Gender and Student Attitudes toward Science, Technology, Engineering, and Mathematics

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Introduction

Increasing demand for workers at various skill-levels in the fields of science, technology, engineering, and mathematics (STEM) is motivating K-12 schools to increase graduates with STEM competencies (Carnevale, Smith, & Melton, 2011; Pathways to Prosperity Project, 2011). Many high school and postsecondary students, however, diverge from STEM pathways into other fields (Carnavale, Smith, & Melton, 2011) and females participate in the STEM workforce at lower rates than males (National Science Board, 2010; National Science Foundation, 2009). In 2011 the National Research Council called on K-12 educators to increase the number of students pursuing STEM careers, including women, students of color, and students from low socioeconomic backgrounds (2011). Experts on the President's Committee of Advisors on Science and Technology contend that improving young students' attitudes toward STEM is as important as increasing academic proficiency (PCAST, 2010).

In 2010 a large, publically-funded foundation in a southeastern state launched a three-year STEM Initiative, awarding $5 million to 14 different grants impacting 43 school districts across the state. These grants are implementing different activities, but all focus on offering students opportunities for authentic, hands-on learning in STEM – launching everything from new science labs, robotics classes, or problem-based math, to student visits to STEM industries.

Purpose

To build understanding about the STEM Initiative's progress the authors are conducting a formative evaluation, annually reporting findings to the foundation and grant staff. A main goal of the initiative is improvement of 4-12th grade student attitudes toward STEM, especially among females and students from other underrepresented populations. To measure changes in student attitudes, the authors developed a "Student Attitudes toward STEM (S-STEM) Survey" (see Appendix). A few existing surveys measured attitudinal dimensions, but none gathered this data across all STEM subjects (Minner, Ericson, Wu, & Martinez, 2012). The S-STEM Survey consists of three constructs measuring student attitudes toward STEM subjects, specifically composed of items measuring self-efficacy and career interest. A fourth survey section measures student interest in twelve STEM career areas. This paper reports on gender differences found in the evaluation's Year Two S-STEM Survey results.

Theoretical Framework

Self-efficacy refers to a person's belief in their ability to complete tasks and affect events that impact their lives (Bandura, 1986). Researchers are finding growing evidence that self-efficacy is a predictor of academic achievement (Multon, Brown, & Lent, 1991; Pajares, 1996; Zimmerman & Bandura, 1994). Recent research has emphasized the need to distinguish between general self-efficacy towards task completion and specific self-efficacy towards particular tasks

or academic areas (Chen, Gully, Whiteman, & Kilcullen, 2000). There is growing evidence in educational research that self-efficacy is critical factor in student career interests (Betz & Voyten, 2012; Tang, Pan, & Newmeyer, 2008).

Related to self-efficacy are constructs contained within outcome expectancy theories, which assume that individuals, including students, regularly assess the likelihood of attaining goals (Eccles & Wigfield, 2002; Wigfield & Eccles, 2000). One concept within outcome expectancy theories is expectancy value, or the degree to which individuals value these outcomes. An example of this is whether an individual believes they are likely to need STEM knowledge in a career. Collectively self-efficacy and outcome values form a set of core constructs that can influence motivation and persistence within an academic track (Schunk, 1991; Wigfield & Eccles, 2000).

Gender has been found to have an interactive effect on attitudes and interest in STEM careers. Female students tend to have more negative attitudes toward science classes and careers than males (Cannon & Simpson, 1985; Weinburgh, 1995). Also female student interest in STEM content has been found to decline faster than male interest levels by high school (Wells, Sanchez, & Attridge, 2007).

Methods

The authors use a mixed-methods design for data collection and analysis, although only quantitative survey results are presented in this paper. They aggregate data from all 14 grants and construct initiative-level findings. S-STEM Survey data is collected in the fall semester of each implementation year. This paper reports on survey data collected in Year Two; the findings are considered to be descriptive measures of the student population. The S-STEM Survey measures student STEM attitudes and interests in STEM careers and collects demographic information, such as gender and race/ethnicity. The analyses in this paper use: frequencies; cross-tabulations; independent sample two-tailed *t*-tests for comparing construct scores; and non-parametric Mann-Whitney tests for comparing underlying distributions of items.

Data Sources

Three scales in the S-STEM Survey measure separately student attitudes toward science, mathematics, and engineering and technology. They use a five-point Likert response scale (1 = *strongly disagree* to 5 = *strongly agree*) and measure two sub-concepts of attitudes: self-efficacy and career interest. A fourth scale, which is not discussed further in this paper, contains 11 items and measures student attitudes toward 21st century learning. Author, 2013 describe the development of the S-STEM Survey and report validity and reliability results.

TABLE 1
S-STEM Survey sample items.

S-STEM Survey Construct	Number of Items	Sample Items
Science Attitudes	8	I am sure of myself when I do science.
		I will need science for my future work.
Mathematics Attitudes	9	I am the type of student who does well in math.
		When I'm older, I might choose a job that uses math.
Engineering & Technology Attitudes	9	I like to imagine creating new products.
		I believe I can be successful in a career in engineering.

The final section of the survey measures student interest in 12 STEM career pathways and uses a four-point response scale (1 = *not at all interested* to 4 = *very interested*). These 12 career-pathway items each contain a definition of the pathway and give examples of occupations.

An Upper Elementary School and Middle/High School version of the S-STEM Survey, which are identical in content and vary only by reading-level, were administered in the fall of Year Two. Coordinators of the 14 grants administered the survey online to students impacted by their program. A single URL for both versions of the S-STEM Survey was used; the survey homepage contained an initial question sorting respondents by their self-identified grade-level.

TABLE 2
S-STEM Survey response rates.

S-STEM Survey	Number of Responses	Responses after Cleaning	Estimated Students Impacted in 2011-2012	Estimated Response Rate
Upper Elementary School (4-5th)	3,433	3,397		
Middle and High School (6-12th)	8,404	8,304		
Total	11,837	11,701	16,933	69.10%

In total, after data cleaning, 7,032 of the middle and high school students were middle school students and 1,324 were high school.

TABLE 3
Demographic characteristics of the S–STEM Survey respondents.

Demographic Characteristic	Percentage of Respondents			
	Upper Elementary	**Middle**	**High**	**Total**
Total	29.03	60.10	10.87	100.00
Gender				
Male	51.09	50.58	50.24	50.69
Female	48.91	49.42	49.76	49.31
Race/Ethnicity				
American Indian/Alaska Native	4.01	3.62	2.28	3.58
Asian	0.59	2.13	0.71	1.52
Black/African American	16.47	10.16	17.61	13.01
White/Caucasian	57.79	63.72	63.36	61.89
Hispanic/Latino	10.57	12.62	9.12	11.57
Multiracial	4.30	3.70	5.03	3.99
Other	6.27	4.04	1.89	4.43

Results

Student Attitudes toward STEM

A construct score was calculated for each student for the science, mathematics, and engineering and technology attitudes constructs by averaging the Likert-scale responses for all items in a given construct.

TABLE 4
Average STEM construct scores by school-level.

Construct	Average Construct Score			
	Upper Elementary	**Middle**	**High**	**Total** (std. dev.)
Science Attitudes	3.31	3.19	3.19	3.28 (0.70)
Mathematics Attitudes	3.15	3.09	3.06	3.11 (0.39)
Engineering & Technology Attitudes	3.60	3.39	3.28	3.44 (0.84)

In general findings indicate that, across all STEM subject areas, attitudes of older students are less positive than attitudes of younger students. An exception, attitudes toward science decline between upper elementary school and middle school, but not between middle and high school. Interestingly, the standard deviation for math attitudes is much lower than for the other constructs. This pattern remains when disaggregated by gender and school grade and only drops slightly across school-levels. This suggests that student attitudes toward mathematics are

more stable over time. Also of note is that engineering attitudes have the highest construct average across all school-levels.

When comparing female and male student attitudes toward science, results indicate that female students have more negative science attitudes than males from fourth through ninth grade, but more positive attitudes than males in the tenth through twelfth grades (Figure 1). A two-tailed t-test between male and female attitudes (aggregated across time) confirms that males and females do not exhibit the same mean score for science attitudes (t=3.99, df=11577, p<.0001). Findings also suggest that attitudes drop slightly among older students for both groups, as shown in the previous table.

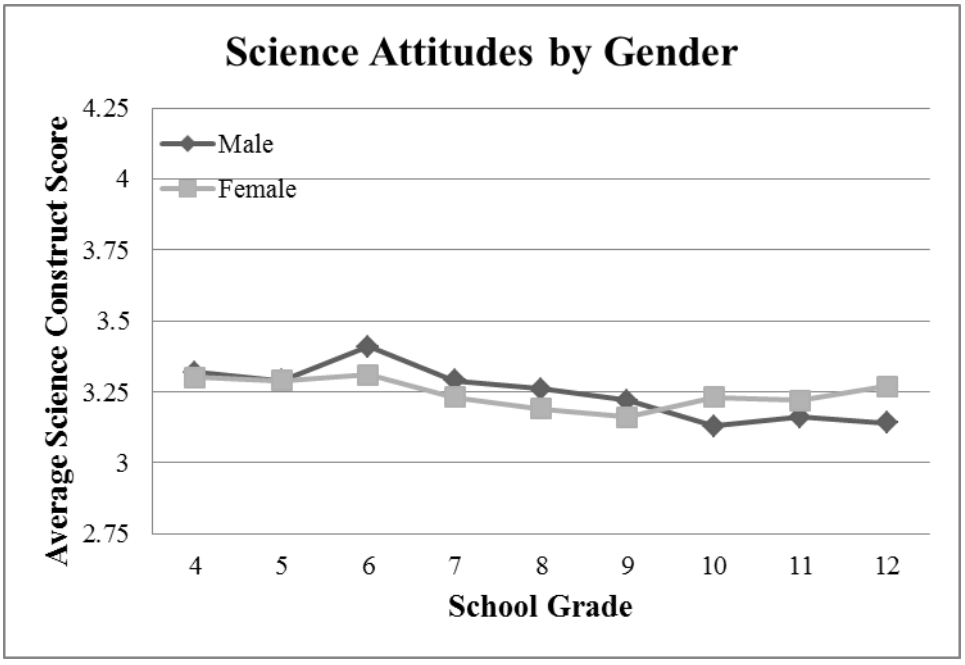

FIGURE 1
Male and female student attitudes toward science by grade-level.

When comparing female and male student attitudes toward mathematics, no major differences were found (Figure 2). A two-tailed t-test, aggregated across school-levels, confirms that males and females do not differ significantly in their mathematics attitudes (t=-1.38, df=11681, p=.1684). Findings also indicate that student mathematics attitudes remain fairly consistent across grade-levels. Finally, results show that, in general, mathematics attitudes are slightly less positive than science attitudes.

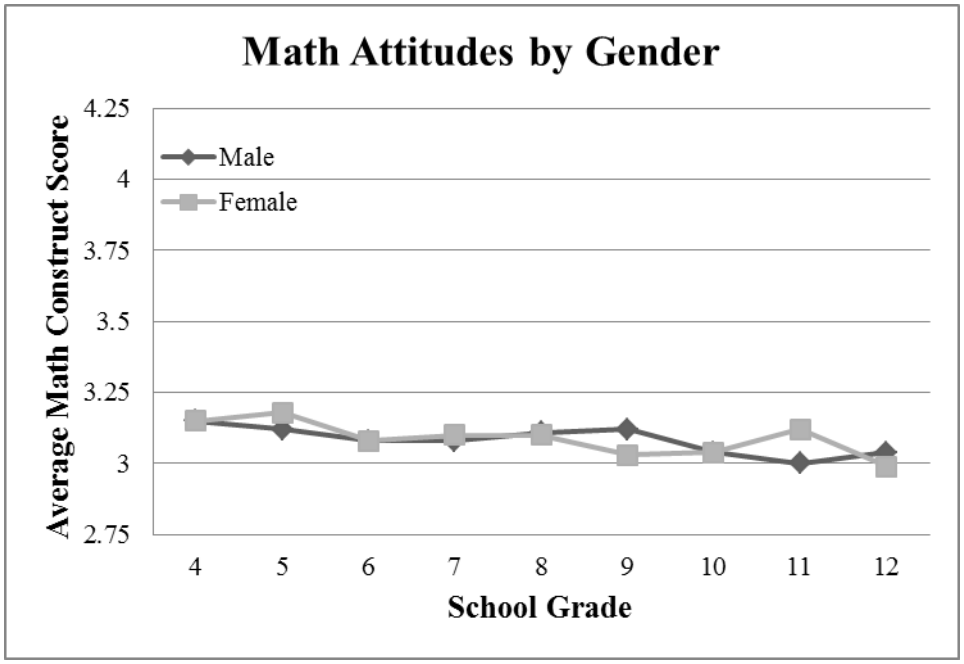

FIGURE 2
Male and female student attitudes toward math by grade-level.

Results indicate that male and females students have markedly different attitudes toward engineering and technology (Figure 3). Female engineering and technology attitudes are consistently less positive than male attitudes and, except for aberrations from fourth to fifth grade and tenth to eleventh grade, are continually lower for older students. Across middle and high school the gap between male and female engineering and technology attitudes is wider than for science or mathematics. T-tests show that, as expected, male and female means for engineering attitudes, aggregated across school-levels, differ significantly (t=37.65, df=11462, p<.0001).

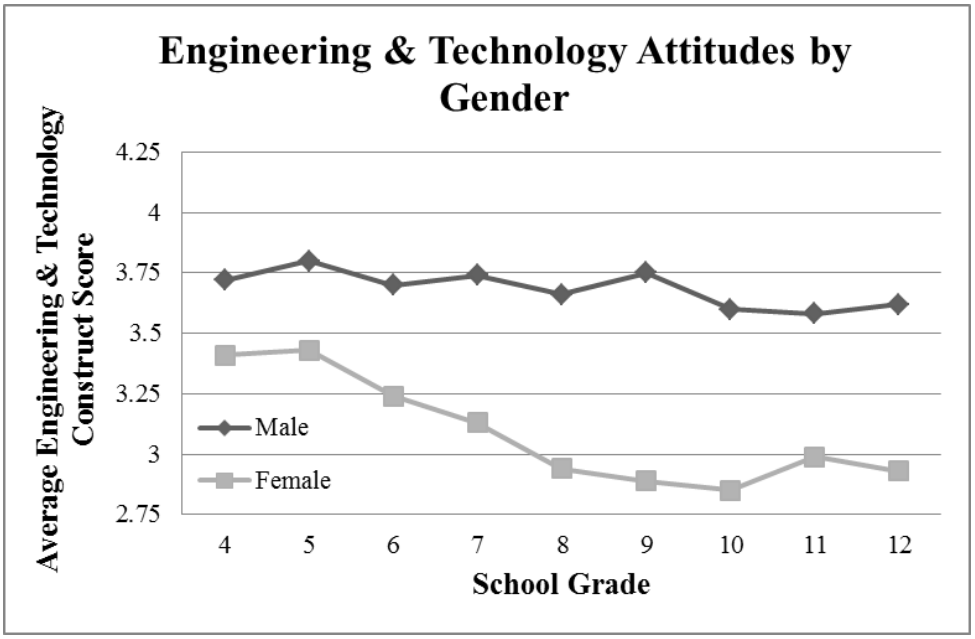

FIGURE 3
Male and female student attitudes toward engineering and technology by grade-level.

Student Interest in STEM Careers

The twelve items measuring student interest in STEM career pathways are not validated as a construct, so the authors consider each item individually. Figures 4 and 5 show the percent of male and female students that are either "somewhat interested" or "very interested" in the pathways across school-levels. Results from the nonparametric Man-Whitney test indicate that the underlying distributions of career interests between males and females, across school-levels, for all 12 careers areas (except for environmental work, discussed below), are significant. Findings suggest that male and female student interests in STEM career pathways decline among older students, with the sharpest drops between elementary and middle school. As shown in Figure 4, male and female career interests decline at similar rates for the fields of physics, biology and zoology, veterinary work, mathematics, earth science, computer science, and energy. Furthermore, among those pathways, male students have higher levels of interest than females in all but biology and zoology and veterinary work. Results indicate that high school male students have the least interest in veterinary work.

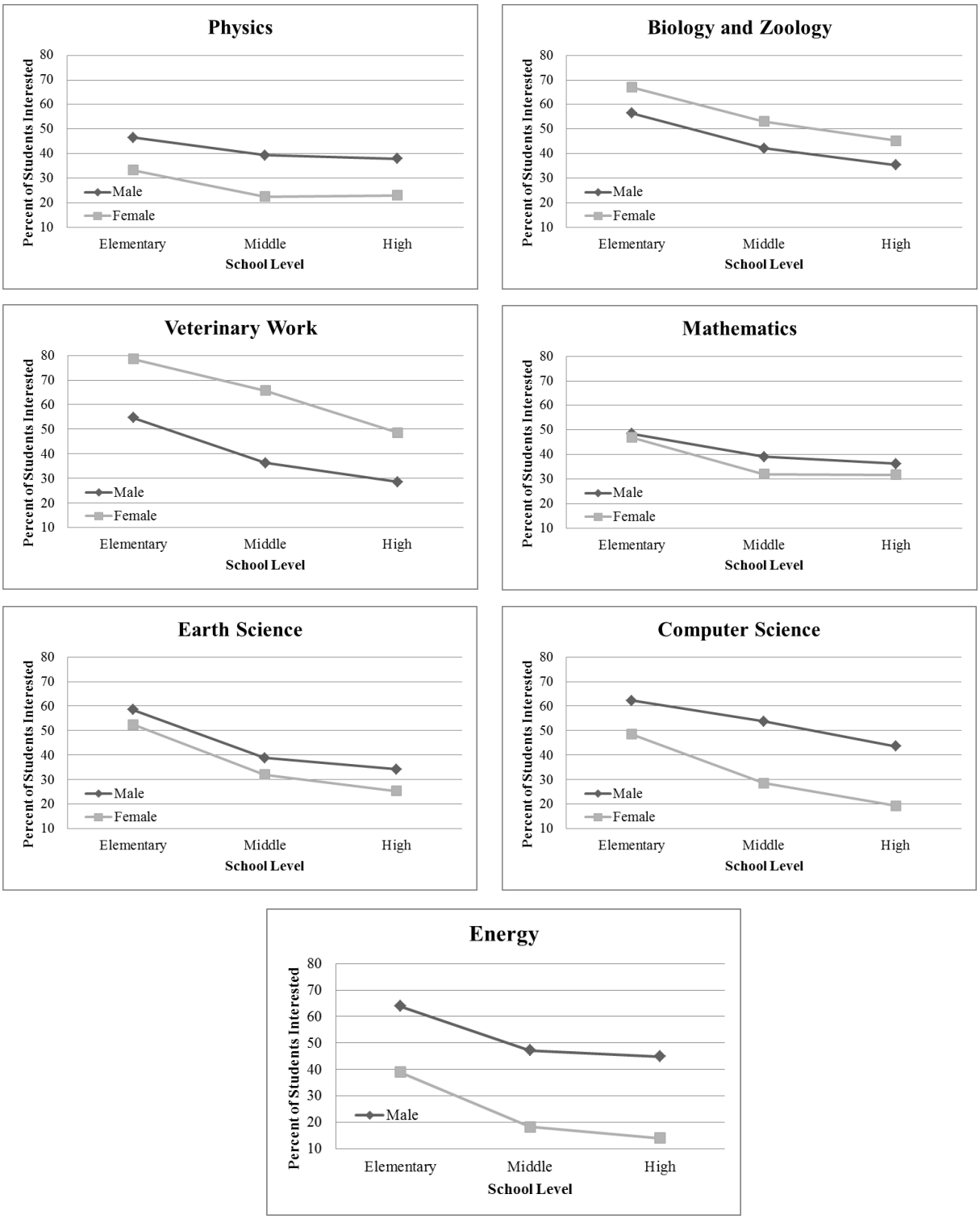

FIGURE 4
Parallel career interests for males and females across school-level.

Findings show that trends in male and female student interest in environmental work, medicine, medical science, chemistry, and engineering differ across school-levels (Figure 5). Male interest in engineering increases slightly across all school-levels – the only career pathway for which males exhibit a monotone increasing trend. This is particularly interesting given that male attitudes toward engineering show a slight decrease across school-levels. High school female students, however, demonstrate very low interest in engineering careers. Only careers in energy were of lower interest. Females demonstrate a monotone increasing trend in career interest only in medicine. Finally, females show slightly greater interest in environmental work than males in elementary school, while males show greater interest in high school. Results from the nonparametric Mann-Whitney test indicate that the underlying distribution of interest in environmental work is significantly different between genders among high school students (p<.0001), but not among elementary school (p=.0899) or middle school students (p=.4861).

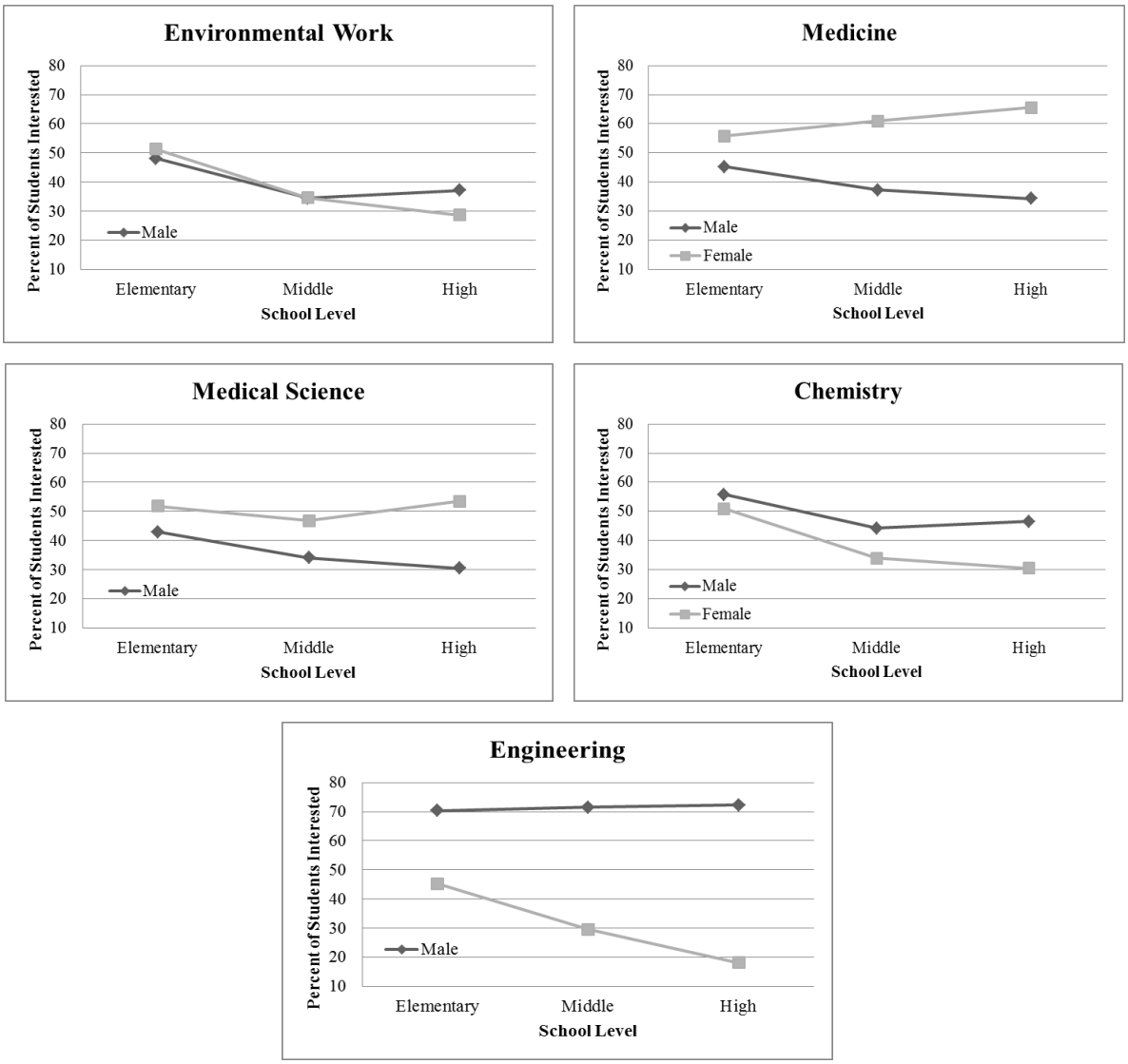

FIGURE 5
Non-parallel career interests for males and females across school-level.

Significance

Results from the S-STEM Survey provide uniquely comprehensive, detailed measures of student attitudes toward STEM and interest in STEM careers collected from a single, valid, reliable survey. The three-year STEM Initiative impacts a large, diverse group of students, therefore other STEM program administrators might consider these evaluation findings as they plan their own goals and activities. STEM education programs targeted at younger students might produce greater returns. Alternatively, new strategies may be employed in middle and high schools to try to reverse students' declining STEM attitudes and interest. Female students' overall low level of interest in STEM careers, and especially their lack of interest and positive attitudes toward engineering and technology, points to the need for educators to make additional efforts in this area.

The authors have shared the survey findings with the initiative's funding foundation and grant administrators. Several grant teams have indicated their intentions to adjust their Year Three program activities based upon the results. Some high school grants plan to focus more on the transition to college and careers. Others grants have shared the results with their faculty and plan to emphasize connections between science content and careers in Year Three. Furthermore, the use of internet technologies to administer the surveys has encouraged grant staff to make additional use of the instruments. A few teams have created survey items specific to their program, while others have chosen to administer the S-STEM Survey additional times.

REFERENCE LIST

Author, (2013). Student Attitudes toward STEM: The Development of Upper Elementary School and Middle/High School Student Surveys. *Proceedings of the 2013 American Society for Engineering Education Annual Conference & Exposition.* Washington, DC: ASEE.

Bandura, A. (1986). *Social foundations of thoughts and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice Hall.

Betz, N. E. & Voyten, K. K. (2012). Efficacy and outcome expectations influence career exploration and decidedness. *The Career Development Quarterly, 46*(2), 179-189.

Cannon, R. K., & Simpson, R. D. (1985). Relationships among attitude, motivation, and achievement of ability grouped, seventh-grade, life science students. *Science Education, 69*(2), 121-138.

Carnevale, A. P., Smith, N. & Melton, M. (2011). *STEM: Science, Technology, Engineering, Mathematics.* Georgetown University Center on Education and the Workforce: Washington, DC.

Chen, G., Gully, S. M., Whiteman, J.-A., & Kilcullen, R. N. (2000). Examination of relationships among trait-like individual differences, state-like individual differences, and learning performance. *Journal of Applied Psychology, 85*(6), 835-847.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53,* 109-132.

Minner, D., Ericson, E., Wu, S., & Martinez, A. (2012). Compendium of STEM Student Instruments PART II: Measuring Students' Content Knowledge, Reasoning Skills, and Psychological Attributes. Washington, DC: Abt Associates.

Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of Counseling Psychology, 38*(1), 30-38.

National Science Board (2010). *Science and Engineering Indicator.* Arlington, VA: National Science Foundation (NSB 10-01).

National Science Foundation. (2009). *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2009.* Arlington, VA: National Science Foundation.

National Research Council. (2011). *Successful K-12 STEM Education: Identifying Effective Approaches in Science, Technology, Engineering, and Mathematics.* Board on Science Education and Board on Testing and Assessment, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Pathways to Prosperity Project (2011). *Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century.* Harvard Graduate School of Education: Cambridge, MA.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*(4), 543-578.

PCAST, President's Committee of Advisors on Science and Technology. (2010). Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math (STEM) for America's Future. Washington, DC: Executive Office of the President.

Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational Psychologist, 26*(3/4), 207.

Tang, M., Pan, W. & Newmeyer, M. D. (2008). Factors influencing high school students' career aspirations. *Professional School Counseling, 11*(5), 285-295.

Weinburgh, M. (1995). Gender differences in student attitudes toward science: A meta-analysis of the literature from 1970 to 1991. *Journal of Research in Science Teaching, 32*(4), 387-398.

Wells, B., Sanchez, A., & Attridge, J., (2007). Modeling student interest in science, technology, engineering and mathematics. IEEE Summit. "Meeting the Growing Demand for Engineers and their Educators," Munich, Germany.

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology, 25*(1), 68-8.

Zimmerman, B. J., & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. *American Educational Research Journal, 31*, 845-862.

APPENDIX

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

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?	○	○	○

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

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
13. **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)*	○	○	○	○
14. **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)*	○	○	○	○
15. **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)*	○	○	○	○
16. **Veterinary Work:** involves the science of preventing or treating disease in animals. (veterinary assistant, veterinarian, livestock producer, animal caretaker)	○	○	○	○
17. **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
18. **Medicine:** involves maintaining health and preventing and treating disease. (physician's assistant, nurse, doctor, nutritionist, emergency medical technician, physical therapist, dentist)	○	○	○	○
19. **Earth Science:** is the study of earth, including the air, land, and ocean. (geologist, weather forecaster, archaeologist, geoscientist)	○	○	○	○
20. **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)	○	○	○	○
21. **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)	○	○	○	○
22. **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)	○	○	○	○
23. **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
24. **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?	❍	❍	❍