



Idaho Students' STEM Experiences

A Follow-up Report

Spring 2016

University
of Idaho

Report Authors

Melinda Hamilton
Leontina Hormel
Susan Stauffer

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I. Executive Summary

The University of Idaho and Micron Foundation have worked together to conduct a five-year research project focusing on Idahoans' experiences and perceptions of science, technology, engineering, and mathematics education and careers. **Year 5 of this study was dedicated to following up with students previously surveyed in order to assess changes in their perceptions over time and to better understand the impact of various experiences on those perceptions.** In 2014, participation was solicited with a mail survey from a subset of students who completed surveys for the UI-Micron STEM Education Research Initiative in fall 2012. Due to the low response rate in 2014, the same survey was delivered electronically in 2015 to Middle and Senior Cohort students who had participated in the 2012 survey. This report summarizes the results from the 2014 survey of Elementary Cohort students who participated in both the 2012 and 2014 surveys, and from the Middle and Senior Cohorts' students who participated in both the 2012 and 2015 surveys.

The changes in survey collection methods in 2014 and 2015 essentially shift the participation from mandatory (almost everyone in the classroom consented to participate in 2012) to optional (many students did not complete the 2014 nor the 2015 surveys on their own time) resulting in "self-selection." Large demographic shifts were observed across the three different cohorts, from 2012 to the follow-up surveys, and may reflect this self-selection. Notably, a higher percentage of students in the follow-up surveys were from families in which a parent had acquired a college degree than in the complete 2012 samples. These demographic differences may have influenced responses to follow-up survey questions.

Students who participated in the follow-up surveys in 2014 and 2015 demonstrated a relatively high interest in math and science compared to that reported in previous survey reports for the entire 2012 sample. Interest was especially high in 4th grade students and diminished with time. Fourth-grade boys demonstrated greater interest in math and science than the girls; however, the gap in interest closed as students progressed to middle school. This gap closure may be partly attributed to the surprising result that middle school girls actually reported liking math more than boys; however, by 10th grade this is no longer true. The drop in interest in math and science by girls between 7th and 10th grades is dramatic. For all ages, the lower interest in math and science by Hispanic students compared to non-Hispanic students is marked.

Many students in the follow-up surveys indicated that they had participated in extracurricular STEM activities. The participation in all extracurricular activities declines as students progress through school, likely due to time constraints. A positive relationship was noted between the number of STEM activities a student participated in and their expressed interest in science and math subjects; however, no cause and effect conclusions can be made from these data.

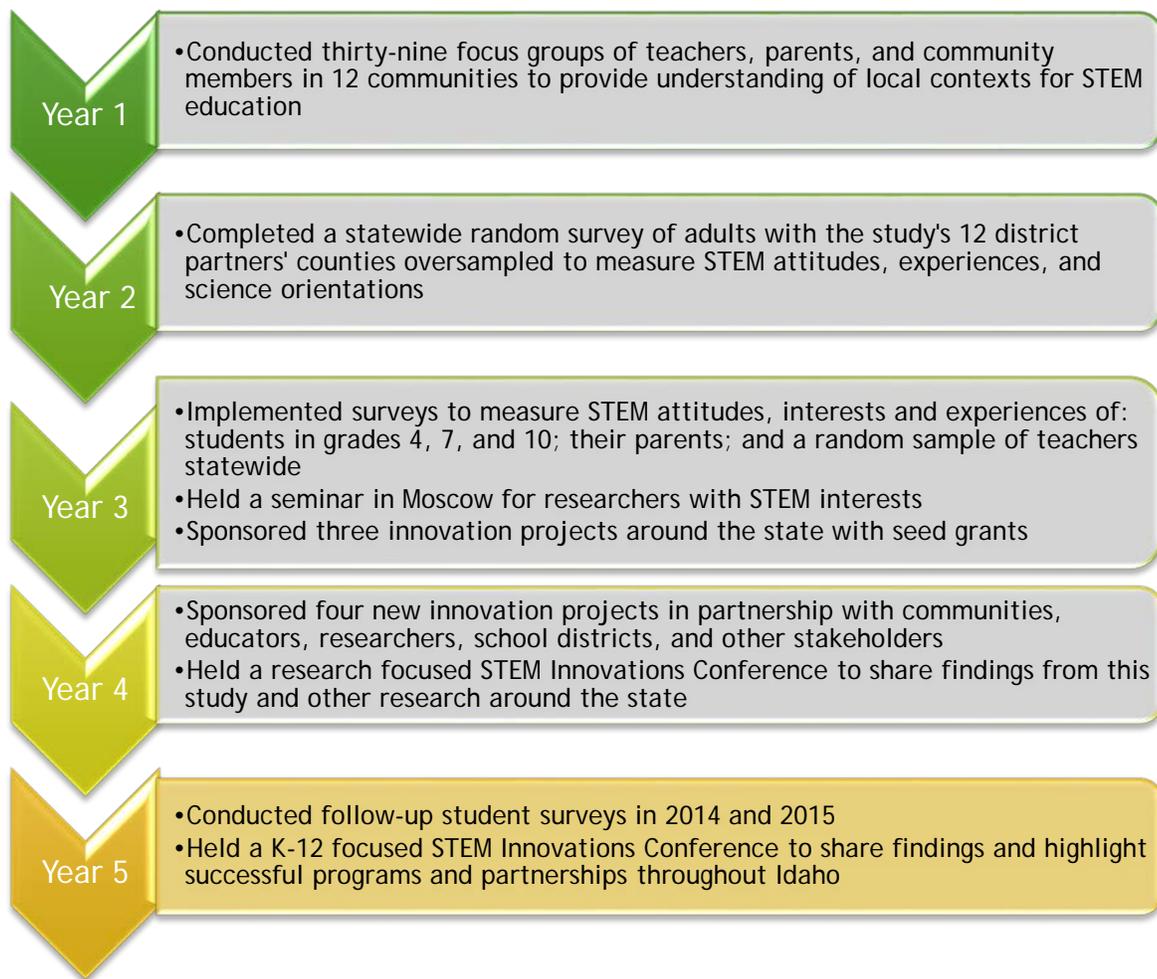
Interest in math and science, educational aspirations, and expressed attitudes about the nature of science and engineering careers did not translate into increased desire to pursue science and engineering careers. A notable result is that for the follow-up survey respondents, there did not seem to be the obvious misunderstanding of math and science requirements for STEM careers. This may be due to the makeup of the students who responded to the follow-up surveys. It is likely that students who have parents with college educations have better exposure to information regarding educational requirements of these careers.

Perhaps the most startling result in the follow-up surveys is the lack of desire by Idaho students to pursue engineering careers. As noted, the cohort samples in the follow-up surveys are from educated families, had exposure to STEM activities, and have a relatively high interest in STEM subjects. We therefore might expect a higher level of interest in engineering careers, especially since money was a driving factor in career selection. There does not appear to be an image issue with engineering, as most students responded that they thought engineering was exciting. The data in this report suggest that the math requirements may be inhibiting student interest in the career. Health care careers fared best among STEM careers, especially for females. Many factors, such as hands-on work, good pay, and availability of jobs near home may be influencing this. Interestingly, students did not see a need for as much math for health care (represented by nursing).

II. Introduction

The University of Idaho and Micron Foundation have worked together to conduct a five-year research project focusing on Idahoans' experiences and perceptions of science, technology, engineering, and mathematics education and careers. From 2010 through 2015, a variety of social science research methods, both qualitative and quantitative, were employed to collect a rich store of data that researchers and practitioners may use to better understand the complexity of youth and adults' STEM experiences and perceptions in Idaho and that may guide future research and intervention strategies (Figure 1).

Figure 1. UI-Micron STEM Education Research Initiative Stages



Year 5 of this study was dedicated to following up with students previously surveyed in order to assess changes in their perceptions over time and to better understand the

impact of various experiences on those perceptions. Of particular interest in this survey was assessing students’ perceptions and attitudes regarding STEM careers. Previous years’ information suggested a disconnect between students’ career aspirations and their self-reported desire and aspirations to pursue STEM education pathways. Follow-up survey data is intended to help understand how various interventions may influence these aspirations. Additionally, follow-up survey results are intended to help understand changes in attitudes and perceptions as students progress through school. This report summarizes results from the Year 5 follow-up student surveys. (See Appendix 1)

III. Follow-up Surveys

Follow up surveys were conducted in 2014 and 2015. For the purposes of this report, the Elementary Cohort refers to students that were surveyed in 4th grade in 2012 and responded to the survey in 6th grade in 2014. The Middle Cohort refers to students who were in 7th grade in 2012 that responded to the final 2015 survey in 10th grade. The Senior Cohort refers to students who were in 10th grade in the 2012 survey who responded to the final 2015 survey when they were 1 year post-high school (Table 1).

Table 1. Descriptions of the Three Student Cohorts

Three Cohorts	
Elementary Cohort:	4 th graders in initial survey (2012); subset surveyed only one time again in 2014 in 6 th grade
Middle Cohort:	7 th graders in initial survey (2012); subset surveyed again in 2014; final survey in 2015 when students were in 10 th grade
Senior Cohort:	10 th graders in initial survey (2012); subset surveyed again in 2014; final survey in 2015 when students were 1 year post-high school

2014 Mail Surveys

In the fall of 2014, participation was solicited from a subset of students who completed surveys for the UI-Micron STEM Education Research Initiative in the fall of 2012. Due to the cost of mailing hard copy surveys and follow-up solicitation of responses, a subset of communities to survey was selected. Sampling was conducted in four of the original twelve study districts, representing two urban communities (Boise and Jerome) and two rural communities (Kamiah and Priest River). Communities were selected in order to get representation from communities of different size, demographic makeup and economic drivers.

Elementary Cohort Sample

A total of 44 students responded to the 2014 survey from this cohort, representing 28% of those who completed the initial surveys in the four districts. This is a response rate of 44% of the 6th graders that received the survey (see Methodology in Appendix 1). This was the highest response rate of the three cohorts.

The proportion of girls completing surveys in these four districts increased from 53.5% to 58%. Ethnic diversity of respondents in this cohort decreased with 88% of 6th graders identifying as white. The percentage of students from Hispanic households declined from 16% to 6%. Furthermore, 59% of students in the 2014 sample reported at least one parent had a college degree, while only 29% of all the parents who took the survey in those districts in 2012 reported having a college degree (Table 2).

Table 2. Elementary Cohort Demographics Compared to 2012 District Samples

Demographic Groups	2012 4 th Graders (n=159)	2014 6 th Graders (n=44)
Geographic Residence		
Boise	47 students	7 students
Jerome	42 students	12 students
Kamiah	35 students	11 students
Priest River	35 students	13 students
Gender		
Girl	53.5%	58%
Boy	46.5%	42%
Ethnicity*		
White	79%	88%
Hispanic	16%	6%
American Indian or Alaskan Native	4%	9%
Black or African American, Asian American, or Other	3%	3%
Parents' Educational Level**		
One or more parents with college degree	29%	59%
Neither parent has a college degree	71%	32%
Do not know	--	9%

*Respondents could identify with more than one category for ethnicity.

**Parents' Educational Levels are derived from two different sources. Fourth graders' parents reported their educational levels, while 6th graders reported parents' educational levels in the follow-up survey.

Middle Cohort Sample

Thirty-one percent (n=122) of those who completed surveys in the 7th grade in the four districts participated in the 2014 survey (Table 3).

Table 3. Middle Cohort Response by District

Demographic Groups	2012 7 th Graders (n=388)	2014 9 th Graders (n=122)
Geographic Residence		
Boise	101 students	50 students
Jerome	163 students	41 students
Kamiah	31 students	7 students
Priest River	93 students	24 students

Senior Cohort Sample

Only fourteen percent (n=70) of those who completed surveys in the 10th grade in the four districts participated in the 12th-grade survey. The response rate of 16.5% was the lowest of the three cohorts (Table 4).

Table 4. Senior Cohort Response by District

Demographic Groups	2012 10 th Graders (n=497)	2014 12 th Graders (n=70)
Geographic Residence		
Boise	156 students	33 students
Jerome	223 students	23 students
Kamiah	26 students	3 students
Priest River	92 students	11 students

2015 Electronic Surveys

The low response rate to the mail surveys and potential biased response demographics gave cause for concern regarding drawing conclusions from the data. It was therefore decided to attempt to sample all 12 communities again, this time using an electronic survey tool (Qualtrics) and sending the survey to all students in the Middle and Senior Cohorts who participated in the 2012 survey for whom we had, or could easily obtain through phone calls, a current email address. While this approach still leads to potential bias of respondents, it was anticipated that we could garner a larger number of responses and greater demographic variability than the 2014 surveys. The Elementary Cohort was not sampled again in 2015, however, due to problems obtaining email addresses (Appendix 1).

Middle Cohort Sample

Almost 15% of those who completed surveys in the 7th grade participated again as 10th graders in 2015 (Table 5). Similar to the Elementary Cohort follow-up survey in 2014, the Middle Cohort had a proportional increase in girls (49% to 59%); and a proportional decrease of students from Hispanic households (17% to 7%). These student respondents were also from households where students reported a higher percentage of parents attaining college degrees (50% to 66%).

Table 5. Middle Cohort Demographics

Demographic Groups	2012 7 th Graders (n=995)	2015 10 th Graders (n=146)
Gender		
Girl	49%	59%
Boy	51%	41%
Ethnicity*		
White	71%	72%
Hispanic	17%	7%
American Indian or Alaskan Native	7%	3%
Black or African American, Asian American, or Other	15%	16%
Parents' Educational Level**		
One or more parents with college degree	50%	66%
Neither parent has a college degree	19%	14%
Do not know	31%	20%

*Respondents could identify with more than one category for ethnicity.

**Parents' Educational Levels as reported by students in the 2012 surveys.

Senior Cohort Sample

Thirteen percent of those who completed surveys in the 10th grade participated in the 2015 follow-up survey (Table 6). Similar to the other two cohorts, the Senior Cohort had a proportional increase in girls (52% to 62%). There was also an increase in the proportion of white students (80% to 86%) while other groups' participation accordingly decreased.

Student respondents to the 2015 surveys were also from households where students reported a higher percentage of parents attaining college degrees (52% to 64%).

Table 6. Senior Cohort Demographics Compared to 2012 District Samples

Demographic Groups	2012 10 th Graders (n=1179)	2015 First year after high school (n=155)
Gender		
Girl	52%	62%
Boy	48%	38%
Ethnicity*		
White	80%	86%
Hispanic	17%	10%
American Indian or Alaskan Native	4%	3%
Black or African American, Asian American, or Other	9%	5%
Parents' Educational Level**		
One or more parents with college degree	52%	64%
Neither parent has a college degree	35%	26%
Do not know	13%	10%

*Respondents could identify with more than one category for ethnicity.

**Parents' Educational Levels as reported by students in the 2012 surveys.

Possible Relationships Between Sample Collection Methods, Resulting Demographics and Perceptions

The changes in survey collection methods in 2014 and 2015 essentially shift the participation from mandatory (everyone in the classroom) to optional resulting in a potential bias similar to self-selection bias. Significant demographic shifts were indeed observed across the three different cohorts, from 2012 to 2014 and 2015, and results may reflect a demographic bias.

Results observed over the first and second years of the UI/Micron STEM Education Research Initiative project suggested that level of education, gender, and ethnicity may be related to perceptions and attitudes about science and education. In fact, participation itself suggests a relationship between education and perceptions. In Year One, when participants were

recruited for the 36 focus groups conducted with parents, teachers, and community members in the twelve target communities, many of those contacted hesitated to participate. Often, people told researchers they did not know much about science or that they never did very well in science and math and may not be very good sources of

...but the thing is, I don't think that we should minimize the necessity of the computer aspect or the technology or the higher education to deal with the world needs, but at the same time, someone has to run the bottom. There's more jobs that are essential to the knowledge of woodworking, metal working, mechanics; not everybody is going to sit down at a computer and design the parts we need to fix something. Somebody has to install them. And that is all forgotten. - Parent, 2011

information. Thus, Idahoans' perceptions of STEM were in some ways revealed in the process of trying to solicit their participation in this project (Hormel 2014). Focus group discussions also included remarks that showed that at least some of the participants saw education as a major distinction between STEM and other fields (Quote Box 1). In Year Two, when conducting statewide surveys with adults, the samples reflected a larger proportion of individuals with Associate's Degrees or higher than what is reflected in US Census reports for the state of Idaho (Storrs, Hormel, and Mihelich 2012:94-98). According to the 2006-2010 ACS (American Community Survey) from the US Census Bureau, for example, 43.1% of people living in Ada County had earned an Associate's Degree or higher, while 59% of our community sample of individuals in the Boise area in 2011 had earned an Associate's Degree or higher. **In other words, the self-selection process observed in who opts into this survey theme - STEM education - suggests that people with lower levels of educational attainment opt out more often than those with higher levels.**

In 2014 and 2015 surveys, we observed a higher representation of students from households whose parents earned an Associate's Degree or higher than in the 2012 sample. Given this, we might expect that this same self-selection bias influenced the results. Additionally, the smaller number of responses, especially for the Senior Cohort and for Hispanic students limits interpretation of the results.

IV. Results and Discussion

Results will be presented for the 2014 mail-in survey of the Elementary Cohort (6th graders at the time of that survey). Comparisons will be made between 2012 survey responses and 2014 survey responses for only those students who participated in both surveys.

Additionally, results will be presented for the 2015 electronic surveys of the Middle Cohort (10th graders at the time of that survey) and Senior Cohort (first year after high school graduation at the time of that survey). Comparisons will be made between the 2012 survey

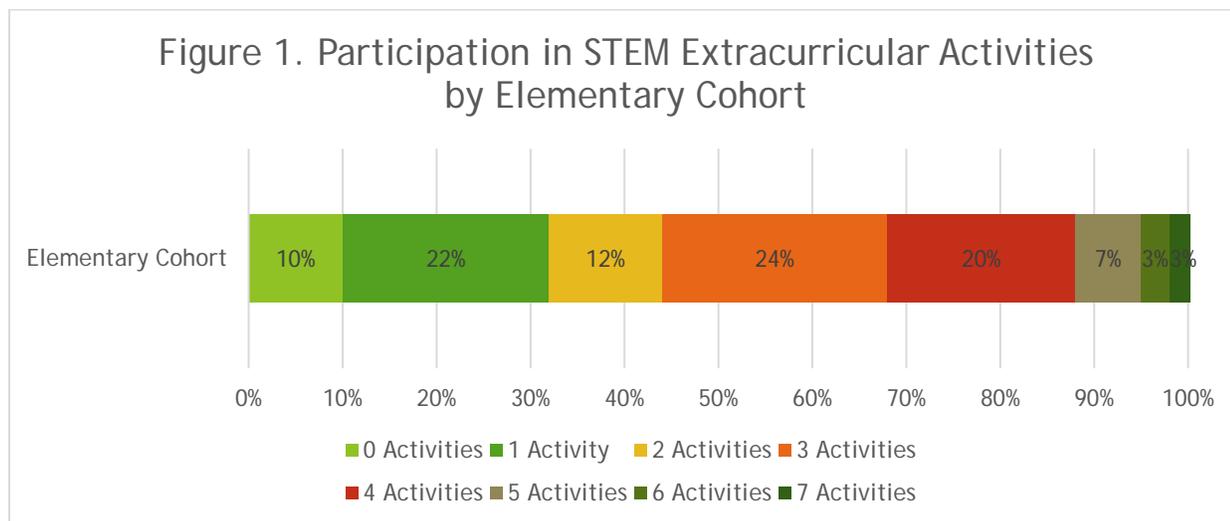
responses for these cohorts and the 2015 responses for only those students who participated in both the 2012 and the 2015 surveys. Due to different sampling strategies and timing of surveys, comparisons between the Elementary Cohort and the Middle and Senior Cohorts cannot be drawn.

These comparisons are intended to help identify changes in attitudes and perceptions with time and progression through school. Follow-up survey results for all three cohorts will also be used to investigate the impact various extracurricular activities may have on these attitudes and perceptions.

Occasionally it may be useful to compare the results from the cohorts that participated in both surveys to the total sample results from 2012 in order to better understand the impact that sample demographics and self-selection may have on interpretation of results.

Extracurricular Activities

Changes in students' perceptions, aspirations, and interest in STEM education and careers may change as the student progresses through school. These changes may be the result of many factors. The exposure to STEM activities and programs has the potential to increase interest and awareness of STEM careers and STEM subjects. In order to include this factor in the assessment of changes in students' aspirations and attitudes, it is important to have some measure of the exposure these students have had to extracurricular activities in the two- or three-year span between surveys. The 2014 and 2015 follow-up surveys included a series of questions regarding the kinds of extracurricular activities students had participated in since the 2012 survey. Activities noted specifically in the survey as associated with STEM (referred to as STEM activities for the purposes of this report) were 4-H; science experiments not required for school; Family Math Night; repairing/building electronics outside of school; robotics workshop, class, competition, or camp; computer use at home for schoolwork (Elementary Cohort only); Women in Science Day or Lunch (Middle and Senior Cohorts only); science fair; Lego League; and other science or technology or engineering or math clubs, camps or competitions.



Based on students' responses, Elementary Cohort students' participation in math and science activities was common, with over 50% reporting that they participated in 3 or more activities during the two-year span (Figure 1). This may be related to the available time outside of class these students have to participate. This may also reflect adults' perceptions of what

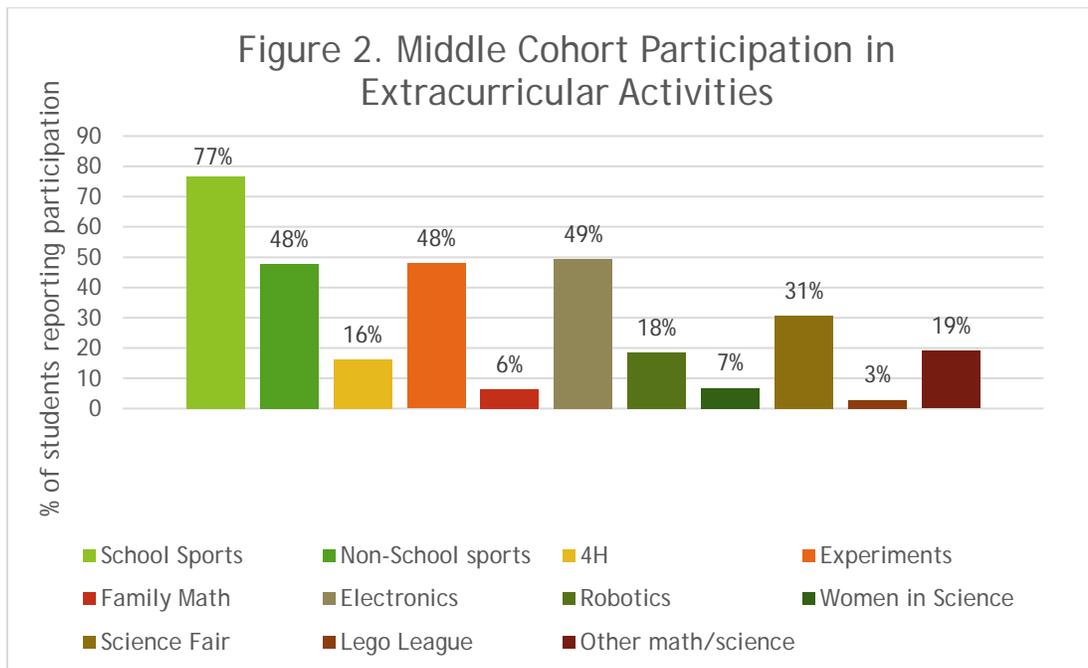
When do you think it is most important for parents to be involved in their children's education experience and decision making?

- Elementary School.....60%*
- Junior High/Middle School..... 19%*
- High School.....16%*
- Not sure.....5%*

life stage in their child's development is critical for shaping their learning and interests. When asked in the 2011 statewide survey, "When do you think it is most important for parents to be involved in their children's education experience and decision making?" 60% of adults said elementary school was the most important. If parents' tendency to participate in extracurricular activities with their

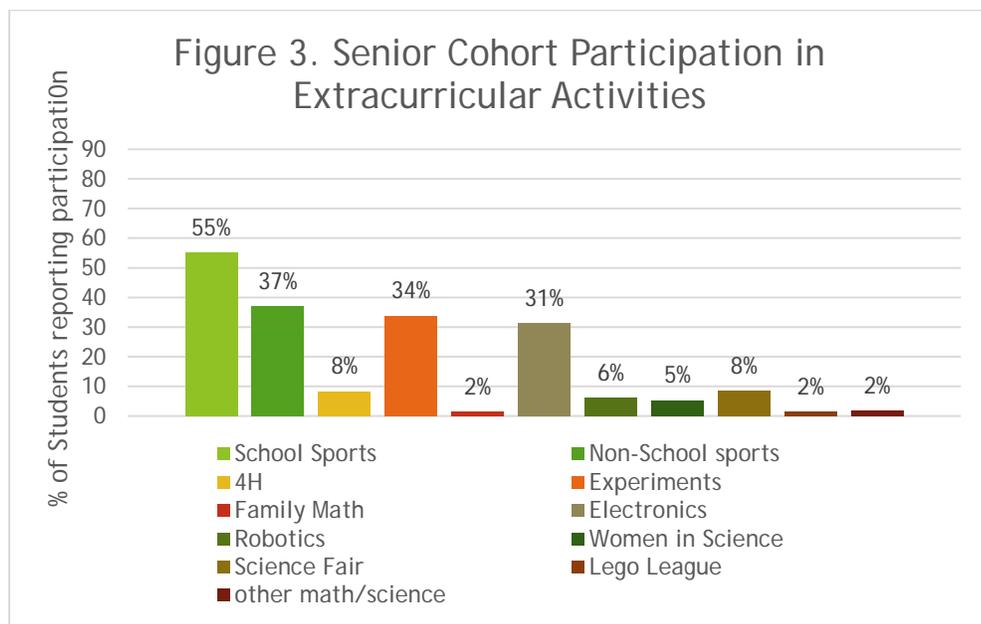
children mirrors their response, we might expect higher participation in extracurricular science and math activities when the parents are involved.

Middle Cohort students' self-reporting of extracurricular math and science activities ranged from 3% participation (Lego League) to as high as 49% participation in repairing and building electronics outside of school; however, the greatest participation reported in extracurricular activities for this cohort was for sports team participation, with 77% reporting participation in a school sports team and 48% reporting participation in a non-school sports team (Figure 2).



Students' participation in other forms of extracurricular activities (non-STEM) may affect their time and ability to participate in STEM activities. The high rate of participation in sports by the middle cohort may reflect time, availability and accessibility of the activities.

The Senior Cohort participation in all extracurricular activities was dramatically less than for other cohorts. Participation in sports activities dropped to 55% participation in school sports teams and 37% participation in non-schools sports teams. The drop in participation in STEM activities was even more pronounced (Figure 3). The highest participation rates reported for STEM activities outside of school were trying science experiments (34%) and repairing or building electronics (31%).



The decrease in participation in extracurricular activities for the Senior Cohort is not surprising, given the time constraints many students feel in high school. Twenty-nine of the 131 (22%) students answering the question "How many hours per week did you usually work at a job during the school year in high school?" responded that they worked 20 or more hours per week; and only 30 (23%) responded that they did not work at all during high school.

STUDENT TIME CONSTRAINTS

77%

The majority of the Senior Cohort students responding in 2015 said they had worked in High School

22%

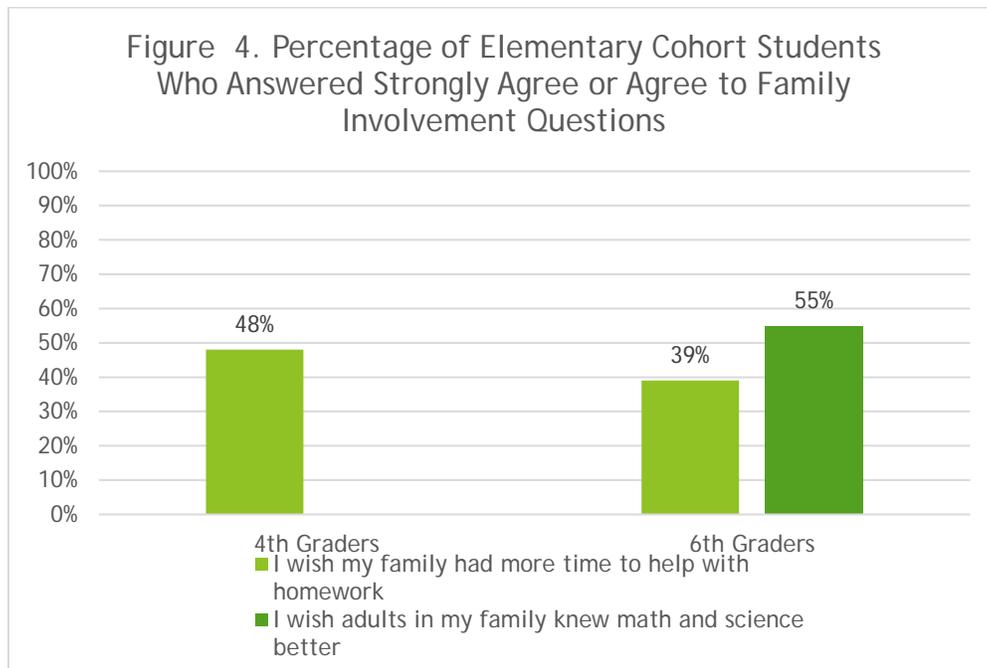
Over 20% of the Senior Cohort students said they worked more than 20 hours per week during High School

Students Educational Experiences

Perceived need for assistance

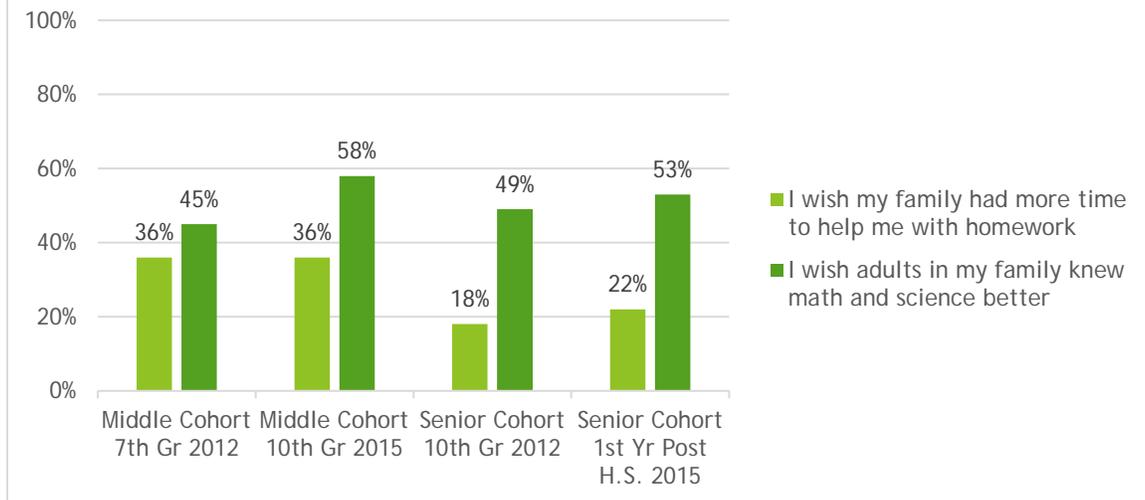
As was noted earlier, 60% of adult respondents in the 2011 statewide STEM survey said that elementary school is the most important time for parents to be involved in their children's education and decision making. The 2012 and 2014/2015 student surveys asked students the extent to which they wished they had more help from family with homework and the extent to which they wished the adults in their family knew math and science better.

Elementary Cohort student responses show a declining desire for family members' assistance with their homework from 2012 to 2014 (Figure 4), suggesting that they agree with the adult perceptions that need is greater in the earlier years. In the 4th grade responses (2012), almost half (48%) said they wish the adults in their family had more time to help with homework, while only 39% of those same students in 6th grade felt this way.



In 2014, the Elementary Cohort students were also asked about their desire for family adults to know math and science better. While this question was not included in the 2012 survey of 4th graders, it is interesting to note that over half of the 2014 respondents expressed a desire for their family adults to know math and science better. Given that science is often not introduced until 5th grade in Idaho schools, it seems reasonable that the realization by students that they need more help in these areas would become apparent by 6th grade.

Figure 5. Percentage of Middle and Senior Cohort Students Who Answered Strongly Agree or Agree to Family Involvement Questions.



The Middle Cohort students and the Senior Cohort students both revealed an increase in their desire for adults to know math and science better over the three-year time between the 2012 and 2015 surveys (Figure 5). For both cohorts, however, responses to the desire for more time for help with homework in 2015 did not differ greatly from the original responses in 2012. This may suggest that students see a specific need for more help in these subjects as they progress through school but are not interpreting that as a general need for more time to help with homework.

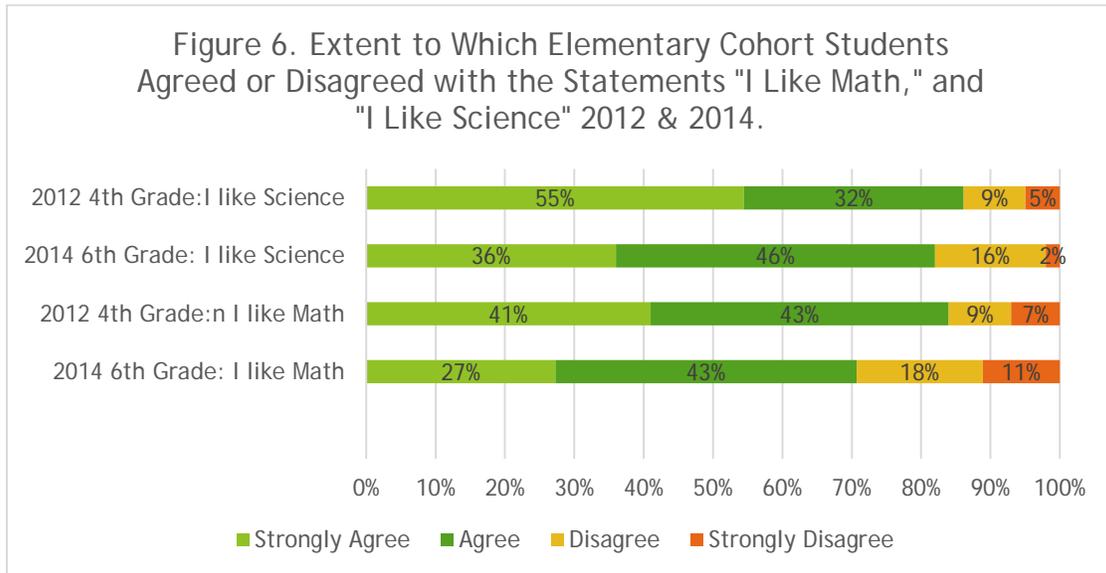
This desire for more access to knowledge in subjects like math and science suggests that innovative programming that enables students to access tutors or subject matter experts outside of class time without relying on family members may be useful.

Student Educational Attitudes

An important aspect of this research from inception has been understanding student attitudes about subjects fundamental to STEM skill development: math and science. Research indicates that students' attitudes toward mathematics, in particular, are correlated with the likelihood they will be interested in STEM careers during high school, and this is especially observed among girls.

Figure 6 displays Elementary Cohort student responses regarding how much they like math and science. For both math and science, student interest in the subjects declined as the

students progressed from 4th to 6th grade. Most notable was the decline in the number of students who strongly agreed with the statements.



When the individual responses of students regarding their agreement with the statement “I like math” were compared between 2012 to 2014, 52% of the respondents answered with the same level of agreement in 2014 as they did in 2012 while 34% responded less favorably (that is they agreed less with the statement “I like Math”) than they did in 2012, and only 14% responded more favorably, that is with greater agreement with the statement “I like math” than they did in 2012. When the individual responses regarding their agreement with the statement “I like science” were compared between 2012 and 2014, only 39% answered with the same level of agreement, 36% responded less favorably and 25% responded with greater agreement. These results suggest that the declining interest in math and science begins early and early interventions may be critical to both maintaining interest and preparing students for STEM pathways.

A decline in interest in math with time **within cohorts** was demonstrated for both the Middle and Senior Cohorts (Figure 7). A decline in interest in science with time however, was only seen in the Middle Cohort. It is interesting to note that decreases in interest in math and science within the Middle Cohort with time (from 7th to 10th grade: 13% lower) were similar to the decreases **between Middle and Senior students** (from 7th to 10th grade) in 2012 when all students were included (2012 report). However, the percent of students who agreed or strongly agreed that they like math and science in the Middle and Senior Cohorts in 7th and 10th grades was consistently slightly higher than the percent of all students in 7th and 10th grades in 2012. This suggests a bias in results due to the demographics of those that responded. In 2012, when almost all students in the selected 7th and 10th grade classrooms were surveyed, the samples were more representative of the populations. However, in the 2015 surveys, the cohort includes only those that chose to respond and the 2012 results are

for those students only. There may likely be a connection between students that already demonstrate an interest in these subjects and their willingness to participate in a survey about STEM Education.

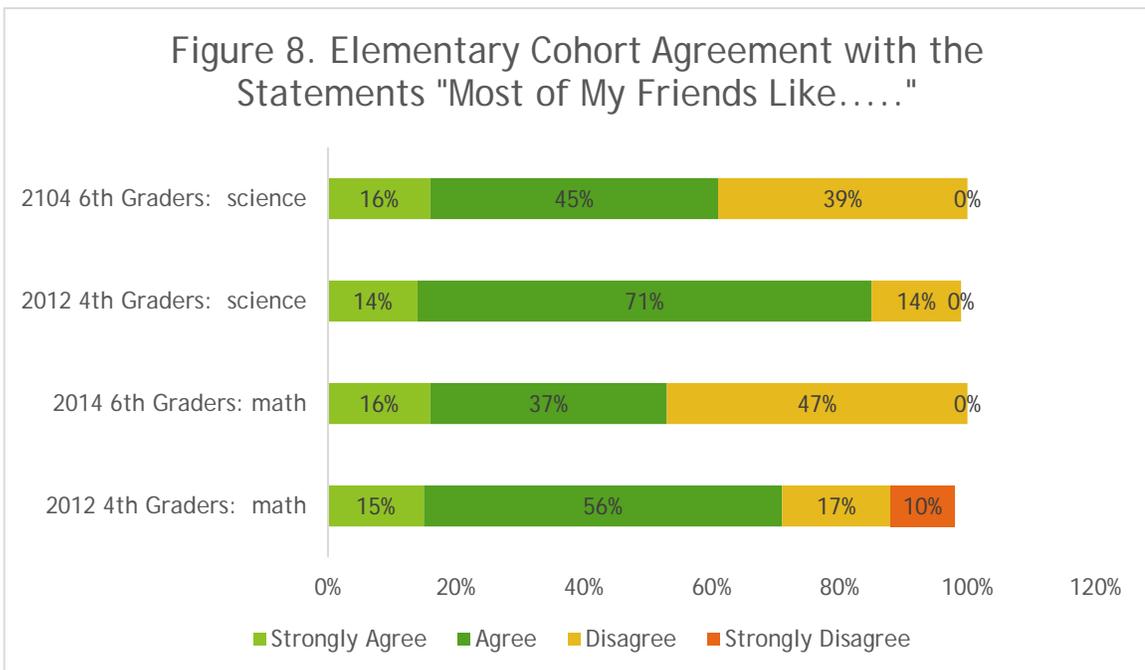
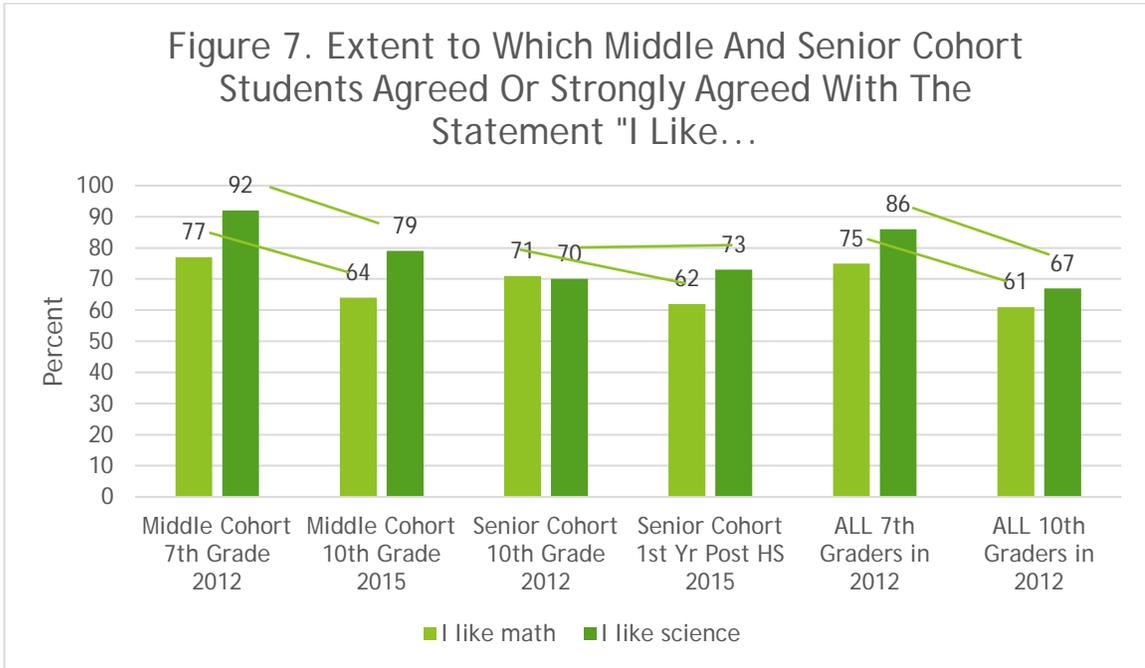
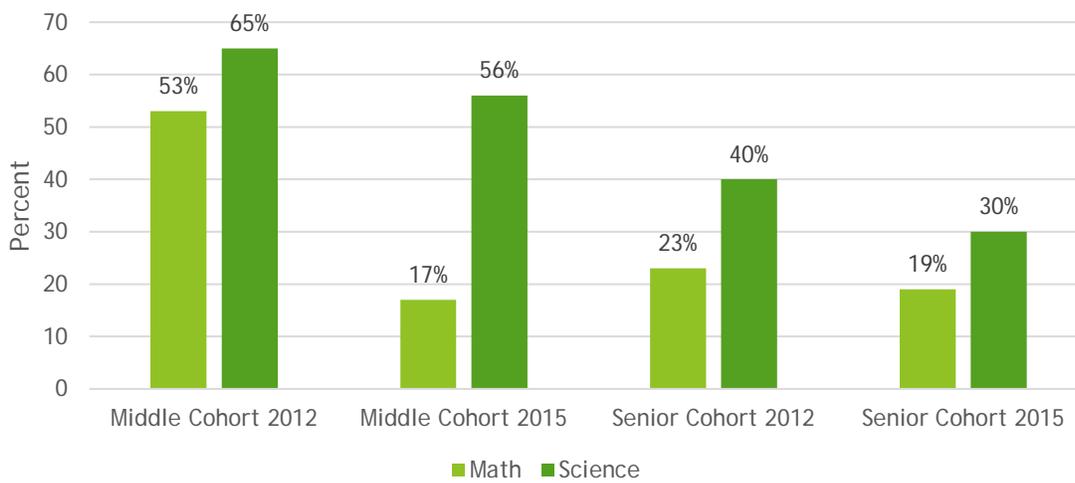


Figure 9. Middle And Senior Cohort Students Who Agreed Or Strongly Agreed To The Statement "Most Of My Friends Like..."



Over 50% of students in all cohorts responded that they like math and science (Figures 6 and 7). If these responses reflect students' true feelings, we might expect that students would indicate that most of their friends like math/science. However, Figures 8 and 9 indicate that many students disagree with statements that most of their friends like these subjects.

In the Elementary Cohort, the responses in 4th grade (2012) to "I like math" and "I like science" did not differ greatly from the responses to "Most of my friends like math" and "Most of my friends like science;" however, by 6th grade, the negative responses to "...my friends like math" and "...my friends like science" were considerably greater than the negative responses to "I like math" and "I like science."

Within the Middle Cohort, there was a large decline in the agreement to the statement "Most of my friends like math" between 2012 and 2015. The contrast between the statement "I like math" and "Most of my friends like math" in 2015 when these students were in 10th grade was striking. Sixty-four percent (64%) of the Middle Cohort 10th graders agreed that they liked math (Figure 7) while only 17% reported that they thought most of their friends did (Figure 9).

Within the Senior Cohort, agreement with the statements “Most of my friends like math” and “Most of my friends like science” was also notably lower than students’ agreement to the statements “I like math” and “I like science.”

During a time in life when students want to be accepted by and similar to their peers, it is interesting that so many students perceive that most of their friends don’t like math and science when over 60% of individuals at each grade level respond that they do like math and science. Again, this suggests a potential sampling bias of students with an interest in STEM.

Gender and Race Considerations Regarding Attitudes Toward Math And Science
When developing possible intervention strategies to increase interest in STEM fields, gender and race are important to consider as they are often correlated with students experiences with math and science.

Figure 10 illustrates that at an early age, 4th grade, a gender gap in interest in math has begun to form. In the Elementary Cohort, 95% of 4th-grade boys agreed or strongly agreed that they liked math while only 76% of 4th-grade girls agreed or strongly agreed. Both the boys and girls in this cohort demonstrated some loss in interest by 6th grade; however, the decline in those agreeing and strongly agreeing was actually greater for the boys, and the number of boys strongly disagreeing rose dramatically.

Interest in science was slightly higher for both 4th- and 6th-grade girls compared to 4th- and 6th-grade boys in the Elementary Cohort; however, little change was demonstrated between 4th and 6th grade for either gender (Figure 11).

Figure 10. Extent to Which Boys and Girls in the Elementary Cohort Agreed or Disagreed with the Statement, "I Like Math"

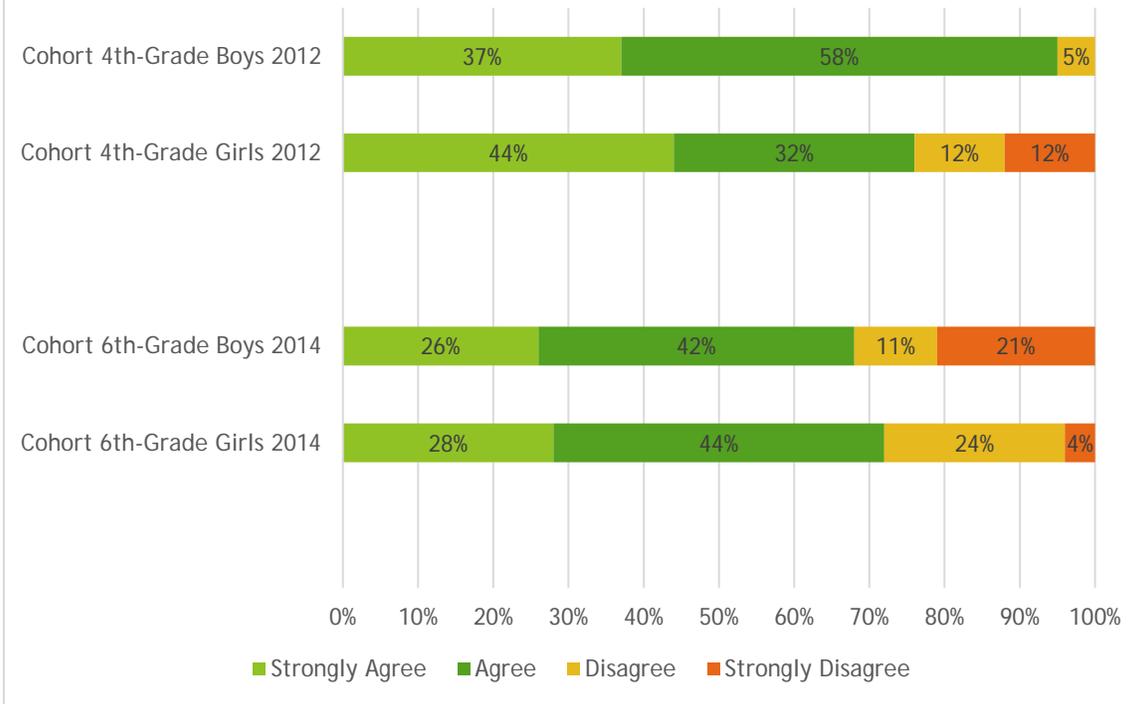
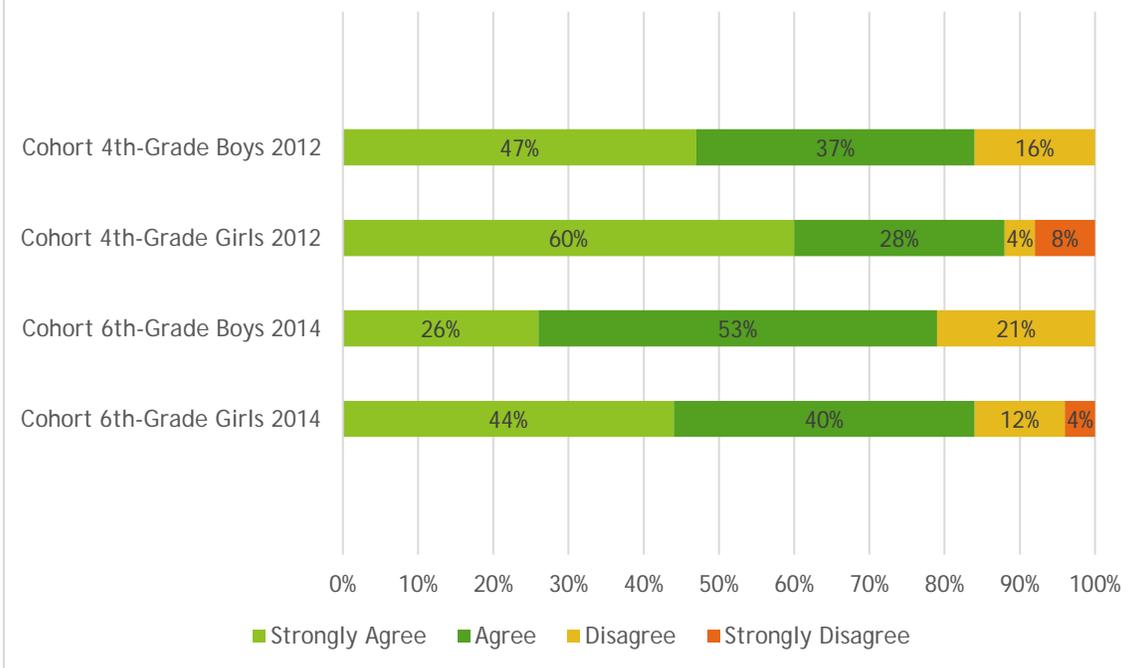
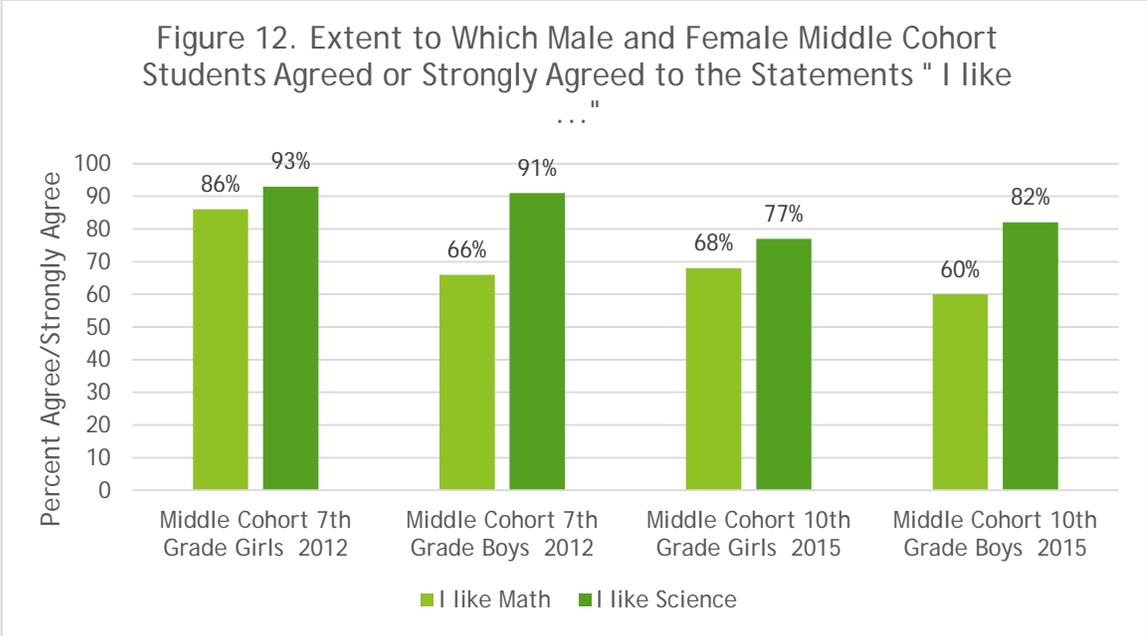


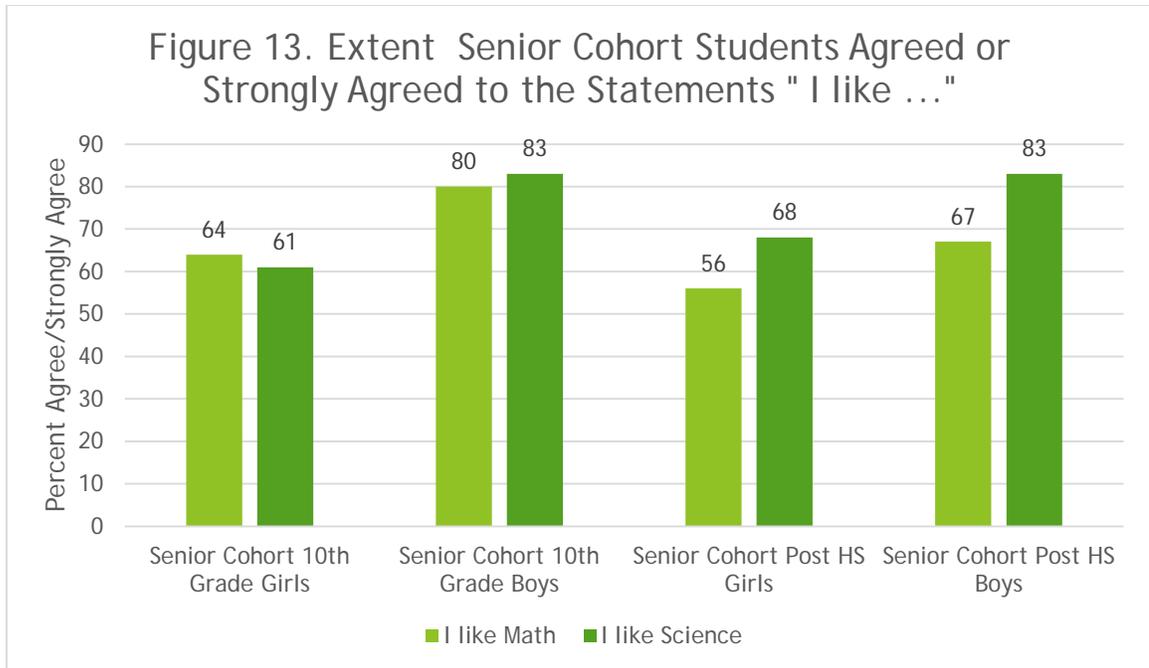
Figure 11. Extent to Which Boys and Girls In the Elementary Cohort Agreed or Disagreed with the Statement, "I Like Science"



The Middle Cohort comparisons surprisingly demonstrated girls' greater interest in math when compared to boys (Figure 12). In both the 2012 survey when the students were in 7th grade and the 2015 survey when they were in 10th grade, girls had more positive responses to the statement "I like math" than boys. Interest in science, however, was similar for boys and girls in both the 7th-grade survey and the 10th-grade survey. Interest in both math and science decreased for both boys and girls between surveys.

Results from the Senior Cohort, however, did not demonstrate the same or greater interest in math and science by girls compared to boys (Figure 13). In both the 2012 survey (10th grade) and again when surveyed in 2015 (post high school) agreement with the statements "I like math" and "I like science" was considerably lower for girls than for boys. While all students in this cohort demonstrated relatively high interest (over half agreeing or strongly agreeing) in both math and science, the only notable decrease in interest between 10th grade and post-high school was interest in math by the boys, dropping from 87% agreement to 67% agreement.

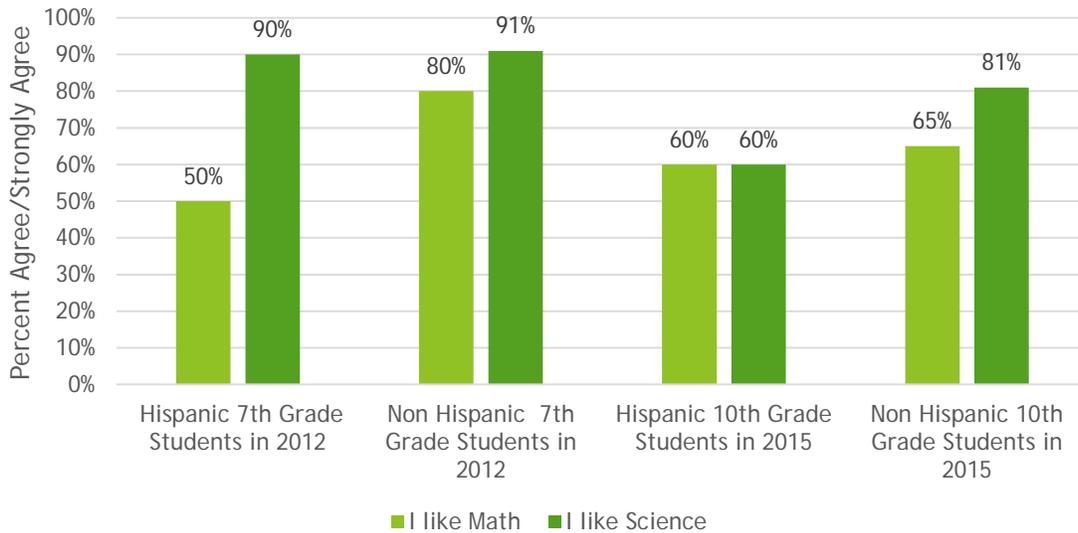




Comparisons of interest in math and science were also made between self-declared Hispanic students and non-Hispanic students within the Middle and Senior Cohorts. While the sample number of Hispanic students responding to the surveys was small by comparison to the non-Hispanic student sample, trends in responses are still worth noting.

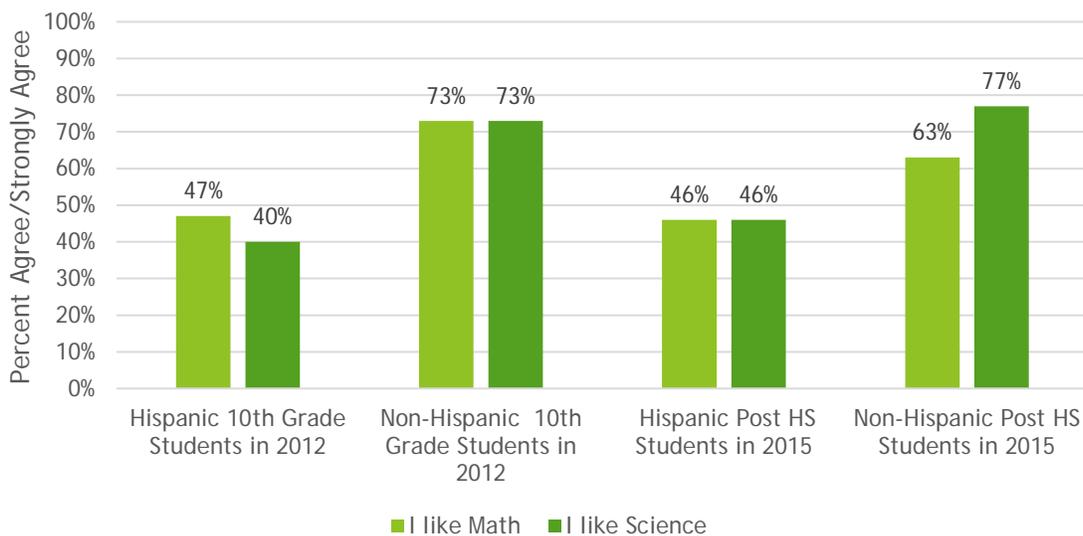
When students in the Middle Cohort were in 7th grade (2012), Hispanic student agreement with the statement "I like science" did not differ from non-Hispanic students, and in both cases the interest was high, over 90% agreeing or strongly agreeing with the statement (Figure 14). However, for these same students in 7th grade, Hispanic students had a much lower level of interest in math, only 50% agreeing or strongly agreeing with the statement "I like math," while 80% of the non-Hispanic students agreed or strongly agreed. By 10th grade (2015), the differences in math interest between Hispanic and non-Hispanic students was not as apparent, both between 60-65% agreement with the statement "I like math". However, interest in science by 10th grade had declined considerably for Hispanic students, down to 60% agreement, while still high (81% agreement) for non-Hispanic students.

Figure 14. Extent to Which Hispanic and Non-Hispanic Middle Cohort Students Agreed to the Statements " I like ..."



Within the Senior Cohort the differences by race were more pronounced (Figure 15). Agreement with both statements "I like math" and "I like science" was markedly lower for Hispanic students than non-Hispanic students when surveyed in 10th grade (2012) and again when surveyed post High School (2015). Additionally, little change was observed between the 2012 and 2015 survey responses for either Hispanic or non-Hispanic students.

Figure 15. Extent to Which Hispanic and Non-Hispanic Senior Cohort Students Agreed to the Statements " I like ..."



Of particular interest in the 2014 and 2015 surveys is the possible relationship between STEM activities and interest in math and science. As noted previously, the Elementary Cohort students participated in a relatively high number of STEM activities, many with three or more activities; and a large percent of the Middle and Senior Cohort students participated in science experiments and electronics repair. Interventions such as the activities listed as STEM activities in the survey are often expected to yield increased interest in STEM subjects. Table 7 looks at the percentage of students in the follow-up surveys (2014 and 2015) that responded positively to math and science (Strongly Agreed or Agreed to the statements “I like math” and “I like science”) based on the number of extracurricular STEM activities (2 or more or less than 2) that they participated in since the 2012 survey.

Table 7. Elementary Cohort 6th Grade Student Agreement with the Statements “I like...” compared to participation in STEM activities.

	SA/A likes math	SA/A likes science
Less than 2 STEM activities	65%	82%
2 or more STEM activities	74%	81%

While there was a small increase in the percentage of Elementary Cohort 6th graders that responded positively to “I like math” between those that participated in 2 or more STEM activities compared to those that participated in less than 2 STEM activities, there was essentially no difference in interest in Science based on number of activities in which they participated (Table 7).

Table 8. Middle Cohort 10th Grade Student Agreement with the Statements “I like...” compared to participation in STEM activities.

	SA/A likes math	SA/A likes science
Less than 2 STEM activities	60%	68%
2 or more STEM activities	67%	87.5%

The relationship between STEM activities and interest in math and especially science was more pronounced within the Middle Cohort 10th-grade students (Table 8). The percentage of students agreeing with the statement “I like science” increased nearly 20% for students participating in 2 or more STEM activities.

Similarly, an increase in interest in both math and science was observed in the Senior Cohort post-high school students that participated in 2 or more STEM activities (Table 9).

Table 9. Senior Cohort Post High School Student Agreement with the Statements “I like...” compared to participation in STEM activities.

	SA/A likes math	SA/A likes science
Less than 2 STEM activities	57%	69%
2 or more STEM activities	75%	86%

These results show a positive association between participation in STEM activities and attitudes toward math and science. Conclusions should be drawn with caution. While it is possible that there is a cause-and-effect relationship, it is also reasonable to imagine that students who have a positive attitude toward math and science would tend to participate in more STEM activities. Additionally, as noted earlier, the sample demographics suggest that a disproportionate number of students already interested in STEM chose to participate in the study.

Student Educational Aspirations

The 2012 and 2015 surveys of the Middle and Senior Cohorts included questions regarding students’ aspirations with respect to their levels of educational attainment.

Figures 16 and 17 demonstrate that by middle school, students have already set high aspirations for education. Over 80% of the Middle Cohort students responded in 2012 (7th grade) that they expected to go to a 4-year university or

COLLEGE PREPARATION

85%

The number of 10th graders in the Middle Cohort who reported the cost of college and availability of financial aid were either fairly or extremely important when considering whether to attend college.

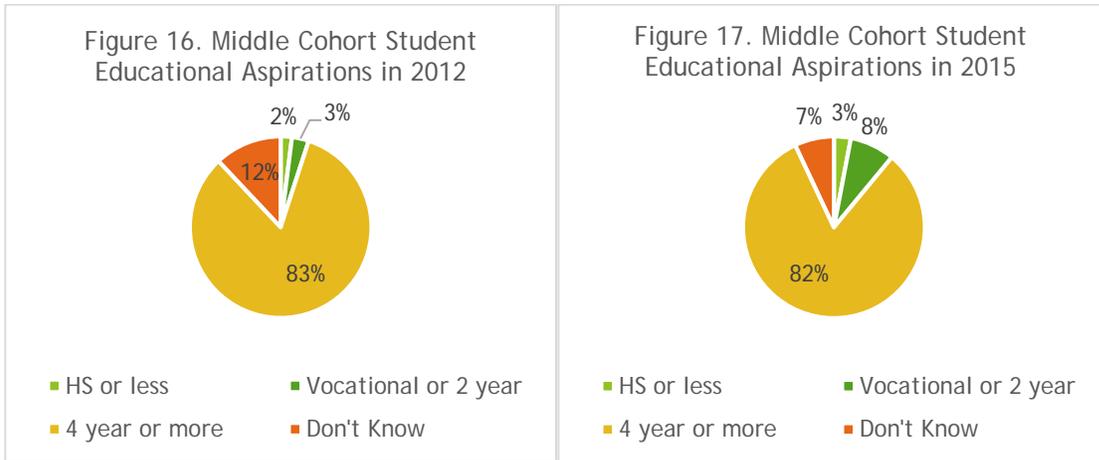
66%

...of Middle Cohort 10th graders, though, said they were not sure if they knew how to apply for financial aid.

26%

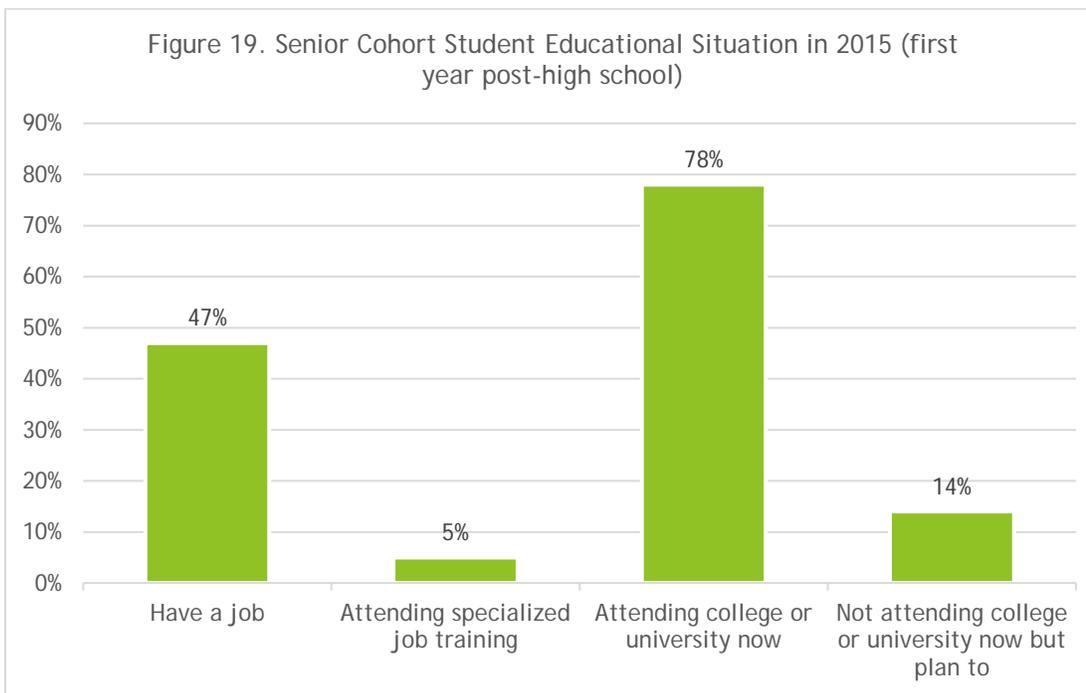
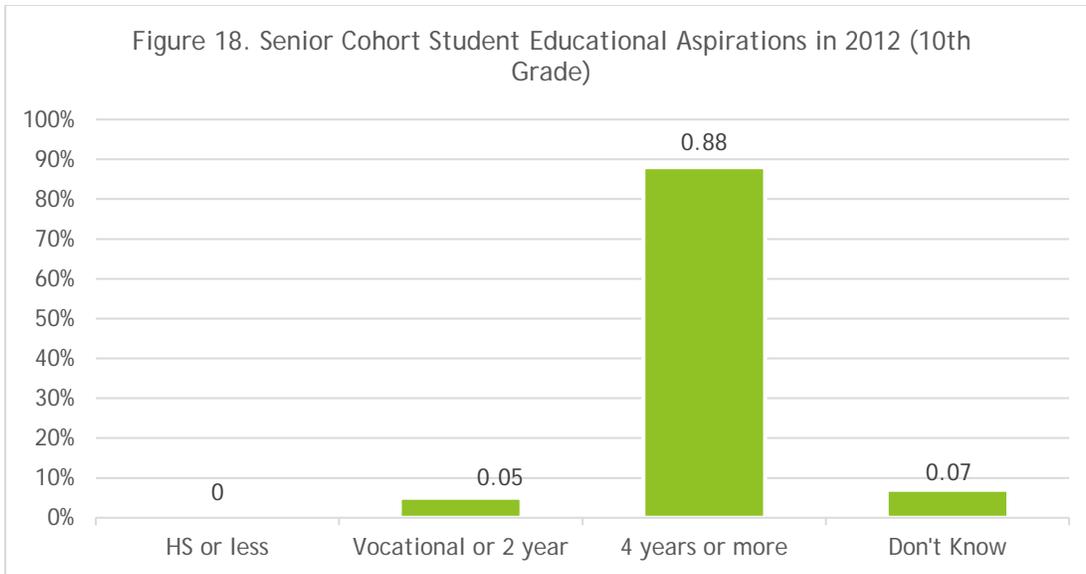
The number of high school seniors who reported they were not sure if they knew how to apply to college, and almost one-fifth of seniors indicated they remained unsure which high school classes they should take to be successful in college

higher and these aspirations did not change significantly when asked again in 10th grade (2015).



Similarly, the Senior Cohort overwhelmingly responded in 2012 that they aspired to complete a 4-year degree or higher (Figure 18). When asked in 2015 what their actual educational/job situation was, all but one of the 154 Senior Cohort respondents had graduated HS and over 77% were attending a college or university (Figure 19). Policy makers and major employers in the state of Idaho have expressed concern regarding the rate of college admission and college completion among resident students. The “Go On” rate (% of HS graduates entering post-secondary education) is consistently one of the lowest in the nation. The results of the follow-up survey are in stark contrast to this, and again, likely represent the sample that responded to the survey.

For many high school students the reality of what is necessary to meet their educational aspirations may not be easy to realize. For example, 90% of seniors said that the cost of college was fairly or extremely important to their decisions to go to college, 85% said the availability of financial aid was extremely or fairly important, and yet 66% reported they were still unsure how to apply for financial aid. Thus, while over 80% of students would like to complete 4-year degrees and beyond, a considerable percentage of them face uncertainty in key processes that enable them to afford college and that make the education experience in college positive and successful. Thus, the will to attend college is widely shared and desired among Idaho youth, but the tools for realizing these goals fall short.



Students were also asked if having the college close to home, even if they were not able to live at home while attending school, played a role in their decisions. Of the 10th-grade students in the Middle Cohort, 37% said this was either fairly or extremely important. This factor could be important to higher education decision makers as they consider ways to make college accessible to Idaho residents, such as through distance learning programs and satellite branches.

Students' Career Aspirations

Middle and Senior Cohorts students were asked in 2012 and again in 2015 their perceptions of scientific work. In all cases, over 70% of the students surveyed responded that they think scientific work is exciting (Figure 20); yet these same students had little interest in becoming scientists.

The 2012 survey did not ask similar questions for engineering; however, questions regarding perception of engineering and desire to be an engineer are included in the 2015 survey (Figure 21). Agreement with the statement that "engineering is exciting" was not as high as for science; however, it was generally high, with over 60% of the Middle Cohort (10th graders) agreeing and nearly half of the Senior Cohort (first year post-high school) agreeing. Again, the desire to become an engineer was considerably lower than the perception that the career was exciting. Interestingly the agreement to both questions was lower for the Senior Cohort compared to the Middle Cohort. Policy makers and other stakeholders often consider marketing these careers as a way to promote recruitment based on the presumption that they are just not viewed as exciting careers. These results tend to contradict that assumption and suggest that there are other reasons students are not pursuing these careers.

CAREER ASPIRATIONS

OVER 70%

Students in both the Middle and Senior Cohorts and in both surveys thought scientific work is exciting

YET ONLY

1/3

Of them said they wanted to be scientists

Figure 20. Extent to Which Middle And Senior Cohort Students Agreed Or Strongly Agreed With The Statements...

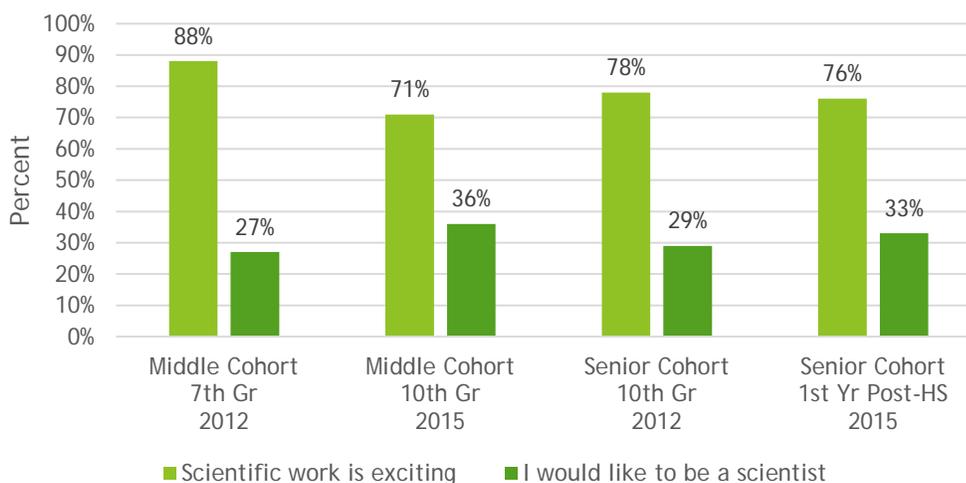
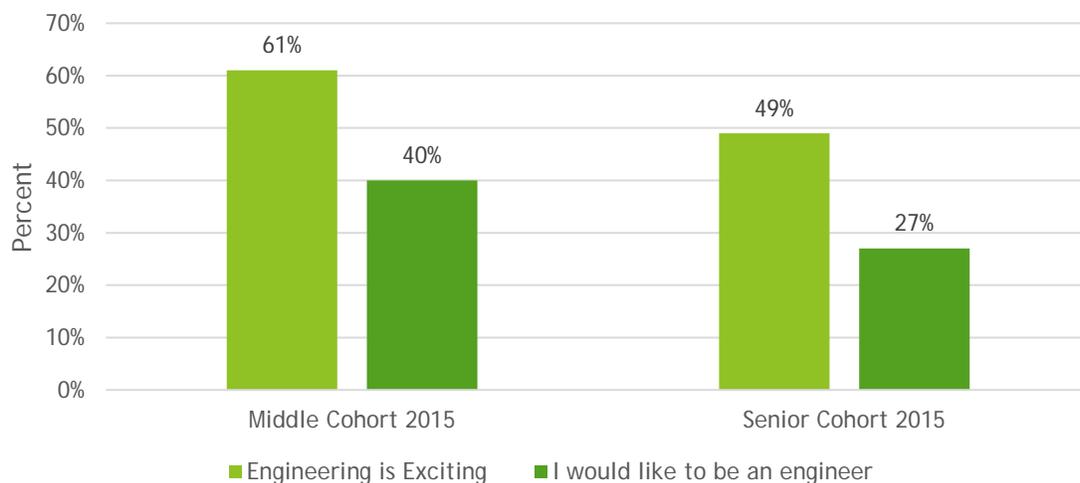


Figure 21. Extent to Which Middle and Senior Cohorts Students Agreed or Strongly Agreed With the Statements ...



All surveys included the following open-ended question, “If today you had to pick a career for the future, the career you would most likely pursue is _____.”*

*Engineering, science and medicine/health care responses comprise “STEM” careers as defined for this report. These are fields that typically require a lot of high-level math and science courses beyond high school. All remaining career areas together comprise “non-STEM” careers. It is valuable to note that some jobs within the Social Sciences and the Justice System may also be defined as STEM careers, since NSF does include social science disciplines (e.g., sociology and psychology) in its broad consideration of STEM fields. “Non-STEM,” therefore, includes careers that - depending on the context - may require STEM preparation.

In response to this open-ended question, students displayed little interest in pursuing engineering careers - even less than when specifically asked to agree with the statement “ I would like to be an engineer” in Figure 21 above. Again, the belief that engineering is exciting does not seem to translate into a desire to pursue an engineering career.

Given the high rate of identification of health care careers as choices by the Middle and Senior Cohorts students, it would appear that while these students express little interest in science careers overall (Figure 20), they are not associating health care and medical occupations with “science careers.”

Gender Considerations Regarding Factors That Shape Career Aspirations

The gender gap in health care, particularly nursing, is observed nationally, and these survey results tend to mirror that gap in Idaho's youth. In order to better understand what is driving the preference to health care by females, we evaluated the factors shaping career aspirations by gender in the 2015 survey of Middle and Senior Cohort students.

Responses by gender for the Middle Cohort mirrored the combined results, where "money" and a "job I like" were considered most important. Little difference was seen between female and male responses with the exception of the factor "physical." Fifty-eight percent of female students in 10th grade saw this as extremely or fairly important. It is important to note that in this 2015 survey the wording used was "To have a job that is really physical and/or I could work with my hands." This variation in wording could, in fact, completely change the connotation of the question and may partly explain the attraction to health care fields. A similar trend in responses was seen in post-high school students in the Senior Cohort surveyed in 2015 (Figure 23). In this cohort, however, females cited staying in their hometown and physical/hands-on work as important more often than males. Follow-up research would be needed to understand if more opportunities in health care fields are thought to exist in communities across Idaho by students.

CAREER CHOICES

36% of 4th-grade students in the 2012 survey named a STEM field

When asked again in 6th grade in 2014, only 20% responded with a STEM field

55% of 10th graders in the Middle Cohort in 2015 named a STEM field

Of those 10th-grade students choosing STEM, only 13 individuals or 9% identified engineering

38% of the 10th-grade students naming STEM careers chose health care fields

46% of post-HS students in 2015 named STEM careers

- Over ½ of those students choosing STEM chose health care professions
- Only 6% of post-HS students in 2015 chose engineering professions

Figure 22. Factors Cited as Extremely or Fairly Important in Middle Cohort Females' and Males' Career Aspirations

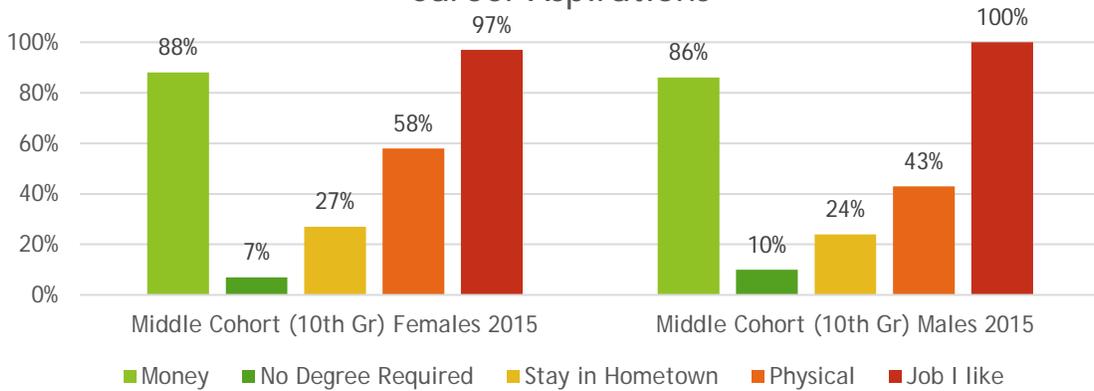
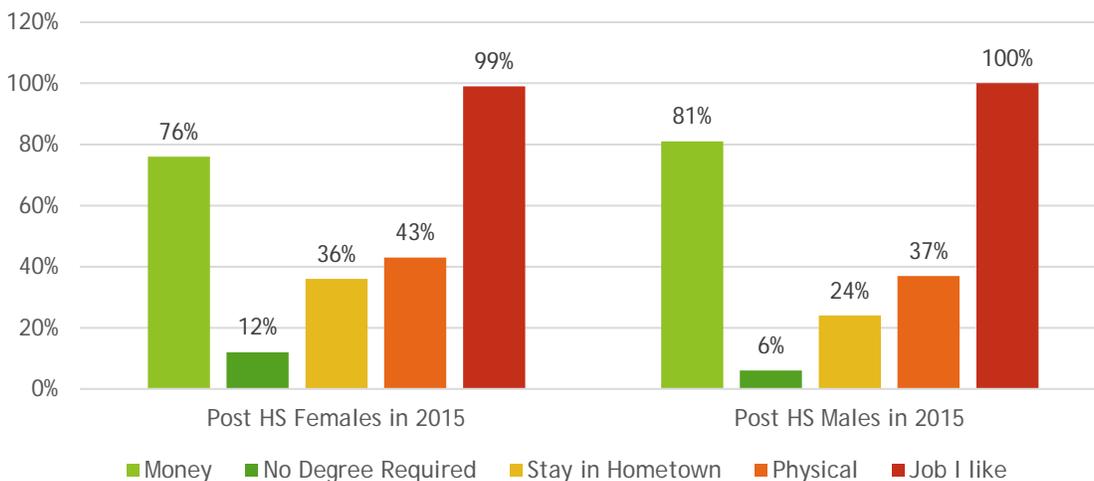


Figure 23. Factors Cited as Extremely or Fairly Important in Senior Cohort Females' and Males' Career Aspirations



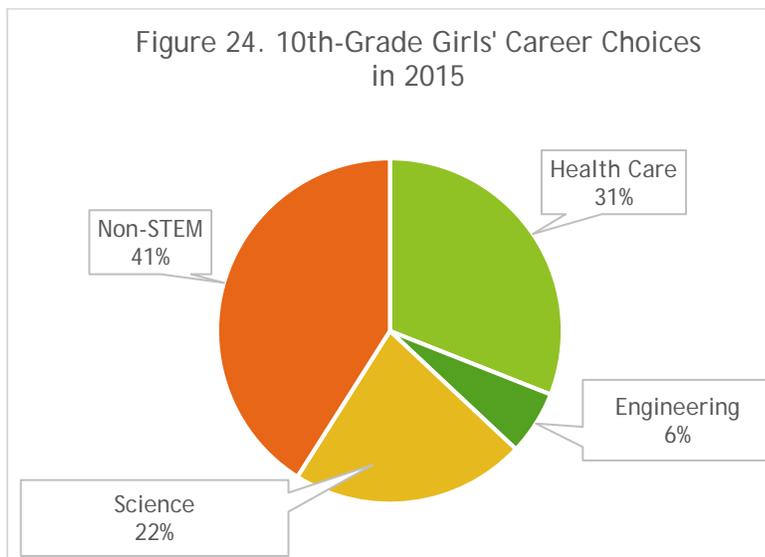
Gender and Race Considerations with Respect to Career Aspirations

The 2015 surveys represented students that were either in high school (10th graders in the Middle Cohort) or recently graduated from High School (first year post high school in the Senior Cohort) when students are at a crossroads regarding decisions that may impact their career paths in the future. For this reason it is important to understand how gender and race may be influencing career interests if we hope to steer students toward high demand STEM careers in their region. We therefore tabulated the responses to career choice by gender and race, specifically looking at the differences in aspirations between Hispanic and non-Hispanic (predominantly white) students and between female and male students.

As noted above, three general areas arose that constituted STEM-related fields: Engineering, medicine as well as other health care careers, and science fields (more broadly).

Among the 10th graders in the Middle Cohort, a gender pattern seemed to emerge. While boys and girls expressed similar levels of interest in STEM careers overall (around 60%), engineering drew a larger percent of interest (12%) from the 10th Grade boys, compared to the girls for whom only 6% identified engineering careers (Figures 24 and 25). Conversely, boys expressed less interest in health care occupations (14%) compared to girls (31%).

These results may suggest that by high school, the gender association with particular careers has already been established. This may imply that efforts to engage and interest girls in engineering need to begin much earlier. These results are also relevant to efforts by the health care fields to recruit males into professions such as nursing that are often viewed as feminine occupations.



GENDER AND CAREER ASPIRATIONS

2X

10th-Grade Females selected health care careers twice as often as males and 10th Grade males selected engineering careers twice as often as females.

40%

Only 40% of post-high school females were still expressing interest in STEM careers with Health Care careers still dominating their choices.

50%

Half of post-high school males still expressed interest in STEM careers; however, health care and engineering were not the favored choices.

Figure 25. 10th-Grade Boys' Career Choices in 2015

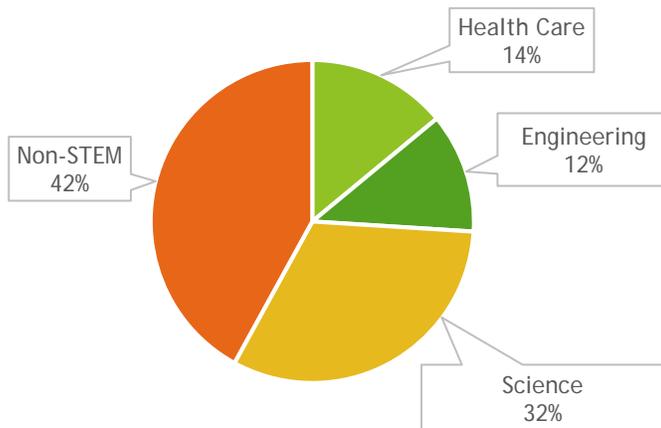


Figure 26. First Year Post-HS Female Career Interests

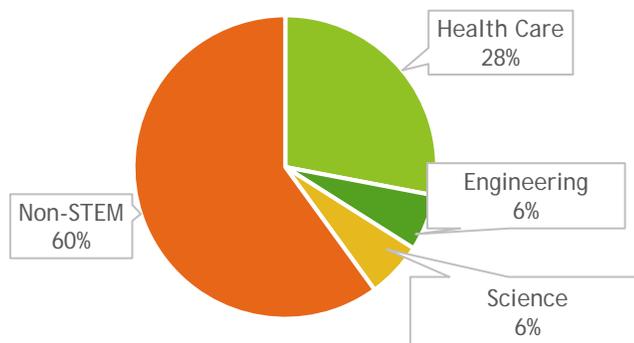
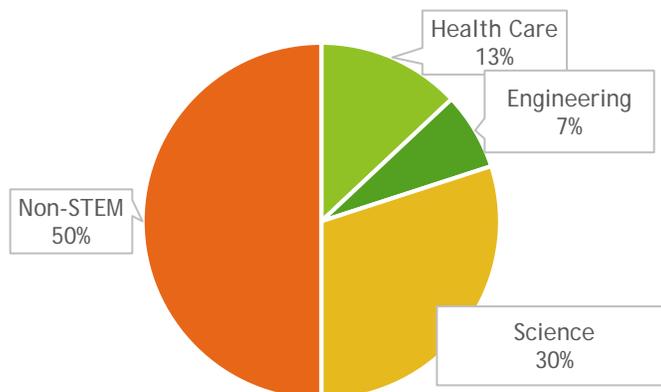
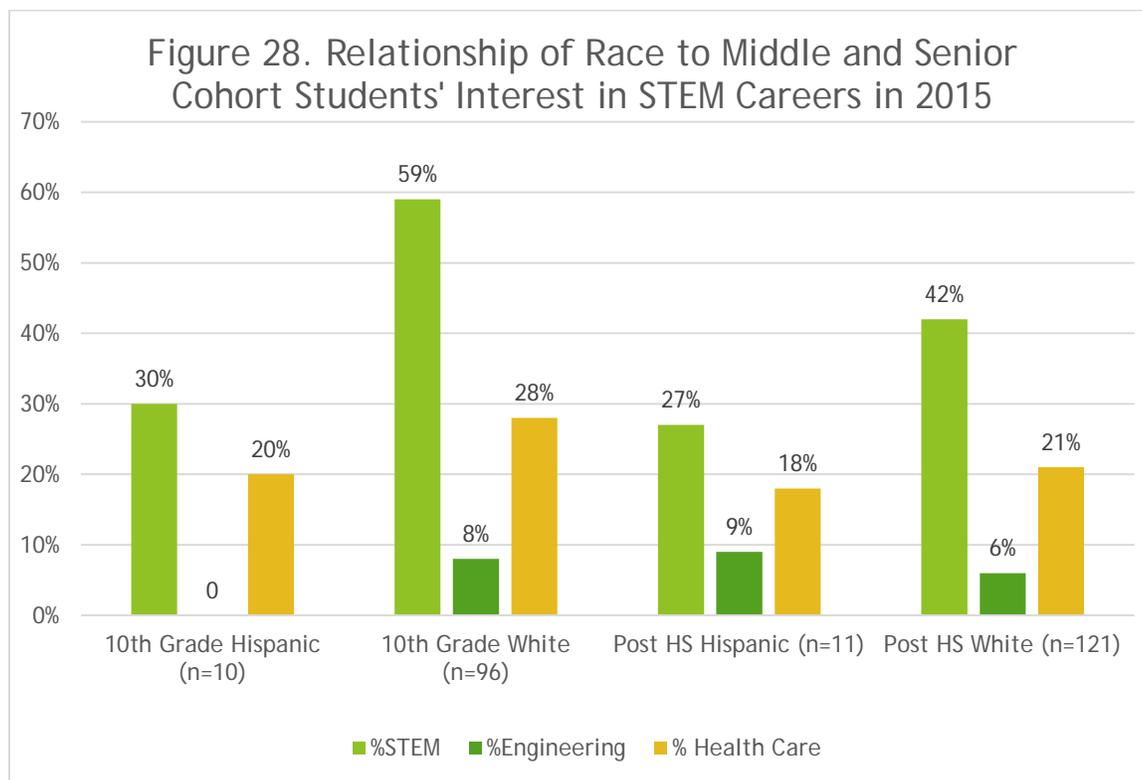


Figure 27. First Year Post-HS Male Career Interests



The Senior Cohort student responses to the open-ended question of career choice, however, revealed a lower interest in STEM careers overall by both males and females (50% and 40%, respectively) and lower interest in STEM careers by females compared to males (Figures 26 and 27). Again, health care professions were more frequently chosen by females (28%) compared to males (13%), and interest in engineering was low for both males and females and did not differ by gender.

Interest in STEM careers by Hispanic students in both the Middle and Senior Cohorts in 2015 was appreciably lower than for white students (Figure 28) at 30% or less in both cohorts. Difference is specific interest in engineering and in health care professions were negligible between Hispanic and white students in both cohorts.



Regardless of race or gender, it appears that students are not associating health care professions with the idea of being a scientist and, therefore, it may be useful to investigate their perception of the amount of math and science required for these careers. Middle and Senior Cohort students were asked in 2015 how much math and science they thought were needed for various careers. Nursing was used to represent Health Care and Engineering was included. The results suggest that by this time in their education they are aware of the heavy math and science requirements for these careers.

Factors shaping students' career aspirations

For both the Middle and the Senior Cohorts' responses in 2015, students recognized the need for a lot of math in the engineering profession (Figures 29 and 30). Interestingly, the students did not equate the need for "a lot of math" with the nursing profession, even though they acknowledged the need for a lot of science. The low interest in pursuing engineering compared to the relatively high interest in pursuing health care professions might suggest that the requirement for a lot of math may be acting as a deterrent to professions perceived as needing a lot of math. While this appears contradictory to the relatively high rate of agreement to the statement "I like math", other indicators such as the responses to "engineering is exciting" and "scientific work is exciting" (Figures 20 and 21) suggest that these students are not selecting career options based on their attitudes toward the careers or their interest in specific subjects. It is, therefore, important to understand what factors do indeed shape these decisions.

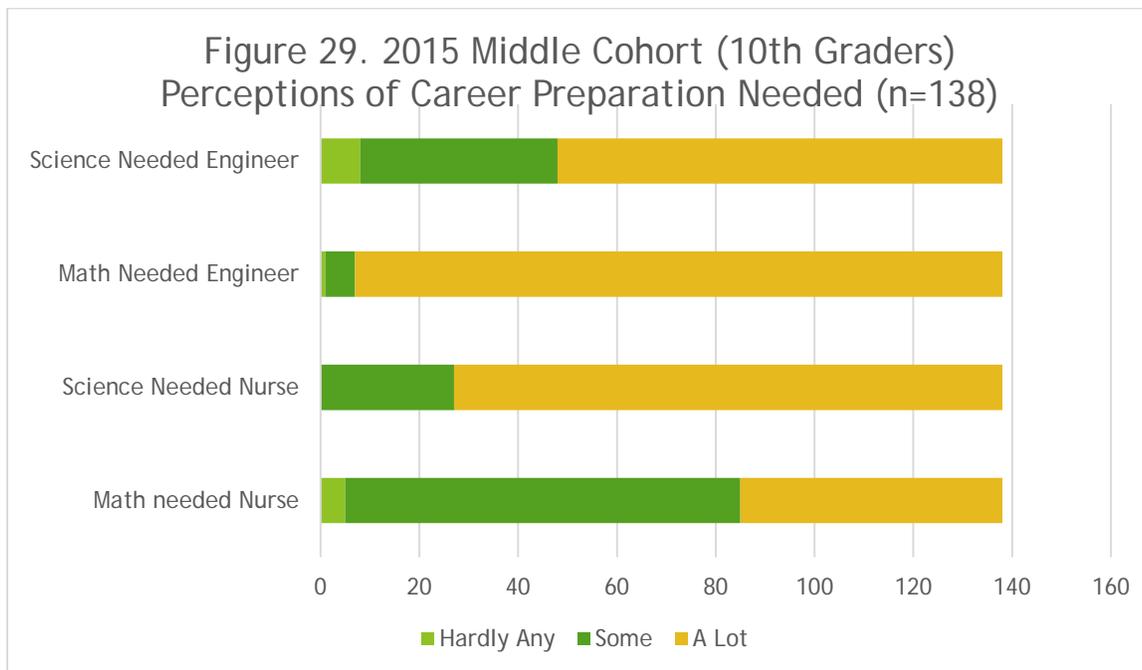
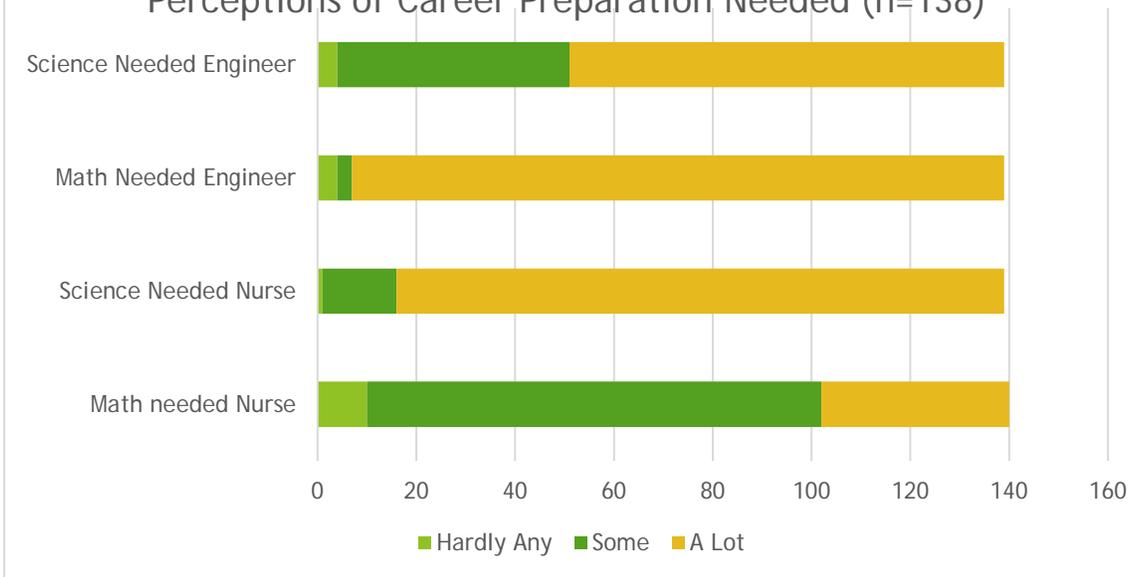
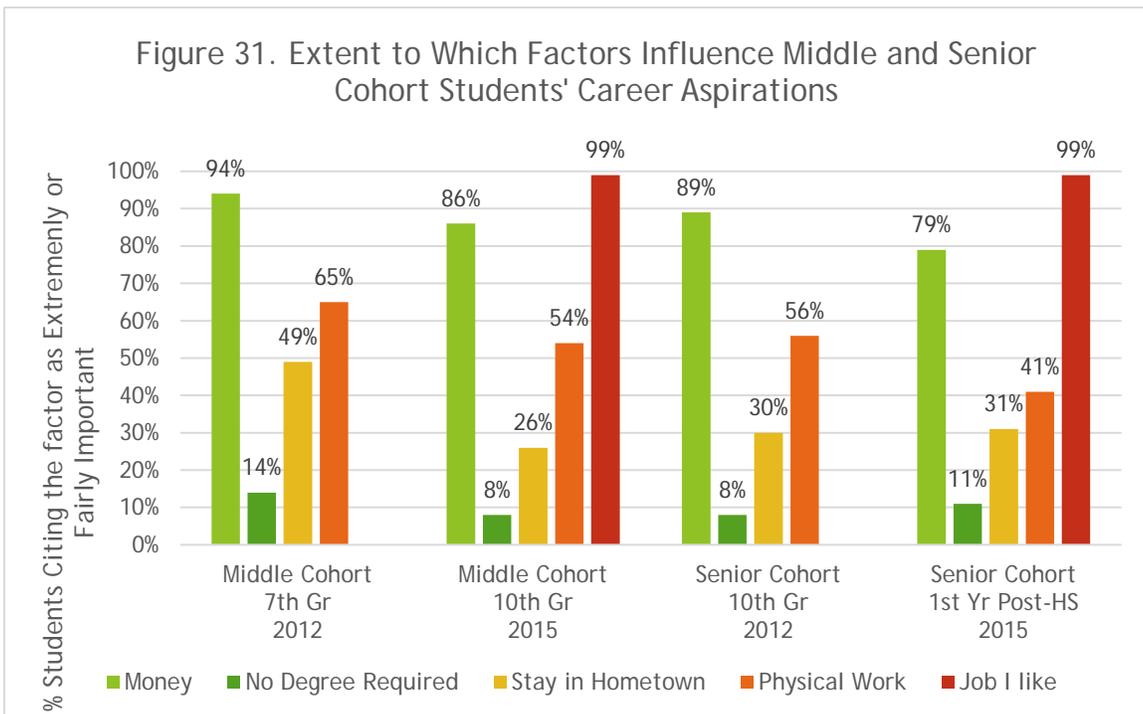


Figure 30. 2015 Senior Cohort (1st Year Post-HS) Perceptions of Career Preparation Needed (n=138)



Students were asked a series of questions in 2012 and again in 2015 about which aspects they consider important for their future career decisions. They were asked the extent to which these factors were important: earning a lot of money; having a job that does not require a college degree; having a job that is really physical; and having a job that allows them to stay in their hometowns. In the 2015 survey, the response “having a job that I like” was added.

Figure 31. Extent to Which Factors Influence Middle and Senior Cohort Students' Career Aspirations



The vast majority of both the Middle and Senior Cohort students cited money as an important factor when choosing a career (Figure 31). However, in both cohorts, there was a slight decline in the percentage of students that felt this way over time (between the 2012 and 2015 surveys). Finding a career that did not require a college degree did not appear to be important to students of either cohort, regardless of when they were surveyed. Finding a career that allows students to stay near their hometowns was considered important by nearly half of the 7th grade students in the Middle Cohort when surveyed in 2012, however the importance of this factor decreased significantly when they were asked again in 2015. In fact, as seen in Figure 31, the percentage of students that considered being near their hometown important did not differ greatly between 10th-grade students in the Middle Cohort (2015), 10th-grade students in the Senior Cohort (2012), nor post-HS students in the Senior Cohort (2015). This suggests that by 10th grade the desire to stay near home has leveled off and those students that still find it important may continue to consider that factor in future job decisions. It is interesting that doing physical/hands-on work is considered important by 65% of 7th graders in the Middle Cohort and by over 50% of Middle Cohort 10th-grade students and by Senior Cohort students responding in 2012 while in 10th grade. The importance of physical work, however, is lower in responses of the Senior Cohort students when surveyed in 2015 post-high school. In general, importance of all four factors included in both surveys declined as students progressed through school, making conclusions about the factors driving actual choices post high school hard to draw. Perhaps more confounding is the overwhelming positive response to the factor “a job that I like” in the 2015 survey. If we believe that this is driving decisions, then we might conclude that the students’ stated interest in math and science subjects has little bearing on what they like to do.

Gender/factors shaping career choice

The open text questions, “What do you like most about the career you have chosen?” and “What do you like least about this career?” were also included in the 2015 survey. We evaluated the results for the Middle Cohort for this report since this appears to be a critical juncture in the decision-making process of students.

The most common answer to what female students in the Middle Cohort like about the chosen career had to do with helping people or society at 37%. The next most common answers were about creativity and challenges at 9% and working with animals at 9%. On the other hand, male respondents in the Middle Cohort named working with computers (17%) and solving problems and creativity (17%) as the most common reasons for choosing the career which is interesting since they demonstrated so little interest in engineering. This suggests that they may not understand the problem-solving and IT components that are possible in engineering occupations. Helping people/society was a close second at 15% and helping animals was low at 4% for males. These responses tend to coincide with the female interests in health care.

In response to what they liked least, the female respondents in the Middle Cohort most commonly cited the amount, type, or cost of schooling (29%). Male students also cited this most often, but only at 16%, as their answers were considerably more diverse. Neither females nor males commonly cited income as a deterrent, only 7% of females and 5% of males naming money as what they liked least.

These responses citing schooling as a deterrent do not coincide with the statements that not needing a degree is not a significant factor when choosing a career. It is possible that the students distinguish between “getting a degree” as a deterrent from the difficulty of classes and costs of schooling.

VI. CONCLUSIONS

Interest in math and science are considered strongly linked to a student’s longer term education and career aspirations. This is why many STEM education interventions utilize one form or another of interest assessments when evaluating the success of a program. Additionally, there is considerable interest in the education research community in understanding how early, how often, and the duration of interventions needed to impact this interest long term. This most recent assessment of student attitudes and perceptions in Idaho supports the idea that STEM activities and interventions are related to student interest in STEM subjects especially in younger students. It is important, however, not to draw cause and effect conclusions. As noted previously, the self-selection process may inherently draw students who already demonstrate an interest in STEM and, therefore, the activity participation may be a reflection of that interest. Both participation in extracurricular STEM activities and interest in science and math show demonstrable decline from 4th to 6th grade, suggesting that, indeed, early intervention may be critical. While this decline in interest in math continues throughout middle and high school, there is a point at which middle school students’ interest in science seems to level off. This suggests that interventions that strive to make math interesting and engaging are critical to STEM interest. The gender differences in attitudes toward math and science in this report further demonstrate that while girls actually still like math in middle school, to some extent even more than boys, their interest drops dramatically between 7th and 10th grade. This supports argument not only for early intervention, but for sustained efforts throughout the education progression, perhaps with special attention to female student interests and how educators engage both girls and boys in middle school and high school math and science education. While the number of Hispanic students in the follow-up surveys was small, the differences in attitudes toward math and science were pronounced. Clearly, Hispanic students’ interest in math and science is waning in Idaho at all ages, and this is something that will need to be addressed if we are to take advantage of the growing Hispanic population in the state to fill the STEM job demands.

Perhaps more interesting in this report is the apparent disconnect between interest in math and science, attitudes about science and engineering professions, and career aspirations.

Even with a sample that is by all our measures quite interested in math and science, and that believes that these careers are exciting, there is little interest in pursuing science and engineering careers. In fact, the interest in engineering occupations is startlingly low. While students aspire to acquire a higher education, and they are not deterred in career choice by the need for a degree, they seem to be selecting careers for which they do not see the need for a lot of math as they perceive engineering does. We cannot, from these surveys, conclude that engineering recruiters need to do a better job of marketing the careers. It would seem that preparation and interest in math are bigger factors in this low interest in engineering careers.

The interest in health care professions by females in particular, suggests that students are selecting this based on perception that they will like the job, will make good money, will be able to do hands-on work, and may even be able to stay close to home. Additionally, the perception that less math is required may be influencing this choice.

Consistently, attitude about math has been an important factor in student responses to the survey questions, both in 2012 and again in the follow-up surveys in 2014 and 2015. This would suggest that math interventions are and will continue to be paramount to efforts to prepare the next generation STEM workforce.

Appendix One: Survey Methodology

2014 Mail-in Surveys

In 2012, 4th graders, 7th graders, and 10th graders were surveyed, during which contact information was obtained in order to conduct a follow-up survey with the same students two years later.

A follow-up mail-in survey was conducted among four of the twelve school districts surveyed in the 2012 UI-Micron STEM student surveys. The districts selected were: Kamiah, Boise, Priest River, and Jerome. Before the follow-up survey was distributed, data verification occurred between January 2014 and March 2014 for all the students who had a valid phone number. Students and/or their parents were called in order to verify contact information.

The surveys were conducted as mail surveys using a modified Dillman data collection method¹. The survey was sent on September 29, 2014, followed by a postcard on October 10, 2014. A second survey was sent on October 24, 2014 to all those who had not yet completed a survey. To increase response rates, phone calls were made to 9th- and 12th-grade students who had not yet completed and returned a survey. Calls were made December 9-13, 2014. Each student was called at least once and up to five times in order to confirm a mailing address and to receive verbal confirmation of willingness to complete the study. Students who indicated they no longer had a survey were mailed another copy from December 16 to 19, 2014. Data collection ended on January 27, 2015.

1,036 total students from the four chosen districts filled out a survey in 2012 from and gave consent for a follow up survey. Contact was made with 607 students and/or their parents during data verification efforts. At the time of data collection for the follow up survey 75 students did not have a valid address and 11 students reverted their consent. The mailing was sent to 950 students.

At the end of data collection 236 students completed surveys, 29 students refused, 93 had invalid addresses, 16 students were no longer eligible (moved out of state, deceased, or major illness etc.). 575 students did not return any surveys or make any contact with us. The overall response rate for the study was 28.1 percent².

The grade with the highest response rate* was 6th grade with 44% followed by 9th grade with 38.4%. The twelfth grade students had a response rate of 16.5%.

¹ Dillman, D. A., Smyth, J.D., Christian L.M. 2014. Internet, Phone Mail, and Mixed-Mode Surveys: The Tailored Design Method. 4th edition. Wiley.

² RR2, The American Association for Public Opinion Research. 2011. Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys. 7th edition. AAPOR.

In terms of school districts, Boise had the highest response rate of 39.6% followed by Kamiah with a response rate of 29.2%. Priest River had a response rate of 26.9%, and Jerome had a response rate of 21.1%.

*Response rate = (Completed)/[Sent mailing - (Non-deliverable+Ineligible)]

Although mail-in surveys do not encourage high response rates, the complexity of student movement over two years warranted the above approach. The total number of responses was considerably smaller for the follow-up survey than for the initial survey in 2012. As a result, the 2014 samples systematically differ from the 2012 larger samples in regards to demographics.

The survey itself differed from the 2012 survey as well. In addition to repeating selected questions from the 2012 survey, additional questions were included to help elucidate relationships between involvement in STEM activities and student attitudes and perceptions about STEM education and career pathways (See Surveys in Appendices 2 and 3).

Table: Student Counts for Dispositions at Various Stages in Data Collection

District	Grade level	Data Collection In School Survey 2012	Data Verification Fall 2013		Data Collection Follow Up Survey 2014				
		Completed, Gave Consent For Follow Up	Consent No Longer Given	No valid address	Sent Mailing	Completed*	Non-deliverable	Ineligible	Refusal
Kamiah	4 th -6 th	33	0	0	33	11	4	-	-
	7 th -9 th	31	1	2	28	7	4	3	2
	10 th -12 th	26	1	0	25	3	1	2	1
Jerome	4 th -6 th	41	0	14	27	12	1	-	-
	7 th -9 th	163	0	0	163	41	23	1	2
	10 th -12 th	222	2	8	212	23	16	1	7
Boise	4 th -6 th	44	1	13	30	7	8	-	-
	7 th -9 th	100	0	16	84	50	5	2	5
	10 th -12 th	156	2	14	140	33	9	3	10
Priest River	4 th -6 th	35	1	1	33	14	3	-	-
	7 th -9 th	93	2	0	91	24	7	3	2
	10 th -12 th	92	1	7	84	11	12	1	-
TOTAL	4 th -6 th	153	2	28	123	44	23	-	-
	7 th -9 th	387	3	18	366	122	39	9	11
	10 th -12 th	496	6	29	461	70	31	7	18

With an additional 2 surveys where district and grade are unknown

2015 Electronic Follow-up Surveys

Elementary Cohort

After removing students with no phone number nor email, there are 395 students in this cohort. Only 7 of these have (parent) email addresses; the rest having only phone number(s) and/or physical addresses. It would therefore require contacting each student in an attempt to acquire student email addresses. The Elementary Cohort was much smaller than the other cohorts in the original survey (2012) and had a much shorter version of the survey in fourth grade. Thus, we are not able to measure the “change” in response for many of the questions. For these reasons it was decided to utilize the 44 survey responses collected by mail in 2014 for this cohort; recognizing that even with a monumental effort, it would be very difficult to even attain a new sample of 44, which we already had.

Middle and Senior Cohorts

The questions from the 2014 survey (Appendix 3) were administered electronically using Qualtrics through the University of Idaho in 2015. Some questions were edited to reflect the additional year that had passed. Further, an additional four questions that asked about the respondent’s current situation regarding post-high school education and job were added to the Senior Cohort survey. All 12 original communities surveyed in 2012 were included. Surveys were administered and received between November 10, 2015, and January 21, 2016.

The Middle Cohort had 995 7th-grade students in 2012 who took the initial survey. The first email with an individual link to the 2015 survey for each recipient went out to the 520 emails that were available from contact information gathered in 2012. 104 of those 504 emails bounced. An additional 148 emails were sent to Jerome students by following the pattern for Jerome student email addresses.

The Senior Cohort had 1179 10th-grade students in 2012 who took the initial survey. The first email with an individual link to the survey for each recipient went out to the 910 emails that were available from contact information gathered in 2012. 169 of those 910 emails bounced.

More than 700 subsequent calls were made using phone numbers from contact information gathered in 2012, attempting to reach all students from the Middle and Senior Cohorts who took the 2012 surveys, including those whose emails bounced back. When students were reached, they were reminded of their initial participation and the importance of their follow-up responses. They were then requested to provide an email address in order to complete the electronic survey. While it was extremely difficult to reach the students by phone; when we did reach them, they usually confirmed their willingness to take the survey and followed through. For the Middle Cohort, 146 total students submitted surveys. For the Senior Cohort, 155 total students submitted surveys.

Appendix Two: Grade 6 Follow-Up Questionnaire

Grade Six Follow-Up Questionnaire 2014

Factors Influencing Science, Technology, Engineering, and Mathematics Education

Thank you for completing this follow-up questionnaire. This information will be used to help understand how student experiences change over time. Please read each question carefully and answer as accurately as possible, without asking anyone for help and without looking up any answers. If you do not wish to answer a specific question, you may skip it and move on to the next question.

Section 1: Specific Activities in the Past TWO YEARS

1.1 **In the last two years**, have you done any of the following activities? Circle "YES" or "NO" for each activity.

	Circle "YES" or "NO" for each activity.	
a. Participated on a school sports team	YES	NO
b. Participated on a non-school sports team	YES	NO
c. Took art, music, dance or theater classes or lessons outside of school	YES	NO
d. Participated in 4-H	YES	NO
e. Tried science experiments that were not required for school	YES	NO
f. Attended Family Math Night	YES	NO
g. Used a computer at home for schoolwork	YES	NO
h. Attended robotics workshop, class, competition, or camp	YES	NO
i. Participated in a science fair	YES	NO
j. Participated in Lego League	YES	NO
k. Attended science or technology or engineering or math clubs, camps, or competitions	YES	NO

<p>If you selected YES, write the names of the clubs, camps, or competitions in which you participated in the last two years: _____</p>		
---	--	--

1.2 List any OTHER similar activities that were not listed in the previous table that you participated in during the last two years:

Section 2: Careers and Your Ideas about the Future

2.1 a. If today you had to pick a career for the future, the career you would most likely pursue is

b. Do you know anyone who has that kind of career?

Yes

No

2.2 Please circle the answer that best describes your thoughts about the following careers.

	Women	Men	About the same number of men and women
a. Most engineers are:	Women	Men	About the same number
b. Most scientists are:	Women	Men	About the same number

2.3 Please circle the amount of INTEREST you have in each career.

Career	Your INTEREST in pursuing this career
--------	---------------------------------------

a. Nurse	None	A Little	A Moderate Amount	A Lot
b. Veterinarian	None	A Little	A Moderate Amount	A Lot
c. Business owner	None	A Little	A Moderate Amount	A Lot
d. Engineer	None	A Little	A Moderate Amount	A Lot
e. Farmer	None	A Little	A Moderate Amount	A Lot
f. Cashier	None	A Little	A Moderate Amount	A Lot
g. Write the career YOU listed at the beginning of this section: <hr/>	None	A Little	A Moderate Amount	A Lot

2.4 Please circle the answer that indicates how important or unimportant each of the following will be to you when considering your job or career options for when you are an adult.

	Extremely Important	Fairly Important	A Little Important	Not at All Important
a. To have a job that earns a lot of money	Extremely	Fairly	Little	Not
b. To have a job that allows me to stay in my hometown	Extremely	Fairly	Little	Not
c. To have a job that is really physical and/or	Extremely	Fairly	Little	Not

I could work with my hands				
d. To have a job doing something I really like	Extremely	Fairly	Little	Not

2.5 Do you think you will go to college?

_____ Yes

_____ No

_____ I don't know

Section 3: Your Experiences with Math

Please circle the answer that indicates how much you agree or disagree with each of the following statements about **math**.

	Strongly Agree	Agree	Disagree	Strongly Disagree
3.1 I like math .	SA	A	D	SD
3.2 Most of my friends like math .	SA	A	D	SD
3.3 Math is harder for me than it is for most students in my grade.	SA	A	D	SD
3.4 Math is useful for solving practical problems in life.	SA	A	D	SD
3.5 As an adult, I would like to have a job that uses a lot of math .	SA	A	D	SD
3.6 Studying math is useful for getting a good job.	SA	A	D	SD

Section 4: Your Experiences with Science and Engineering

Please circle the answer that indicates how much you agree or disagree with each of the following statements about **science and engineering**.

	Strongly Agree	Agree	Disagree	Strongly Disagree
4.1 I like science .	SA	A	D	SD
4.2 Most of my friends like science .	SA	A	D	SD
4.3 I think learning science will help me in my daily life in the future.	SA	A	D	SD
4.4 Studying science is useful for getting a good job.	SA	A	D	SD
4.5 Scientific work is exciting.	SA	A	D	SD
4.6 Engineering is exciting.	SA	A	D	SD
4.7 I would like to be a scientist.	SA	A	D	SD
4.8 I would like to be an engineer.	SA	A	D	SD

Section 5: Your Experiences with School

Please circle the answer that indicates how much you agree or disagree with each statement about your school and school experiences.

	Strongly Agree	Agree	Disagree	Strongly Disagree
5.1 I like to do group projects.	SA	A	D	SD
5.2 Most of my friends at school encourage me to do well in my classes.	SA	A	D	SD
5.3 My math classes challenge me to work very hard.	SA	A	D	SD
5.4 My science classes challenge me to work very hard.	SA	A	D	SD

5.5 List all the people you typically ask for help with math and science homework. No names, please (example: best friend, classmate, brother, teacher, mom, tutor, etc.).

Section 6: Family Involvement with School

Please circle the answer that indicates how much you agree or disagree with each statement.

	Strongly Agree	Agree	Disagree	Strongly Disagree
6.1 The adults in my family are very interested in what I learn in school.	SA	A	D	SD
6.2 I wish adults in my family had more time to help me with homework.	SA	A	D	SD
6.3 The adults in my family think science is interesting.	SA	A	D	SD

Section 7: Information about You

7.1 Does one or more of your parents/guardians have a college degree?

_____ Yes

_____ No

_____ I don't know

Appendix Three: Grade 9 and 12 Follow-Up Questionnaire

Follow-Up Questionnaire Grades 9 and 12

Factors Influencing Science, Technology, Engineering, and Mathematics Education

Thank you for completing this follow-up questionnaire. This information will be used to help understand how student experiences change over time. Please read each question carefully and answer as accurately as possible, without asking anyone for help and without looking up any answers. If you do not wish to answer a specific question, you may skip it and move on to the next question.

Section 1: Specific Activities in the Past TWO YEARS

2.1 In the last two years, have you done any of the following activities? Circle "YES" or "NO" for each activity.

	Circle "YES" or "NO" for each activity.	
l. Participated on a school sports team	YES	NO
m. Participated on a non-school sports team	YES	NO
n. Took art, music, dance or theater classes or lessons outside of school	YES	NO
o. Participated in 4-H	YES	NO
p. Tried science experiments that were not required for school	YES	NO
q. Attended Family Math Night	YES	NO
r. Repaired/built electronics outside of school	YES	NO
s. Attended robotics workshop, class, competition, or camp	YES	NO
t. Attended Women in Science Day or Lunch	YES	NO
u. Participated in a science fair	YES	NO
v. Participated in Lego League	YES	NO
w. Attended science or technology or engineering or math clubs, camps, or competitions	YES	NO

<p>If you selected YES, write the names of the clubs, camps, or competitions in which you participated in the last two years:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>		
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1.2 List any OTHER similar activities that were not listed in the previous table that you participated in during the last two years:

Section 2: Careers and Your Ideas about the Future

2.3a. If today you had to pick a career for the future, the career you would most likely pursue is

c. Do you know anyone who has that kind of career?

Yes

No

d. What do you like the **MOST** about this career?

e. What do you like the **LEAST** about this career?

f. Do you know which classes to take in high school to help you prepare for this career?

Yes

No

2.4 Please circle the answer that best describes your thoughts about the following careers.

	Women	Men	About the same number of men and women
a. Most engineers are:	Women	Men	About the same number
b. Most scientists are:	Women	Men	About the same number

2.5 Estimate the number of **MATH** classes you think are required to do each career successfully. Circle your answer for each career.

Career	Number of MATH classes necessary to do this career successfully		
a. Nurse	Hardly Any	Some	A Lot
b. Veterinarian	Hardly Any	Some	A Lot
c. Business owner	Hardly Any	Some	A Lot
d. Engineer	Hardly Any	Some	A Lot
e. Farmer	Hardly Any	Some	A Lot
f. Cashier	Hardly Any	Some	A Lot
g. Write the career YOU listed at the beginning of this section: _____	Hardly Any	Some	A Lot

2.4 Estimate the number of **SCIENCE** classes you think are required to do the career successfully. Circle your answer for each career.

Career	Number of SCIENCE classes necessary to do this career successfully		
a. Nurse	Hardly Any	Some	A Lot
b. Veterinarian	Hardly Any	Some	A Lot
c. Business owner	Hardly Any	Some	A Lot
d. Engineer	Hardly Any	Some	A Lot
e. Farmer	Hardly Any	Some	A Lot
f. Cashier	Hardly Any	Some	A Lot

g. Write the career YOU listed at the beginning of this section: _____	Hardly Any	Some	A Lot
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2.5 Please circle the amount of INTEREST you have in each career **and write the main reason for your level of interest in each.**

Career	Your INTEREST in pursuing this career				Write main reason for your interest level
	None	A Little	A Moderate Amount	A Lot	
h. Nurse	None	A Little	A Moderate Amount	A Lot	
i. Veterinarian	None	A Little	A Moderate Amount	A Lot	
j. Business owner	None	A Little	A Moderate Amount	A Lot	
k. Engineer	None	A Little	A Moderate Amount	A Lot	
l. Farmer	None	A Little	A Moderate Amount	A Lot	
m. Cashier	None	A Little	A Moderate Amount	A Lot	
n. Write the career YOU listed at the beginning of this section: _____	None	A Little	A Moderate Amount	A Lot	

2.6 Please circle the answer that indicates how important or unimportant each of the following will be to you when considering your job or career options for when you are an adult.

	Extremely Important	Fairly Important	A Little Important	Not at All Important
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e. To have a job that earns a lot of money	Extremely	Fairly	Little	Not
f. To have a job that doesn't require a college degree	Extremely	Fairly	Little	Not
g. To have a job that allows me to stay in my hometown	Extremely	Fairly	Little	Not
h. To have a job that is really physical and/or I could work with my hands	Extremely	Fairly	Little	Not
i. To have a job doing something I really like	Extremely	Fairly	Little	Not

2.7 Please circle the answer that indicates how important or unimportant each of the following will be to you when considering whether to attend college.

	Extremel y Importan t	Fairly Importan t	A Little Importan t	Not at All Importan t
a. The cost of college	Extremely	Fairly	Little	Not
b. The availability of financial aid, such as student loans, scholarships, or grants	Extremely	Fairly	Little	Not
c. Having the college close to home, even if you will not be able to live at home while attending school	Extremely	Fairly	Little	Not

2.8 Please circle the answer that indicates how much you agree or disagree with each statement.

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. I know what high school classes I need to take to be successful in college.	SA	A	D	SD
b. I know how to apply to college.	SA	A	D	SD

c. I know how to apply for financial aid to attend college.	SA	A	D	SD
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2.9 Have you ever taken, or do you plan to take Dual Credit or Advanced Placement courses in high school?

Yes

No

Section 3: Your Goals with School

3.1 Choose only one option that represents the **farthest** in school you expect to go.

I don't expect to finish high school

Graduate from high school

After high school, finish vocational/technical education (1 year or less)

Finish community or junior college (2 years)

Complete a four-year degree at a college or university

Continue my education after a four-year degree by going to graduate school (medical school, law school, etc.)

I don't know. I haven't thought much about it.

3.2 Who or what has influenced you the **MOST** in deciding your educational future? **Choose only one option** and write more detail if requested in your choice.

Professional worker (Write the person's job: _____)

Parent(s)

Friend(s)

Class (Write the subject: _____)

Teacher (Write the class subject: _____)

Club or Activity (Write the name of the club or activity: _____)

Something OTHER than those listed above (Write who or what: _____)

3.3 What final grade did you get in the **last** ENGLISH class you completed?

A

B

C

D

F

3.4 What final grade did you get in the **last** MATH class you completed?

___ A ___ B ___ C ___ D ___ F

3.5 What final grade did you get in the **last** SCIENCE class you completed?

___ A ___ B ___ C ___ D ___ F

3.6 My effort in school is best described as....(select ONE answer)

___ I work as hard as I can.

___ I do what I need to get the grade I want.

___ I do as little as possible.

Section 4: Your Experiences with Math

Please circle the answer that indicates how much you agree or disagree with each of the following statements about **math**.

	Strongly Agree	Agree	Disagree	Strongly Disagree
4.1 I like math .	SA	A	D	SD
4.2 Most of my friends like math .	SA	A	D	SD
4.3 Math is harder for me than it is for most students in my grade.	SA	A	D	SD
4.4 Math is useful for solving practical problems in life.	SA	A	D	SD
4.5 Math is helpful for understanding more general problems in the world.	SA	A	D	SD
4.6 As an adult, I would like to have a job that uses a lot of math .	SA	A	D	SD
4.7 Studying math is useful for getting a good job.	SA	A	D	SD

Section 5: Your Experiences with Science and Engineering

Please circle the answer that indicates how much you agree or disagree with each of the following statements about **science and engineering**.

	Strongly Agree	Agree	Disagree	Strongly Disagree
5.1 I like science .	SA	A	D	SD
5.2 Science is harder for me than it is for most students in my grade.	SA	A	D	SD
5.3 Most of my friends like science .	SA	A	D	SD
5.4 I learn things quickly in my science lessons.	SA	A	D	SD
5.5 I think learning science will help me in my daily life in the future.	SA	A	D	SD
5.6 Studying science is useful for getting a good job.	SA	A	D	SD
5.7 Scientific work is exciting.	SA	A	D	SD
5.8 Engineering is exciting.	SA	A	D	SD
5.9 I would like to be a scientist.	SA	A	D	SD
5.10 I would like to be an engineer.	SA	A	D	SD

5.11 Have you ever taken a computer, engineering, or professional technical class such as welding, auto mechanics, nursing, Excel, etc.?

No

Yes → If so, please list the names of the classes:

Section 6: Your Experiences with School

Please circle the answer that indicates how much you agree or disagree with each statement about your school and school experiences.

	Strongly Agree	Agree	Disagree	Strongly Disagree
6.1 I like to do group projects.	SA	A	D	SD

6.2 Most of my friends at school encourage me to do well in my classes.	SA	A	D	SD
6.3 I learn more useful things from friends and relatives than I learn in school.	SA	A	D	SD
6.4 There are not enough challenging math classes in school for me.	SA	A	D	SD
6.5 There are not enough challenging science classes in school for me.	SA	A	D	SD
6.6 I think I would be successful taking online courses in high school.	SA	A	D	SD
6.7 I get enough guidance and information about what specific careers require in terms of education and what the work involves.	SA	A	D	SD

6.8 List all the people you typically ask for help with math and science homework. No names, please (example: best friend, classmate, brother, teacher, mom, tutor, etc.).

Continue on next page →

Section 7: Family Involvement with School

Please circle the answer that indicates how much you agree or disagree with each statement.

	Strongly Agree	Agree	Disagree	Strongly Disagree
7.1 The adults in my family are very interested in what I learn in school.	SA	A	D	SD
7.2 I wish adults in my family had more time to help me with homework.	SA	A	D	SD

7.3 I wish adults in my family knew math and science better.	SA	A	D	SD
7.4 The adults in my family think science is interesting.	SA	A	D	SD
7.5 The adults in my family think it is important for me to learn science .	SA	A	D	SD

Please circle the answer that best reflects how often the adults in your family discuss the following topics with you.

	Often	Sometimes	Rarely	Never
7.6 My family talks with me about the challenges of paying for my college education.	Often	Sometimes	Rarely	Never
7.7 My family talks to me about plans to prepare for college admission exams such as the ACT and the SAT.	Often	Sometimes	Rarely	Never

Section 8: Your Thoughts about Science

Please circle the answer that indicates how much you agree or disagree with each statement.

	Strongly Agree	Agree	Disagree	Strongly Disagree
8.1 I should be able to choose what to believe and what not to believe from science.	SA	A	D	SD
8.2 Scientists report the truth about their findings even when the findings go against their personal beliefs.	SA	A	D	SD
8.3 I find it hard to know what to trust about science because science is always changing.	SA	A	D	SD
8.4 Idaho needs more scientists to help improve things for our state.	SA	A	D	SD

There are several important institutions in this country that perform significant tasks. Circle how much **confidence you have in the people who run the institutions** listed below.

	Great deal of confidence	Only some confidence	Hardly any confidence	I don't know
8.5 Major companies	Great deal	Only Some	Hardly any	Don't Know
8.6 Education	Great deal	Only Some	Hardly any	Don't Know
8.7 Scientific community	Great deal	Only Some	Hardly any	Don't Know
8.8 Military	Great deal	Only Some	Hardly any	Don't Know
8.9 U.S. Congress	Great deal	Only Some	Hardly any	Don't Know

Continue on to back page →

Section 9: Information about You

9.1 Does one or more of your parents/guardians have a college degree?

_____ Yes

_____ No

_____ I don't know

9.2 How many hours per week do you usually work at a job during the school year? (Please enter 0 if you do not have a job during the school year.)

_____ Hours/week

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