	○	○	○	○	○
3. Math is hard for me.	○	○	○	○	○
4. I am the type of student to do well in math.	○	○	○	○	○
5. I can handle most subjects well, but I cannot do a good job with math.	○	○	○	○	○
6. I am sure I could do advanced work in math.	○	○	○	○	○
7. I can get good grades in math.	○	○	○	○	○
8. I am good at math.	○	○	○	○	○

Science

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
9. I am sure of myself when I do science.	○	○	○	○	○
10. I would consider a career in science.	○	○	○	○	○
11. I expect to use science when I get out of school.	○	○	○	○	○
12. Knowing science will help me earn a living.	○	○	○	○	○
13. I will need science for my future work.	○	○	○	○	○
14. I know I can do well in science.	○	○	○	○	○
15. Science will be important to me in my life's work.	○	○	○	○	○
16. I can handle most subjects well, but I cannot do a good job with science.	○	○	○	○	○

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
17. I am sure I could do advanced work in science.	○	○	○	○	○

Engineering and Technology

Please read this paragraph before you answer the questions.

Engineers use math, science, and creativity to research and solve problems that improve everyone's life and to invent new products. There are many different types of engineering, such as chemical, electrical, computer, mechanical, civil, environmental, and biomedical. Engineers design and improve things like bridges, cars, fabrics, foods, and virtual reality amusement parks. **Technologists** implement the designs that engineers develop; they build, test, and maintain products and processes.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
18. I like to imagine creating new products.	○	○	○	○	○
19. If I learn engineering, then I can improve things that people use every day.	○	○	○	○	○
20. I am good at building and fixing things.	○	○	○	○	○
21. I am interested in what makes machines work.	○	○	○	○	○
22. Designing products or structures will be important for my future work.	○	○	○	○	○
23. I am curious about how electronics work.	○	○	○	○	○
24. I would like to use creativity and innovation in my future work.	○	○	○	○	○
25. Knowing how to use math and science together will allow me to invent useful things.	○	○	○	○	○
26. I believe I can be successful in a career in engineering.	○	○	○	○	○

21st Century Skills

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
27. I am confident I can lead others to accomplish a goal.	○	○	○	○	○
28. I am confident I can encourage others to do their best.	○	○	○	○	○
29. I am confident I can produce high quality work.	○	○	○	○	○
30. I am confident I can respect the differences of my peers.	○	○	○	○	○
31. I am confident I can help my peers.	○	○	○	○	○
32. I am confident I can include others' perspectives when making decisions.	○	○	○	○	○
33. I am confident I can make changes when things do not go as planned.	○	○	○	○	○
34. I am confident I can set my own learning goals.	○	○	○	○	○
35. I am confident I can manage my time wisely when working on my own.	○	○	○	○	○
36. When I have many assignments, I can choose which ones need to be done first.	○	○	○	○	○
37. I am confident I can work well with students from different backgrounds.	○	○	○	○	○

Your Future

Here are descriptions of subject areas that involve math, science, engineering and/or technology, and lists of jobs connected to each subject area. As you read the list below, you will know how interested you are in the subject and the jobs. Fill in the circle that relates to how interested you are.

There are no "*right*" or "*wrong*" answers. The only correct responses are those that *are true for you*.

	Not at all Interested	Not So Interested	Interested	Very Interested
1. **Physics:** is the study of basic laws governing the motion, energy, structure, and interactions of matter. This can include studying the nature of the universe. *(aviation engineer, alternative energy technician, lab technician, physicist, astronomer)*	○	○	○	○
2. **Environmental Work:** involves learning about physical and biological processes that govern nature and working to improve the environment. This includes finding and designing solutions to problems like pollution, reusing waste and recycling. *(pollution control analyst*, *environmental engineer or scientist, erosion control specialist, energy systems engineer and maintenance technician)*	○	○	○	○
3. **Biology and Zoology:** involve the study of living organisms (such as plants and animals) and the processes of life. This includes working with farm animals and in areas like nutrition and breeding. (*biological technician, biological scientist, plant breeder, crop lab technician, animal scientist, geneticist, zoologist)*	○	○	○	○
4. **Veterinary Work:** involves the science of preventing or treating disease in animals. *(veterinary assistant, veterinarian, livestock producer, animal caretaker)*	○	○	○	○
5. **Mathematics:** is the science of numbers and their operations. It involves computation, algorithms and theory used to solve problems and summarize data. *(accountant, applied mathematician, economist, financial analyst, mathematician, statistician, market researcher, stock market analyst)*	○	○	○	○

	Not at all Interested	Not So Interested	Interested	Very Interested
6. **Medicine:** involves maintaining health and preventing and treating disease. *(physician's assistant, nurse, doctor, nutritionist, emergency medical technician, physical therapist, dentist)*	○	○	○	○
7. **Earth Science:** is the study of earth, including the air, land, and ocean. *(geologist, weather forecaster, archaeologist, geoscientist)*	○	○	○	○
8. **Computer Science:** consists of the development and testing of computer systems, designing new programs and helping others to use computers. *(computer support specialist, computer programmer, computer and network technician, gaming designer, computer software engineer, information technology specialist)*	○	○	○	○
9. **Medical Science:** involves researching human disease and working to find new solutions to human health problems. *(clinical laboratory technologist, medical scientist, biomedical engineer, epidemiologist, pharmacologist)*	○	○	○	○
10. **Chemistry:** uses math and experiments to search for new chemicals, and to study the structure of matter and how it behaves. *(chemical technician, chemist, chemical engineer)*	○	○	○	○
11. **Energy:** involves the study and generation of power, such as heat or electricity. *(electrician, electrical engineer, heating, ventilation, and air conditioning (HVAC) technician, nuclear engineer, systems engineer, alternative energy systems installer or technician)*	○	○	○	○

	Not at all Interested	Not So Interested	Interested	Very Interested
12. **Engineering:** involves designing, testing, and manufacturing new products (like machines, bridges, buildings, and electronics) through the use of math, science, and computers. *(civil, industrial, agricultural, or mechanical engineers, welder, auto-mechanic, engineering technician, construction manager)*	○	○	○	○

About Yourself

1. How well do you expect to do this year in your:

	Not Very Well	OK/Pretty Well	Very Well
English/Language Arts Class?	○	○	○
Math Class?	○	○	○
Science Class?	○	○	○

2. More about you.

	Yes	No	Not Sure
Do you know any adults who work as scientists?	○	○	○
Do you know any adults who work as engineers?	○	○	○
Do you know any adults who work as mathematicians?	○	○	○
Do you know any adults who work as technologists?	○	○	○

3. More about you.

What is your gender?	Male	Female
	○	○

Appendix B

Middle/High School Student Attitudes toward STEM (S-STEM) – 6th -12th

Directions:

There are lists of statements on the following pages. Please mark your answer sheets by marking how you feel about each statement. For example:

Example 1:	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I like engineering.	○	○	○	○	○

As you read the sentence, you will know whether you agree or disagree. Fill in the circle that describes how much you agree or disagree.

Even though some statements are very similar, please answer each statement. This is not timed; work fast, but carefully.

There are no "right" or "wrong" answers! The only correct responses are those that are true *for you*. Whenever possible, let the things that have happened to you help you make a choice.

Please fill in only one answer per question.

Recommended citation for this survey:

> Friday Institute for Educational Innovation (2012). *Middle/High School Student Attitudes toward STEM Survey*. Raleigh, NC: Author.

Math

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
27. Math has been my worst subject.	○	○	○	○	○
28. I would consider choosing a career that uses math.	○	○	○	○	○
29. Math is hard for me.	○	○	○	○	○
30. I am the type of student to do well in math.	○	○	○	○	○
31. I can handle most subjects well, but I cannot do a good job with math.	○	○	○	○	○
32. I am sure I could do advanced work in math.	○	○	○	○	○
33. I can get good grades in math.	○	○	○	○	○
34. I am good at math.	○	○	○	○	○

Science

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
35. I am sure of myself when I do science.	○	○	○	○	○
36. I would consider a career in science.	○	○	○	○	○
37. I expect to use science when I get out of school.	○	○	○	○	○
38. Knowing science will help me earn a living.	○	○	○	○	○
39. I will need science for my future work.	○	○	○	○	○
40. I know I can do well in science.	○	○	○	○	○
41. Science will be important to me in my life's work.	○	○	○	○	○
42. I can handle most subjects well, but I cannot do a good job with science.	○	○	○	○	○

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
43. I am sure I could do advanced work in science.	○	○	○	○	○

Engineering and Technology

Please read this paragraph before you answer the questions.

Engineers use math, science, and creativity to research and solve problems that improve everyone's life and to invent new products. There are many different types of engineering, such as chemical, electrical, computer, mechanical, civil, environmental, and biomedical. Engineers design and improve things like bridges, cars, fabrics, foods, and virtual reality amusement parks. **Technologists** implement the designs that engineers develop; they build, test, and maintain products and processes.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
44. I like to imagine creating new products.	○	○	○	○	○
45. If I learn engineering, then I can improve things that people use every day.	○	○	○	○	○
46. I am good at building and fixing things.	○	○	○	○	○
47. I am interested in what makes machines work.	○	○	○	○	○
48. Designing products or structures will be important for my future work.	○	○	○	○	○
49. I am curious about how electronics work.	○	○	○	○	○
50. I would like to use creativity and innovation in my future work.	○	○	○	○	○
51. Knowing how to use math and science together will allow me to invent useful things.	○	○	○	○	○
52. I believe I can be successful in a career in engineering.	○	○	○	○	○

21st Century Skills

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
38. I am confident I can lead others to accomplish a goal.	○	○	○	○	○
39. I am confident I can encourage others to do their best.	○	○	○	○	○
40. I am confident I can produce high quality work.	○	○	○	○	○
41. I am confident I can respect the differences of my peers.	○	○	○	○	○
42. I am confident I can help my peers.	○	○	○	○	○
43. I am confident I can include others' perspectives when making decisions.	○	○	○	○	○
44. I am confident I can make changes when things do not go as planned.	○	○	○	○	○
45. I am confident I can set my own learning goals.	○	○	○	○	○
46. I am confident I can manage my time wisely when working on my own.	○	○	○	○	○
47. When I have many assignments, I can choose which ones need to be done first.	○	○	○	○	○
48. I am confident I can work well with students from different backgrounds.	○	○	○	○	○

Your Future

Here are descriptions of subject areas that involve math, science, engineering and/or technology, and lists of jobs connected to each subject area. As you read the list below, you will know how interested you are in the subject and the jobs. Fill in the circle that relates to how interested you are.

There are no "*right*" or "*wrong*" answers. The only correct responses are those that *are true for you*.

	Not at all Interested	Not So Interested	Interested	Very Interested
1. **Physics:** is the study of basic laws governing the motion, energy, structure, and interactions of matter. This can include studying the nature of the universe. *(aviation engineer, alternative energy technician, lab technician, physicist, astronomer)*	○	○	○	○
2. **Environmental Work:** involves learning about physical and biological processes that govern nature and working to improve the environment. This includes finding and designing solutions to problems like pollution, reusing waste and recycling. *(pollution control analyst*, *environmental engineer or scientist, erosion control specialist, energy systems engineer and maintenance technician)*	○	○	○	○
3. **Biology and Zoology:** involve the study of living organisms (such as plants and animals) and the processes of life. This includes working with farm animals and in areas like nutrition and breeding. (*biological technician, biological scientist, plant breeder, crop lab technician, animal scientist, geneticist, zoologist)*	○	○	○	○
4. **Veterinary Work:** involves the science of preventing or treating disease in animals. *(veterinary assistant, veterinarian, livestock producer, animal caretaker)*	○	○	○	○
5. **Mathematics:** is the science of numbers and their operations. It involves computation, algorithms and theory used to solve problems and summarize data. *(accountant, applied mathematician, economist, financial analyst, mathematician, statistician, market researcher, stock market analyst)*	○	○	○	○

	Not at all Interested	Not So Interested	Interested	Very Interested
6. **Medicine:** involves maintaining health and preventing and treating disease. *(physician's assistant, nurse, doctor, nutritionist, emergency medical technician, physical therapist, dentist)*	○	○	○	○
7. **Earth Science:** is the study of earth, including the air, land, and ocean. *(geologist, weather forecaster, archaeologist, geoscientist)*	○	○	○	○
8. **Computer Science:** consists of the development and testing of computer systems, designing new programs and helping others to use computers. *(computer support specialist, computer programmer, computer and network technician, gaming designer, computer software engineer, information technology specialist)*	○	○	○	○
9. **Medical Science:** involves researching human disease and working to find new solutions to human health problems. *(clinical laboratory technologist, medical scientist, biomedical engineer, epidemiologist, pharmacologist)*	○	○	○	○
10. **Chemistry:** uses math and experiments to search for new chemicals, and to study the structure of matter and how it behaves. *(chemical technician, chemist, chemical engineer)*	○	○	○	○
11. **Energy:** involves the study and generation of power, such as heat or electricity. *(electrician, electrical engineer, heating, ventilation, and air conditioning (HVAC) technician, nuclear engineer, systems engineer, alternative energy systems installer or technician)*	○	○	○	○

	Not at all Interested	Not So Interested	Interested	Very Interested
12. **Engineering:** involves designing, testing, and manufacturing new products (like machines, bridges, buildings, and electronics) through the use of math, science, and computers. *(civil, industrial, agricultural, or mechanical engineers, welder, auto-mechanic, engineering technician, construction manager)*	○	○	○	○

About Yourself

1. How well do you expect to do this year in your:

	Not Very Well	OK/Pretty Well	Very Well
English/Language Arts Class?	○	○	○
Math Class?	○	○	○
Science Class?	○	○	○

2. In the future, do you plan to take advanced classes in:

	Yes	No	Not Sure
Mathematics?	○	○	○
Science?	○	○	○

3. Do you plan to go to college?
   - ❍ Yes
   - ❍ No
   - ❍ Not Sure

4. More about you.

	Yes	No	Not Sure
Do you know any adults who work as scientists?	○	○	○
Do you know any adults who work as engineers?	○	○	○
Do you know any adults who work as mathematicians?	○	○	○
Do you know any adults who work as technologists?	○	○	○

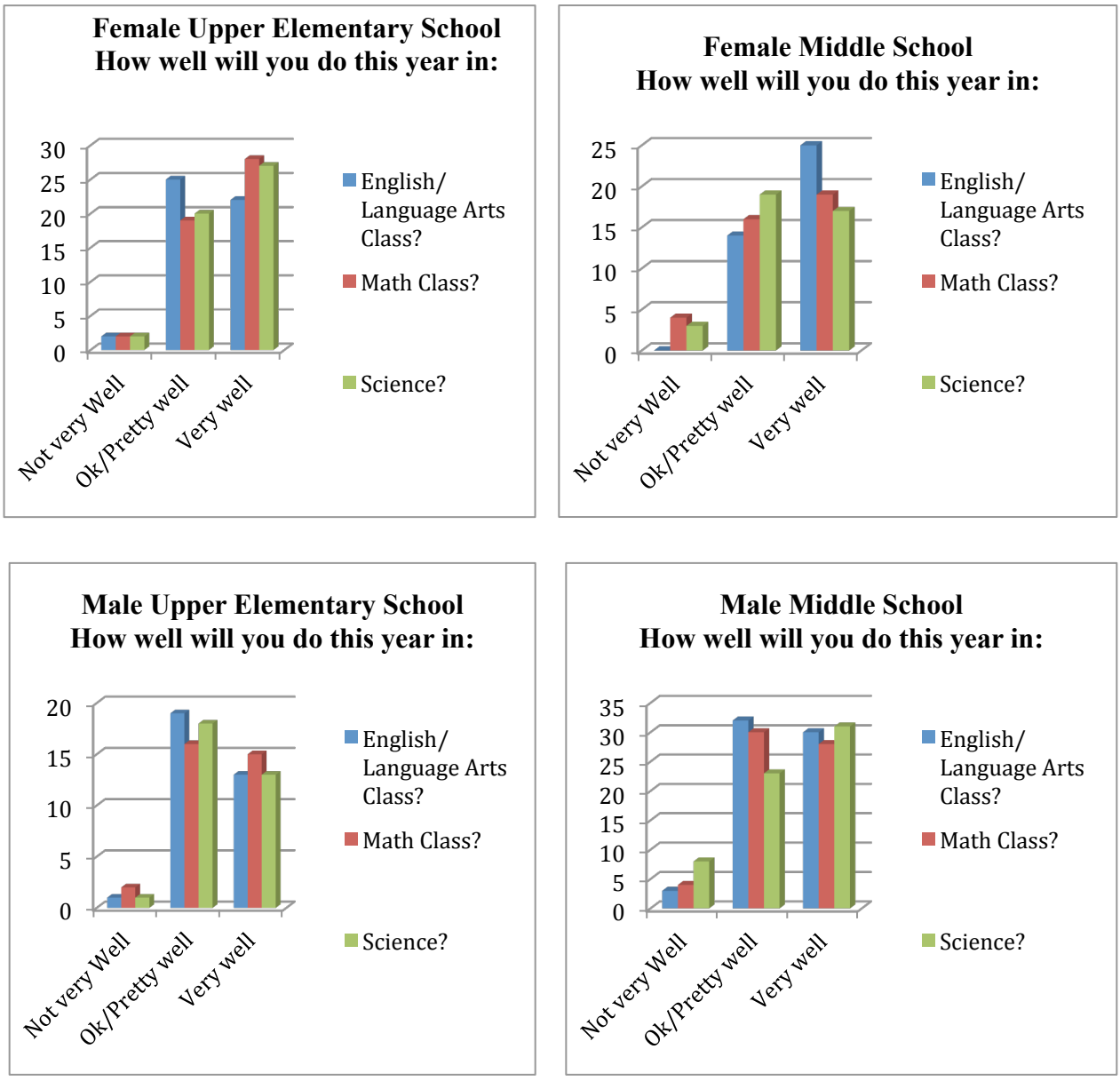
4. More about you.

What is your gender?	Male	Female
	○	○

Appendix C

Table 1

Comparisons of upper elementary and middle school students' perception of how well they will you do this year

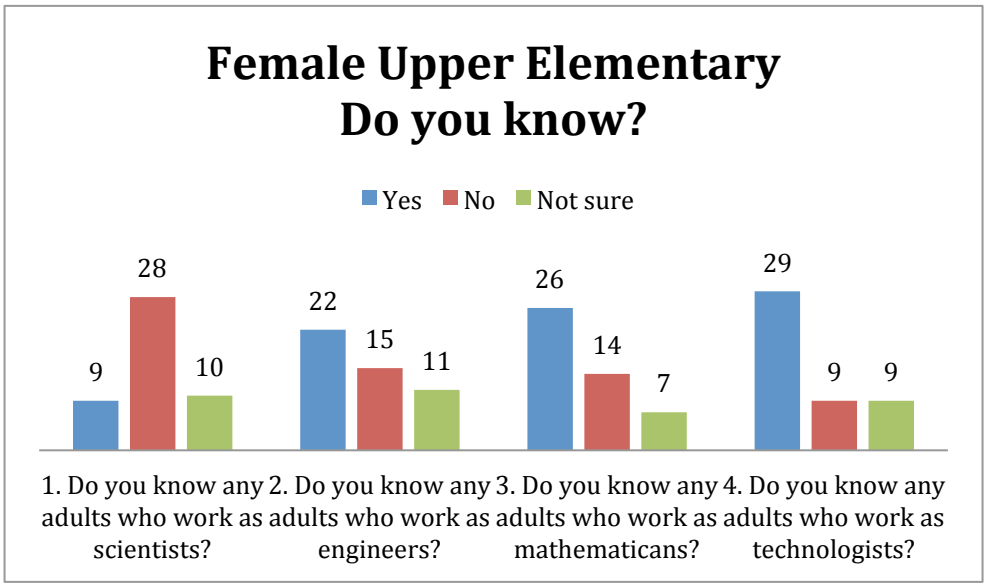


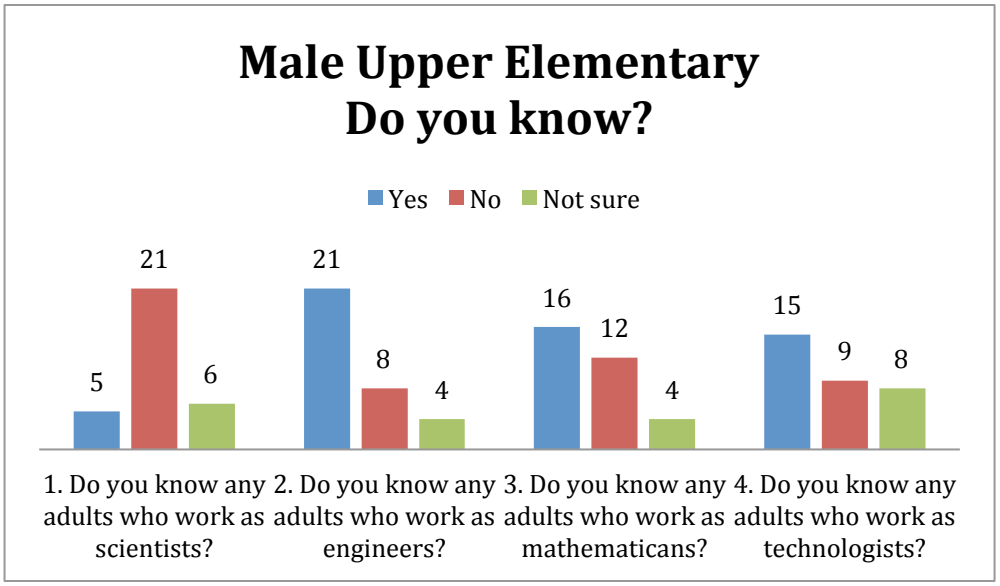
Bar Graphs show responses of upper elementary school female and male students as well as middle school female and male students and their perceptions of how well they will do this year with subjects related to STEM

Appendix D

Table 2

Comparison of upper elementary school students and their knowledge of adults in STEM fields



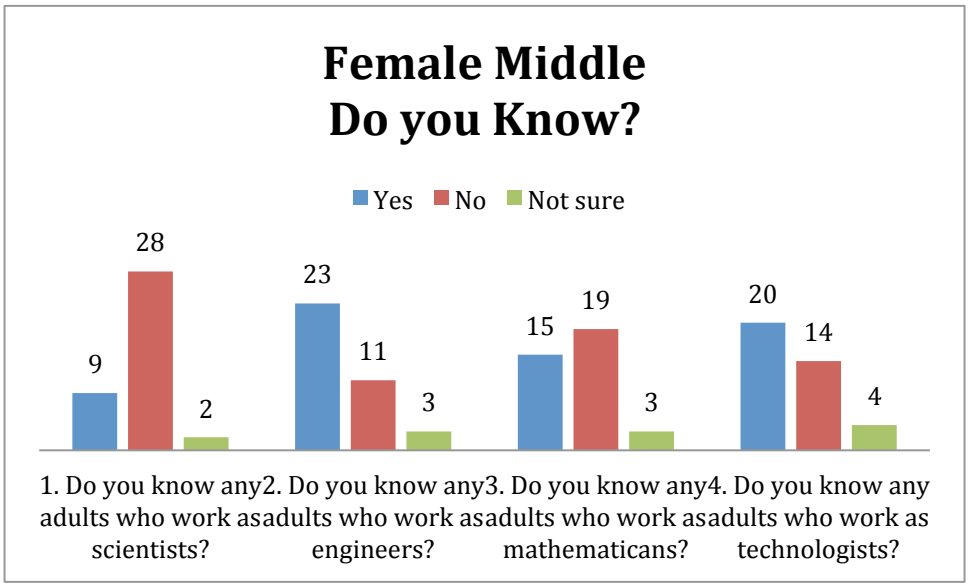


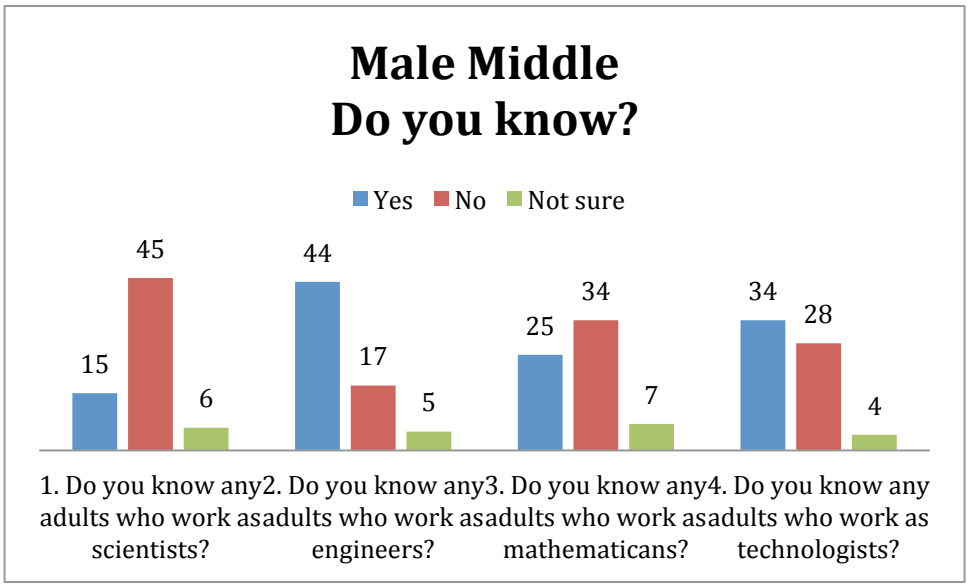
Bar Graphs show responses of upper elementary school female and male students and their response to knowing someone employed in a STEM field

Appendix E

Table 3

Comparison of middle school students and their knowledge of adults in STEM fields





Bar graphs show responses of middle school female and male students and their response to knowing someone employed in a STEM field

Appendix F

Table 4

Upper elementary school students' perceptions of math

Upper elementary school female	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
5. Math has been my worst subject.	18	21	6	3	1
6. I would consider choosing a career in math.	12	14	12	11	0
7. Math is hard for me.	11	21	11	3	1
8. I am the type of student to do well in math.	4	5	10	20	10
9. I can handle most subjects well, but I cannot do a good job with math.	12	17	11	6	3
10. I am sure I could do advanced work with math.	3	6	11	21	8
11. I can get good grades in math.	2	2	5	22	18
12. I am good at math.	3	1	10	23	12
Upper elementary school male	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
5. Math has been my worst subject.	11	8	7	2	4
6. I would consider choosing a career in math.	9	13	6	2	2
7. Math is hard for me.	10	10	4	5	2
8. I am the type of student to do well in math.	3	4	4	9	10
9. I can handle most subjects well, but I cannot do a good job with math.	10	9	7	3	3
10. I am sure I could do advanced work with math.	1	8	10	10	3
11. I can get good grades in math.	0	2	3	16	10
12. I am good at math.	3	2	7	13	7

Tables show upper elementary school student responses to their perception of math

Appendix G

Table 5

Middle school female	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
5. Math has been my worst subject.	14	10	7	5	3
6. I would consider choosing a career in math.	11	7	10	9	1
7. Math is hard for me.	8	16	7	6	2
8. I am the type of student to do well in math.	3	7	7	13	9
9. I can handle most subjects well, but I cannot do a good job with math.	11	11	8	8	1
10. I am sure I could do advanced work with math.	4	5	14	7	9
11. I can get good grades in math.	0	1	8	15	14
12. I am good at math.	0	5	8	13	12

Middle school male	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
5. Math has been my worst subject.	19	16	13	10	8
6. I would consider choosing a career in math.	26	13	14	8	4
7. Math is hard for me.	17	18	16	9	5
8. I am the type of student to do well in math.	6	11	16	17	16
9. I can handle most subjects well, but I cannot do a good job with math.	19	17	16	8	6
10. I am sure I could do advanced work with math.	13	10	17	13	13
11. I can get good grades in math.	4	4	15	17	25
12. I am good at math.	7	7	17	15	20

Middle school students' perceptions of math

Tables show middle school student responses to their perception of math

Appendix H

Table 6

Upper elementary school students' perceptions of science

Upper elementary school females	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
13. I am sure of myself when I do science.	0	5	13	22	7
14. I would consider a career in science.	7	16	6	12	5
15. I expect to use science when I get out of school.	4	14	9	12	8
16. Knowing science will help me earn a living.	4	9	7	17	10
17. I will need science for my future work.	6	9	9	17	6
18. I know I can do well in science.	0	2	7	25	13
19. Science will be important to me in my life's work.	6	7	14	12	8
20. I can handle most subjects well, but I cannot do a good job with science.	15	14	9	6	1
21. I am sure I could do advanced work in science.	9	3	11	17	7

Upper elementary school males	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
13. I am sure of myself when I do science.	2	0	9	15	6
14. I would consider a career in science.	6	8	12	2	4
15. I expect to use science when I get out of school.	0	4	9	15	4
16. Knowing science will help me earn a living.	1	3	10	14	4
17. I will need science for my future work.	2	6	8	8	8
18. I know I can do well in science.	2	0	4	19	6
19. Science will be important to me in my life's work.	2	2	14	10	4
20. I can handle most subjects well, but I cannot do a good job with science.	9	12	4	5	2
21. I am sure I could do advanced work in science.	4	4	9	11	4

Tables show upper elementary school student responses to their perception of science

Appendix I

Table 7

Middle school students' perceptions of science

Middle school females	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
13. I am sure of myself when I do science.	1	3	18	9	8
14. I would consider a career in science.	7	5	13	8	6
15. I expect to use science when I get out of school.	4	7	9	14	5
16. Knowing science will help me earn a living.	3	1	12	16	7
17. I will need science for my future work.	5	4	15	10	5
18. I know I can do well in science.	2	0	10	15	12
19. Science will be important to me in my life's work.	4	2	16	10	7
20. I can handle most subjects well, but I cannot do a a good job with science.	10	10	11	5	3
21. I am sure I could do advanced work in science.	7	4	12	5	11

Middle school males	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
13. I am sure of myself when I do science.	2	10	16	15	21
14. I would consider a career in science.	6	13	15	13	17
15. I expect to use science when I get out of school.	3	11	18	19	13
16. Knowing science will help me earn a living.	2	6	22	17	15
17. I will need science for my future work.	4	7	25	13	15
18. I know I can do well in science.	1	5	16	19	23
19. Science will be important to me in my life's work.	3	9	22	14	15
20. I can handle most subjects well, but I cannot do a a good job with science.	17	10	16	11	9
21. I am sure I could do advanced work in science.	6	8	19	15	16

Tables show middle school student responses to their perception of science

Appendix J

Table 8

Upper elementary school students' perceptions of engineering and technology

Upper elementary school females	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
22. I like to imagine creating new products.	0	7	9	15	16
23. If I learn engineering, then I can improve things that people use every day.	5	10	11	16	5
24. I am good at building and fixing things.	6	2	13	17	8
25. I am interested in what makes machines work.	7	11	9	9	11
26. Designing products or structures will be important for my future work.	3	9	16	14	5
27. I am curious about how electronics work.	6	14	6	13	8
28. I would like to use creativity and innovation in my future work.	2	7	11	14	13
29. Knowing how to use math and science together will allow me to invent useful things.	2	4	15	15	9
30. I believe I can be successful in a career in engineering.	9	12	11	9	6
Upper elementary school males	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
22. I like to imagine creating new products.	3	3	5	9	12
23. If I learn engineering, then I can improve things that people use every day.	4	4	5	9	10
24. I am good at building and fixing things.	3	6	3	11	9
25. I am interested in what makes machines work.	2	2	5	11	12
26. Designing products or structures will be important for my future work.	2	5	11	6	8
27. I am curious about how electronics work.	1	1	4	15	11
28. I would like to use creativity and innovation in my future work.	2	2	6	12	10
29. Knowing how to use math and science together will allow me to invent useful things.	0	3	8	14	7
30. I believe I can be successful in a career in engineering.	3	3	8	10	8

Appendix K

Table 9

Middle school students' perceptions of engineering and technology

Middle school females	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
22. I like to imagine creating new products.	3	6	15	8	6
23. If I learn engineering, then I can improve things that people use every day.	3	3	15	12	5
24. I am good at building and fixing things.	4	4	14	14	2
25. I am interested in what makes machines work.	7	7	12	9	3
26. Designing products or structures will be important for my future work.	6	9	16	3	3
27. I am curious about how electronics work.	6	8	10	10	4
28. I would like to use creativity and innovation in my future work.	4	2	12	11	9
29. Knowing how to use math and science together will allow me to invent useful things.	3	4	10	13	8
30. I believe I can be successful in a career in engineering.	4	8	13	8	4
Middle school males	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
22. I like to imagine creating new products.	3	8	16	19	19
23. If I learn engineering, then I can improve things that people use every day.	2	6	15	23	19
24. I am good at building and fixing things.	6	9	18	16	16
25. I am interested in what makes machines work.	4	11	16	16	18
26. Designing products or structures will be important for my future work.	3	11	15	19	17
27. I am curious about how electronics work.	2	3	17	23	19
28. I would like to use creativity and innovation in my future work.	1	7	14	22	19
29. Knowing how to use math and science together will allow me to invent useful things.	0	7	12	26	20
30. I believe I can be successful in a career in engineering.	4	5	21	20	15

Appendix L

Table 10.1

Upper elementary school student's confidence of personal abilities as a 21st century learner

Upper elementary school females	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
31. I am confident I can lead others to accomplish a goal.	1	2	4	19	19
32. I am confident I can encourage others to do their best.	2	2	6	18	17
33. I am confident I can produce high quality work.	2	3	7	16	17
34. I am confident I can help my peers.	2	0	4	22	17
35. I am confident I can respect the differences of my peers.	3	1	5	20	16
36. I am confident I can handle other's perspectives when making decisions.	3	1	6	20	15
37. I am confident I can make changes when things do not go as planned.	1	4	7	18	15
38. I am confident I can set my own learning goals.	2	0	6	19	18
39. I am confident I can manage my time wisely when working on my own.	1	3	9	13	18
40. When I have many assignments, I can choose which ones need to be done first.	1	4	8	14	18
41. I am confident I can work well with students from different backgrounds.	1	1	6	21	16

Table represents upper elementary school female students' confidence in abilities as a 21st century learner

Table 10.2

Upper elementary school males	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
31. I am confident I can lead others to accomplish a goal.	2	2	7	14	5
32. I am confident I can encourage others to do their best.	0	1	6	19	4
33. I am confident I can produce high quality work.	2	3	6	13	6
34. I am confident I can help my peers.	4	2	5	13	6
35. I am confident I can respect the differences of my peers.	2	2	3	14	9
36. I am confident I can handle other's perspectives when making decisions.	2	2	9	9	8
37. I am confident I can make changes when things do not go as planned.	2	4	5	9	10
38. I am confident I can set my own learning goals.	4	1	6	11	8
39. I am confident I can manage my time wisely when working on my own.	1	4	5	12	8
40. When I have many assignments, I can choose which ones need to be done first.	3	2	4	16	5
41. I am confident I can work well with students from different backgrounds.	0	6	6	11	7

Upper elementary school student's confidence of personal abilities as a 21st century learner

Table represents upper elementary school male students' confidence in abilities as a 21st century learner

Appendix M

Table 11.1

Middle school student's confidence of personal abilities as a 21st century learner

Middle school females	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
31. I am confident I can lead others to accomplish a goal.	0	2	7	12	13
32. I am confident I can encourage others to do their best.	0	0	9	14	13
33. I am confident I can produce high quality work.	0	0	13	15	8
34. I am confident I can help my peers.	0	1	9	14	12
35. I am confident I can respect the differences of my peers.	1	0	10	13	12
36. I am confident I can handle other's perspectives when making decisions.	0	2	8	15	11
37. I am confident I can make changes when things do not go as planned.	1	1	9	12	13
38. I am confident I can set my own learning goals.	0	0	7	16	13
39. I am confident I can manage my time wisely when working on my own.	1	1	10	15	9
40. When I have many assignments, I can choose which ones need to be done first.	0	0	11	13	12
41. I am confident I can work well with students from different backgrounds.	0	1	12	9	14

Table represents middle school female students' confidence in abilities as a 21st century learner

Table 11.2

Middle school student's confidence of personal abilities as a 21st century learner

Middle school males	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
31. I am confident I can lead others to accomplish a goal.	1	2	15	26	20
32. I am confident I can encourage others to do their best.	1	2	14	25	22
33. I am confident I can produce high quality work.	1	3	16	20	24
34. I am confident I can help my peers.	1	3	14	25	21
35. I am confident I can respect the differences of my peers.	1	2	16	25	20
36. I am confident I can handle other's perspectives when making decisions.	1	4	11	30	18
37. I am confident I can make changes when things do not go as planned.	1	1	13	25	23
38. I am confident I can set my own learning goals.	1	1	14	25	22
39. I am confident I can manage my time wisely when working on my own.	1	4	15	26	18
40. When I have many assignments, I can choose which ones need to be done first.	1	4	17	23	19
41. I am confident I can work well with students from different backgrounds.	1	4	16	22	20

Table represents middle school male students' confidence in abilities as a 21st century learner

Appendix N

Table 12

Comparison of upper elementary school students' interest in STEM careers

Upper elementary school	Female	Male	Female	Male	Female	Male	Female	Male
	Not interested at all	Not interested at all	Not so interested	Not so interested	Interested	Interested	Very interested	Very interested
42. Physics:	43%	20%	35%	30%	17%	30%	4%	20%
43. Environmental Work:	35%	17%	26%	57%	24%	13%	15%	13%
44. Biology and Zoology:	31%	30%	16%	33%	29%	13%	24%	23%
45. Veterinary work:	24%	34%	20%	38%	24%	14%	31%	14%
46. Mathematics:	24%	33%	29%	27%	38%	20%	9%	20%
47. Medicine:	40%	27%	18%	50%	18%	10%	24%	13%
48. Earth Science:	34%	17%	25%	52%	23%	7%	18%	24%
49. Computer Science:	30%	17%	28%	33%	22%	17%	20%	33%
50. Medical Science:	29%	23%	16%	50%	24%	13%	31%	13%
51. Chemistry:	34%	23%	23%	23%	25%	37%	18%	17%
52. Energy:	43%	11%	30%	21%	17%	46%	9%	21%
53. Engineering:	28%	17%	22%	7%	30%	30%	20%	47%

Table shows percent of upper elementary school female vs. male students' interest in a particular STEM job or occupation

Appendix O

Table 13

Comparison of upper elementary school students' interest in STEM Careers

Upper elementary school	Female	Male	Female	Male	Female	Male	Female	Male
	Not interested at all	Not interested at all	Not so interested	Not so interested	Interested	Interested	Very interested	Very interested
42. Physics:	20	6	16	9	8	9	2	6
43. Environmental Work:	16	5	12	17	11	4	7	4
44. Biology and Zoology:	14	9	7	10	13	4	11	7
45. Veterinary work:	11	10	9	11	11	4	14	4
46. Mathematics:	11	10	13	8	17	6	4	6
47. Medicine:	18	8	8	15	8	3	11	4
48. Earth Science:	15	5	11	15	10	2	8	7
49. Computer Science:	14	5	13	10	10	5	9	10
50. Medical Science:	13	7	7	15	11	4	14	4
51. Chemistry:	15	7	10	7	11	11	8	5
52. Energy:	20	3	14	6	8	13	4	6
53. Engineering:	13	5	10	2	14	9	9	14

Table shows the number of upper elementary school female vs. male students' interest in a particular STEM job or occupation

Appendix P

Table 14

Comparison of middle school students' interest in STEM careers

	Female	Male	Female	Male	Female	Male	Female	Male
	Not interested at all	Not interested at all	Not so interested	Not so interested	Interested	Interested	Very interested	Very interested
42. Physics	39%	28%	28%	34%	28%	27%	6%	11%
43. Environmental Work	26%	33%	37%	38%	31%	20%	6%	9%
44. Biology and Zoology	26%	35%	34%	24%	29%	32%	11%	8%
45. Veterinary work	26%	32%	24%	31%	32%	26%	18%	11%
46. Mathematics	31%	38%	34%	28%	31%	25%	3%	9%
47. Medicine	22%	25%	22%	30%	31%	38%	25%	6%
48. Earth Science	50%	28%	26%	36%	21%	23%	3%	13%
49. Computer Science	49%	19%	34%	28%	11%	33%	6%	20%
50. Medical Science	31%	28%	23%	33%	17%	33%	29%	6%
51. Chemistry	38%	32%	38%	25%	9%	30%	15%	13%
52. Energy	43%	27%	49%	28%	9%	36%	0%	9%
53. Engineering	42%	16%	39%	24%	17%	35%	3%	25%

Table shows percent of middle school female vs. male students' interest in a particular STEM job or occupation

Appendix Q

Table 15

Comparison of middle school students interest in STEM careers

	Female	Male	Female	Male	Female	Male	Female	Male
	Not interested at all	Not interested at all	Not so interested	Not so interested	Interested	Interested	Very interested	Very interested
42. Physics	14	18	10	22	10	17	2	7
43. Environmental Work	9	21	13	24	11	13	2	6
44. Biology and Zoology	9	22	12	15	10	20	4	5
45. Veterinary work	9	20	8	19	11	16	6	7
46. Mathematics	11	24	12	18	11	16	1	6
47. Medicine	8	16	8	19	11	24	9	4
48. Earth Science	17	18	9	23	7	15	1	8
49. Computer Science	17	12	12	18	4	21	2	13
50. Medical Science	11	18	8	21	6	21	10	4
51. Chemistry	13	20	13	16	3	19	5	8
52. Energy	15	17	17	18	3	23	0	6
53. Engineering	15	10	14	15	6	22	1	16

Table shows the number of middle school female vs. male students' interest in a particular STEM job or occupation