

Idaho Teacher STEM Education Experiences

Micron STEM Education Research Initiative

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Introduction

To identify the multiple factors that help explain Idaho's STEM educational outcomes, a Micron funded five-year research project explores community and statewide factors. This report summarizes key findings from surveys collected in spring 2013 from 268 teachers across Idaho and is supplemented in an appendix with comments made by teachers during focus groups conducted in 2011. Sampling methods and coding techniques are explained in the Methodology section.

Results presented in this report are rounded to the nearest percentage; thus, sometimes the sum of the percentages as well as the corresponding graph bar will not be exactly 100%. For this report, secondary teachers refers to middle school/junior high/high school teachers. *Italicized* titles and labels are taken directly from the survey.

1. The response rate from the eligible Idaho teachers from whom we received a response about whether or not they were willing to participate was very high at 76.4%. Taking into account that some teachers who were eligible would choose to not respond at all, the adjusted response rate is estimated to be 47.5%. The methodology is explained in more detail in the Methodology section.
2. The 268 Idaho teachers who participated in the survey represented all grade levels as well as several subject areas, 74 districts and diverse communities across the state.
3. Teachers were overall positive about the academic impact the new Common Core State Standards (CCSS) in Mathematics and English Language Arts could have on students. Teachers also indicated they are well-informed about the content and expectations of the CCSS; however, more than 40% of secondary math teachers and elementary teachers did not feel well prepared to implement CCSS in their classrooms. Additionally, a large majority of teachers believed there are insufficient resources at their schools for the implementation of CCSS.
4. Teachers overwhelmingly suggested professional development focused on CCSS and technology. English Language Arts (including anything about English, literature, reading and/or writing but excluding minimal requests for English Language Learners and foreign languages), as the third most popular topic, was suggested less than half as many times as either CCSS or technology. Other frequently mentioned topics included science, math, cross-curricular programs, hands-on applications, classroom management, special education, motivating students, and social sciences. Interestingly, just two years earlier in the 2011 teacher focus groups, CCSS was never mentioned as the new standards were not yet weighing heavily on teachers' minds.
5. A majority of teachers are dissatisfied with the level of parents' involvement in their child's education.
6. Teachers were asked in an open-ended question about other topics that currently make it difficult for teachers to teach effectively. The greatest number of write-in responses were negative comments about the state legislature, recent legislation/repeals and the Idaho State Department of Education. Some of the other topics mentioned less frequently and in descending order included funding and wages, parents, insufficient time for all tasks required of teachers, classroom management, CCSS, administrative support, and class sizes. Note the question asked about current teaching environments and CCSS were yet to be implemented in fall 2013.

7. A majority of teachers indicated they were satisfied with their school administrators' responsiveness to teachers' needs although there were 10% who were very dissatisfied. Teachers were generally dissatisfied with administrators' recognition of teachers who advise student academic clubs.
8. A majority of teachers indicated satisfaction with their I.T. support and technology infrastructure; yet many teachers listed technology as a suggested topic for professional development. Possibly this indicates teachers want more training to be able to maximize effectiveness of the technology they either currently utilize or would like to implement.
9. A majority of teachers were dissatisfied with their salaries as well as the total funding available to support their classroom instruction. A specific example is the lack of resources available to introduce hands-on learning exercises.
10. Teachers showed strong trust in science. While more than 80% of the teachers identified with a specific religion, only 25% indicated science can be in conflict with their religious beliefs; and 12% of teachers agreed that people should reject scientific information when it conflicts with their religious beliefs.
11. More than 40% of secondary science teachers anticipated opposition from parents if they were to teach evolution or global climate change. Many teachers also find it difficult to help students learn about science because of misinformation they learn from parents, media, and other sources.
12. Teachers indicated there are things they can do to help students overcome the influence of adverse family conditions that impact student learning. 73% disagree that student achievement in math is mostly a reflection of their natural abilities, possibly indicating the teachers' beliefs that they have a strong influence over student academic success even with adverse circumstances that are beyond teachers' control.
13. Almost half of all teachers agree that many of their students are not motivated to work in school because they feel education has no place in the futures they see for themselves.
14. Teachers indicated many students do not have a clear idea of how math and science can be used in their future employment and daily lives as adults.
15. Generally teachers did not feel that the peer culture at their schools favored boys nor white students to succeed at math and science more so than their peer counterparts.

16. Teachers perceive that parents and teachers have greater influence than students' peers and community members for both academic motivation and college attendance decisions.
17. When students are not prepared for success in a two- or four-year college, secondary teachers chose lack of student motivation as the most significant factor of those listed.
18. Not many secondary teachers rated their schools poorly with providing students information about which high school courses to take for success in college (3%), how to apply to college (7%), and how to apply for financial aid (11%). Ratings of "poor" went up slightly with regards to the school providing parents the same topics just listed with 10%, 14%, and 16%, respectively.

Teacher Sample Demographics

In this section we summarize the teacher sample demographics. The ethnic diversity in Idaho is low relative to the nation. Idaho's population has 12% Hispanic, yet only 2% of our sample of teachers indicated they are Hispanic. The statewide teacher sample represented all grade levels k-12 and many subject areas from 74 public school districts as well as private institutions.

Teacher Sample Demographics: Gender and Ethnicity

Demographic Groups	Teacher Sample	Idaho Population (Census Bureau)	US Population (Census Bureau)	US Teachers (Nat'l Ctr for Ed Stats)
Gender				
Women	56%	50%	51%	47%
Men	44%	50%	49%	24%
Ethnicity*				
White	96%	94%	78%	83%
Hispanic	2%	12%	17%	7%
American Indian or Alaskan Native	1%	2%	1%	Less than 1%
Black or African American, Asian American, or Other	2%	1%	18%	8%

The sample of Idaho teachers is dominated by females at 56%, yet not as drastically as the national 76%; however, the Idaho State Department of Education reported that 71% of public k-12 teachers were female in 2012-13.

Both the sample and the State reported 2% of Idaho teachers are Hispanic, while the general population of Idaho has 12% Hispanic.

*Respondents could identify with more than one ethnicity.
Sources: US Census Bureau and Idaho Department of Education

Teacher Sample Demographics: Grade Levels and Subject Areas Represented

All grade levels from kindergarten through twelfth grade are represented in the sample with between 24 and 46 at each grade level. Since many teachers teach more than one grade level, the sum of the counts of teachers from all grade levels is greater than the number of teachers in the sample.

Grade Level	K	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
# Teachers in Sample	24	46	46	35	27	24	25	38	43	28	32	30	31

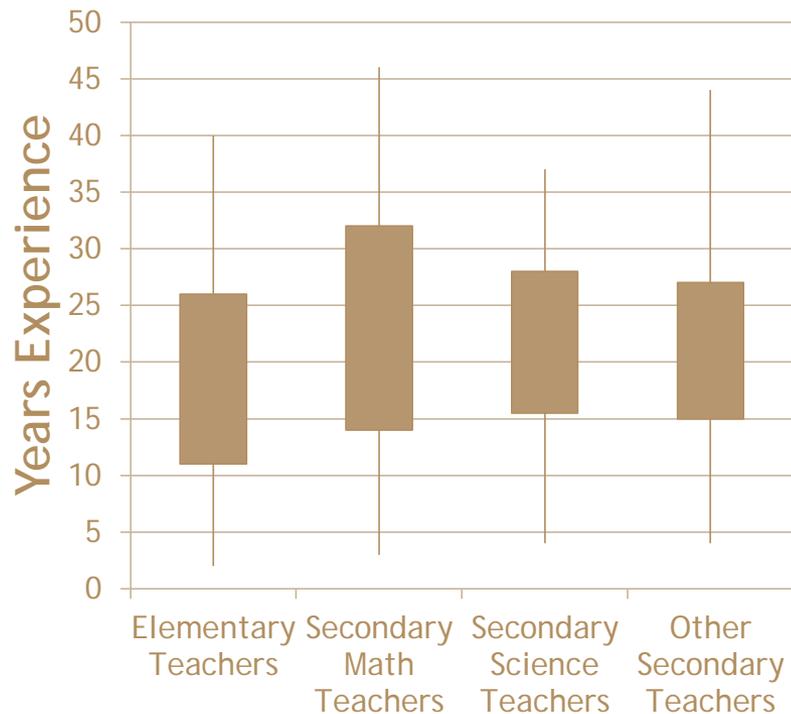
Teachers represented a wide variety of subject areas. Teachers of only special education or electives such as music or art were not intended to be part of the survey. Mainly because some teachers teach in those areas as well as other content areas, there are small numbers represented below in those areas. Several teachers teach in more than one subject area so the sum of the counts is greater than the number of junior/senior high teachers represented.

Subject in Jr High/High School	Social Sciences	Math	English	Science	Vocational /Technical	Health /PE	Arts	Foreign Language /ELL	Speech	Special Ed	Elec tives
#Teachers in Sample	47	39	37	36	13	11	7	6	5	3	9

Teacher Sample Educational Demographics: Employment Information

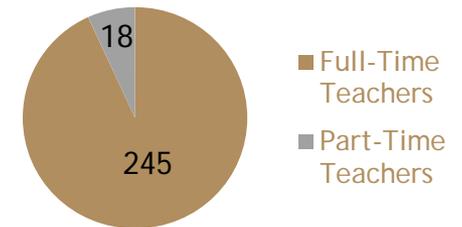
The average number of years taught for the entire sample was 20 years. The median was also 20 years. The teachers had between 2 and 46 years of teaching experience including the 2012-2013 school year when they took the survey. Breaking the sample into sub-groups below, the distributions of years of teaching experience were similar for teachers of elementary, secondary math, secondary science and a group that included all other secondary subjects that are not math or science.

Years Teaching Experience

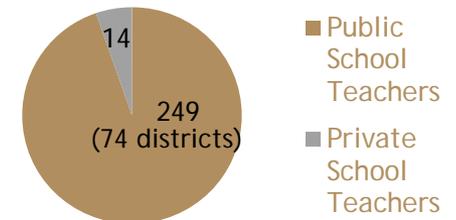


Maximum: Top of upper whisker
 75th percentile: Top of box
 25th percentile: Bottom of box
 Minimum: Bottom of lower whisker

Current Teaching Schedule



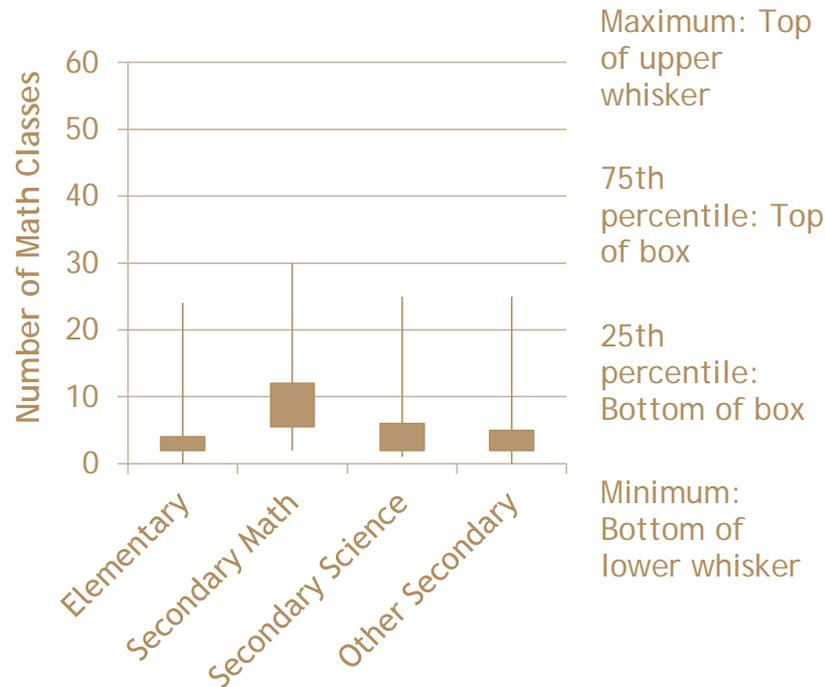
Teacher Sample Public/Private Schools



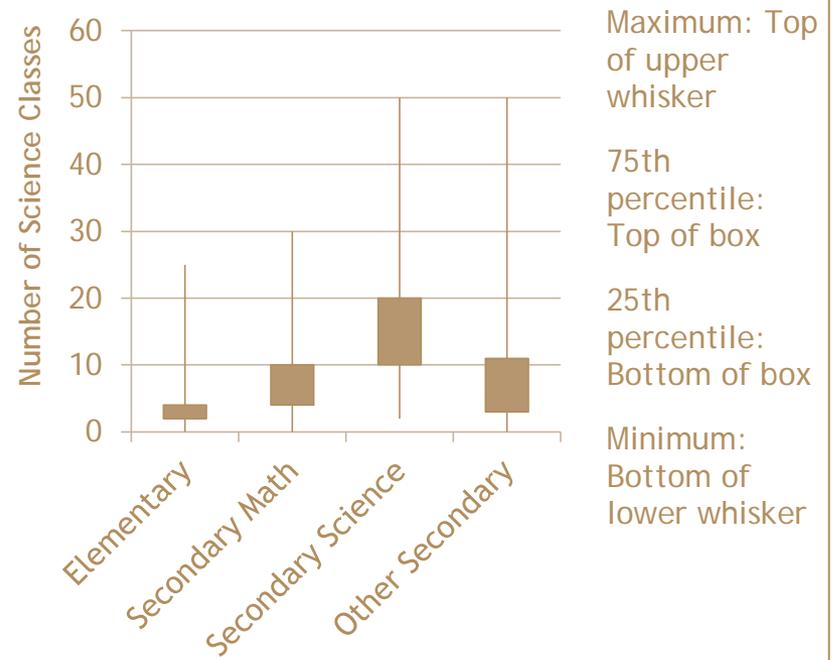
Teacher Preparation in Science and Mathematics

Teachers of secondary math and science reported taking several college classes within their subject areas. Elementary teachers, who must teach several subjects, tend to take fewer math and science courses in college. While the intention of the question was for degree-seeking courses, it is possible that teachers also counted “classes” they have taken for credit during professional development opportunities, possibly explaining some of the very high data values.

Math Classes Taken by Teachers During College



Science Classes Taken by Teachers During College



Common Core State Standards for Mathematics and English Language Arts

The Common Core State Standards (CCSS) for Mathematics and the CCSS for English Language Arts are educational standards for kindergarten through twelfth grade. Developed by state governors and education commissioners through their representative organizations, participation in the CCSS Initiative is voluntary. Currently 45 states including Idaho are participating. Some goals of the CCSS Initiative are to provide high educational standards that will prepare students with the necessary skills in mathematics and English to enter college or a career; to encourage more collaboration for sharing resources across the nation; and to have common assessments. (<http://www.corestandards.org/>)⁵

The CCSS for Mathematics and the CCSS for English Language Arts are currently being implemented across Idaho. The common assessments in these subjects are scheduled for implementation during the 2014-15 school year. With the adoption of the CCSS in Idaho, these standards are also referred to as the Idaho Core Standards.

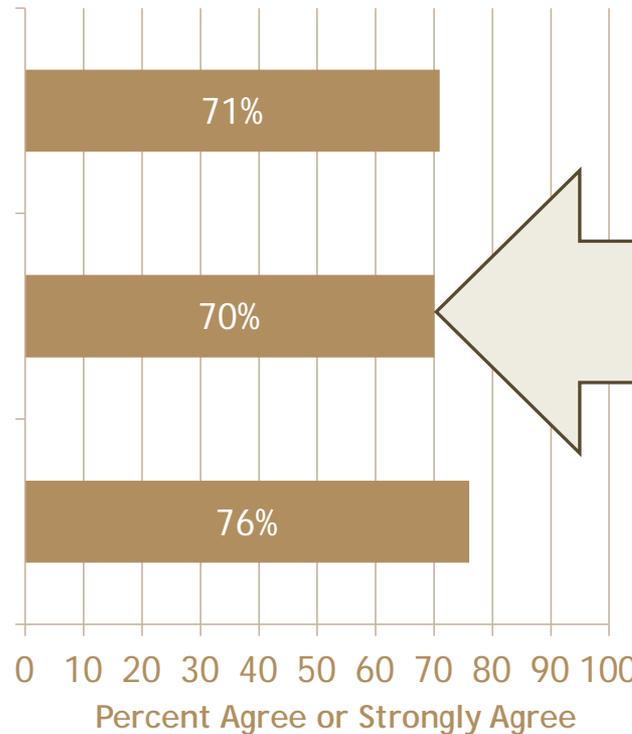
A separate group has been developing shared science standards which are in draft form (*Next Generation Science Standards*) at the time of this writing and were not included in the survey. (<http://www.nap.edu/NGSS/>)⁶

Teachers' Perceptions of Common Core State Standards

I am well informed about the content and expectations of the Common Core State Standards.

The Common Core State Standards require a more challenging curriculum than what has traditionally been required.

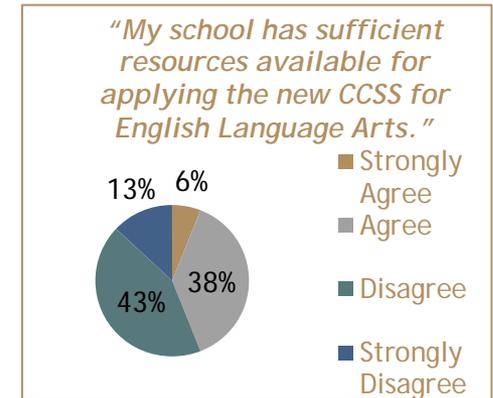
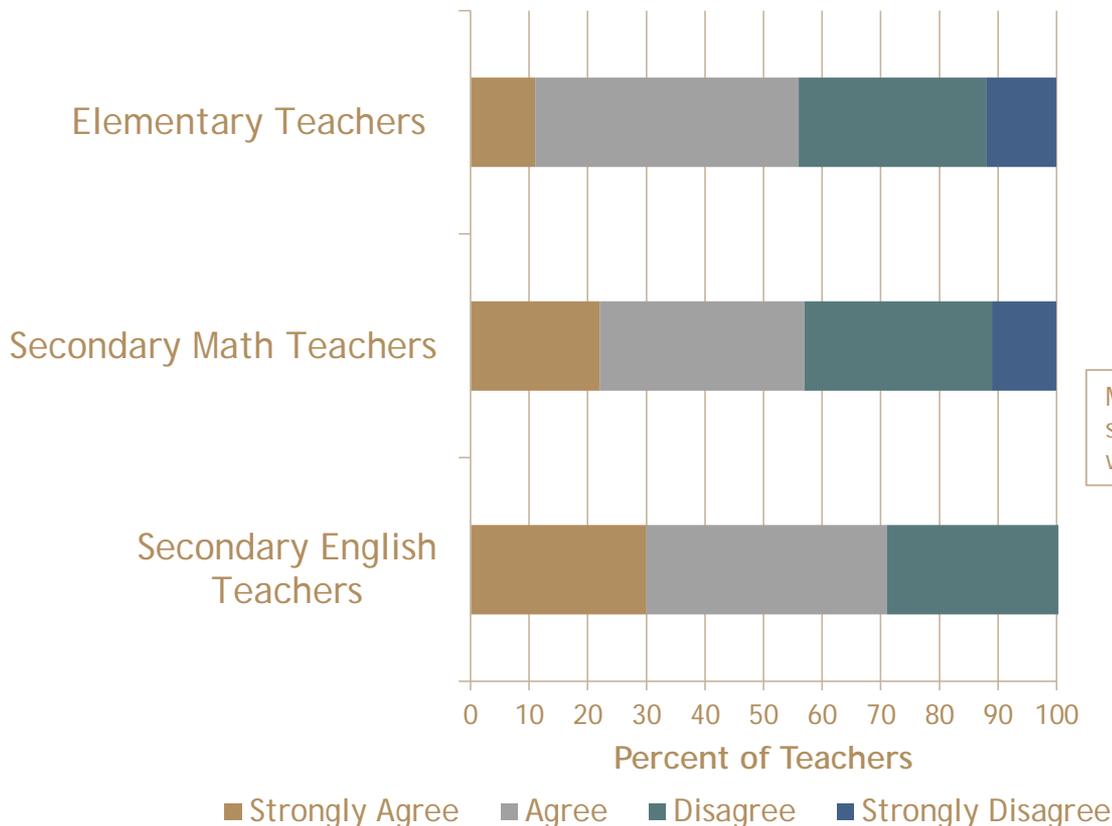
I believe the Common Core State Standards will enhance the academic success of students if correctly implemented by the majority of teachers.



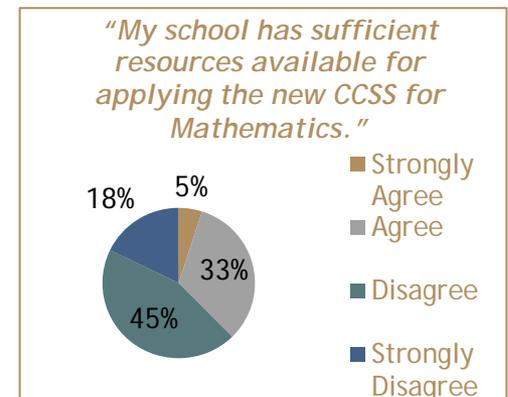
Sub-groups: All elementary teachers as well as secondary math and English teachers are impacted the greatest by the CCSS. 86% of elementary teachers in the sample agreed that the CCSS curriculum would be more challenging than traditional standards; while 65% each of secondary math and English teachers agreed with the increase in the level of challenge.

While none of the secondary English teachers strongly disagreed that they felt well prepared to implement CCSS, the subgroups that will be implementing CCSS for Mathematics (secondary math and elementary teachers) had greater than 10% strongly disagree. At the other end, 30% of English teachers strongly agreed they feel well prepared, yet only 11% of elementary teachers strongly agreed with the same statement.

"I feel well prepared to implement the Common Core State Standards in my classroom."



More than 40% of elementary teachers and secondary math teachers disagreed that they felt well prepared to implement the CCSS.



Common Core Comments

There was no mention of the Common Core State Standards in the teacher focus groups in 2011. Two years later, this was the most requested topic from all teachers for professional development. Teachers were optimistic in their responses about the potential impact of the CCSS on student learning, possibly indicating they are supportive of the CCSS in general; however, many teachers indicated they did not feel well prepared to implement them. A couple of comments from the teacher survey (2013) that capture some teachers' sentiments:

"As we make a transition to Common Core, it would be great to have more resources for students to meet those expectations."

"The biggest thing is that [teachers] need more prep time and Common Core prep time..."

"The most difficult thing is the amount of information the new CCSS requires. There's just not enough time. I feel like we're set up to fail."

Click [HERE](#) to see comments about standardized testing from the 2011 teacher focus groups

Professional Development

In this section we look at teacher professional development. While 57% of teachers indicate they are satisfied/very satisfied with the quality level of their professional development opportunities, more than 10% indicate they are very dissatisfied with it. Moreover, 58% of teachers disagreed that sufficient professional development time has been devoted to supporting the transition to the Common Core State Standards at their school.

The open-ended question probing for suggested topics for teacher professional development revealed teachers are most interested in CCSS and technology. English language arts (including anything about English, literature, reading and/or writing but excluding minimal requests for English Language Learners and foreign languages), as the third most popular topic, was suggested less than half as many times as either CCSS or technology. Other frequently mentioned topics included science, math, cross-curricular programs, hands-on applications, classroom management, special education, motivating students, and social sciences. Coding techniques for this open-ended question are discussed in the Methodology section.

Please indicate how satisfied or dissatisfied you are currently with each of the following at your school:

The amount of time your district provides for professional development

59%

The quality of professional development opportunities

57%

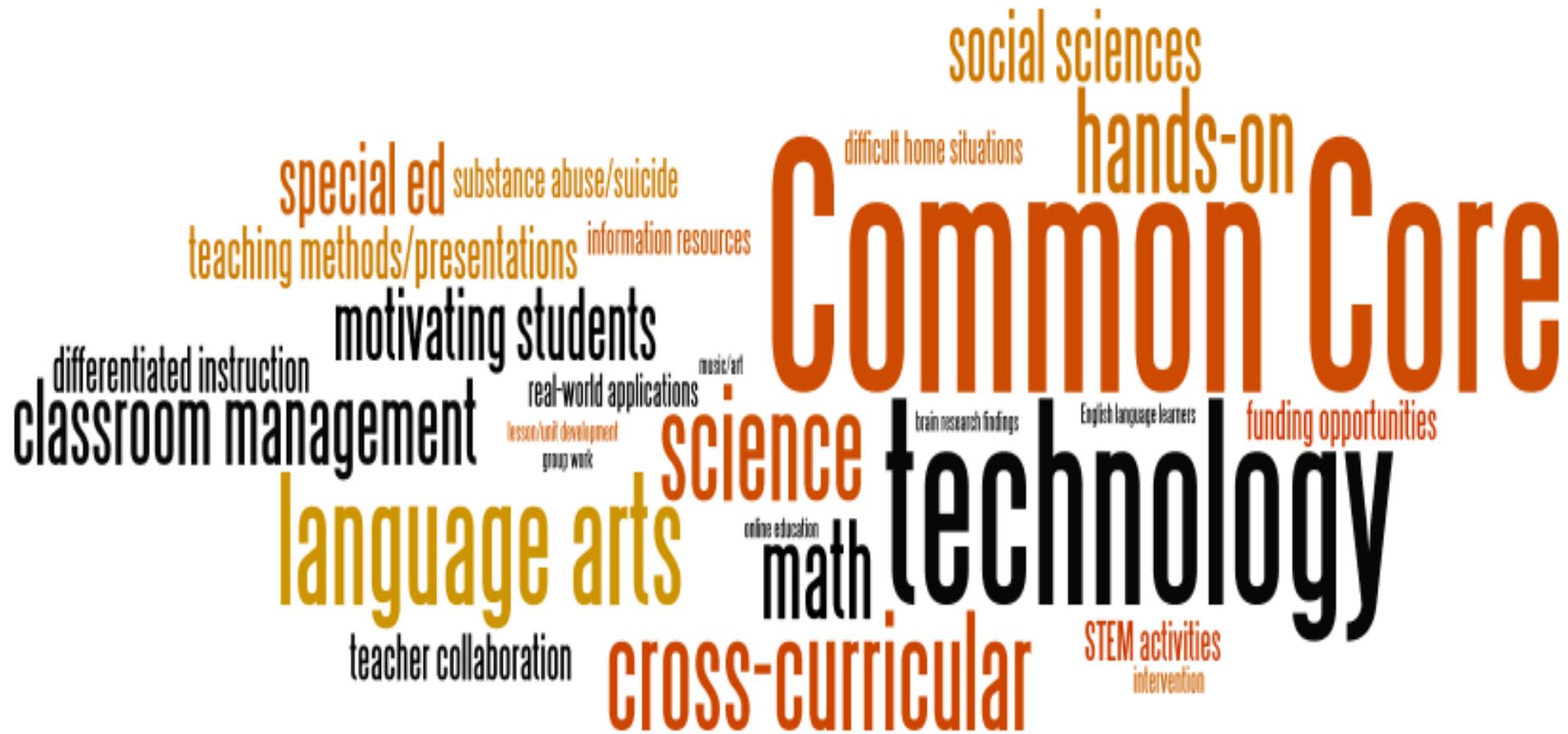
Science, technology, engineering, and math related professional development opportunities

75%

0 10 20 30 40 50 60 70 80 90 100
Percent Satisfied or Very satisfied

Yet, in another question, only 42% agreed/strongly agreed with *There has been sufficient professional development devoted to supporting the transition to the CCSS at my school.*

“For professional development opportunities, please suggest two or three specific topics that would be most helpful to you.”*



*In the above word cloud, a larger font size indicates that topic was written more frequently by teachers.

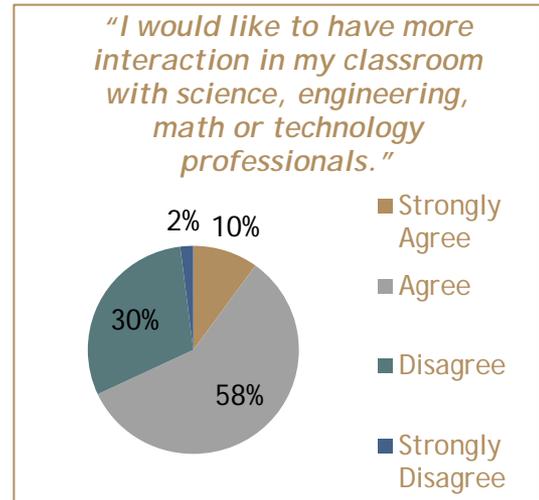
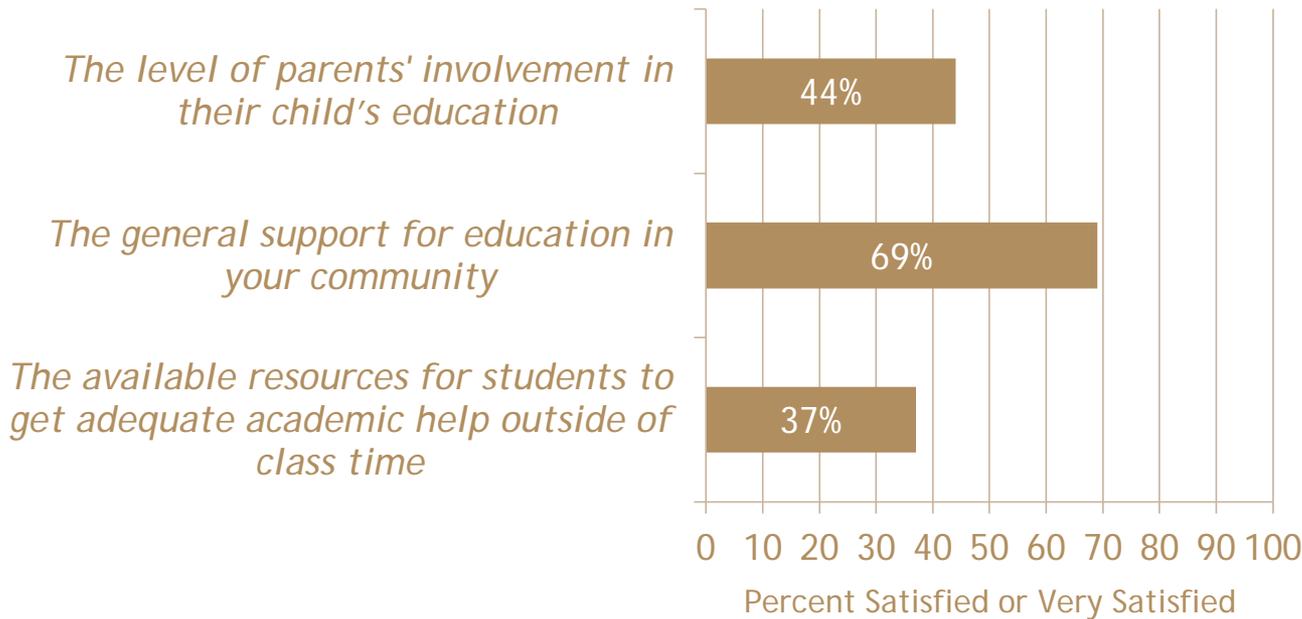
Teacher Satisfaction

In this section, we examine teacher satisfaction levels with a variety of factors. While generally satisfied with community support, teachers indicate they would like more parental involvement as well as more interaction with STEM professionals. 63% of teachers are dissatisfied with available resources for students to get help outside of class. Only 17% of teachers indicated satisfaction with total funding to support classroom instruction. Teachers expressed extreme dissatisfaction with state-level politics and legislation in an open-ended question.

Teacher Satisfaction: Community and Parents

A majority of teachers in the sample were satisfied with the support for education in their communities; yet only 44% indicated they are satisfied with parents' involvement.

Please indicate how satisfied or dissatisfied you are currently with each of the following at your school:

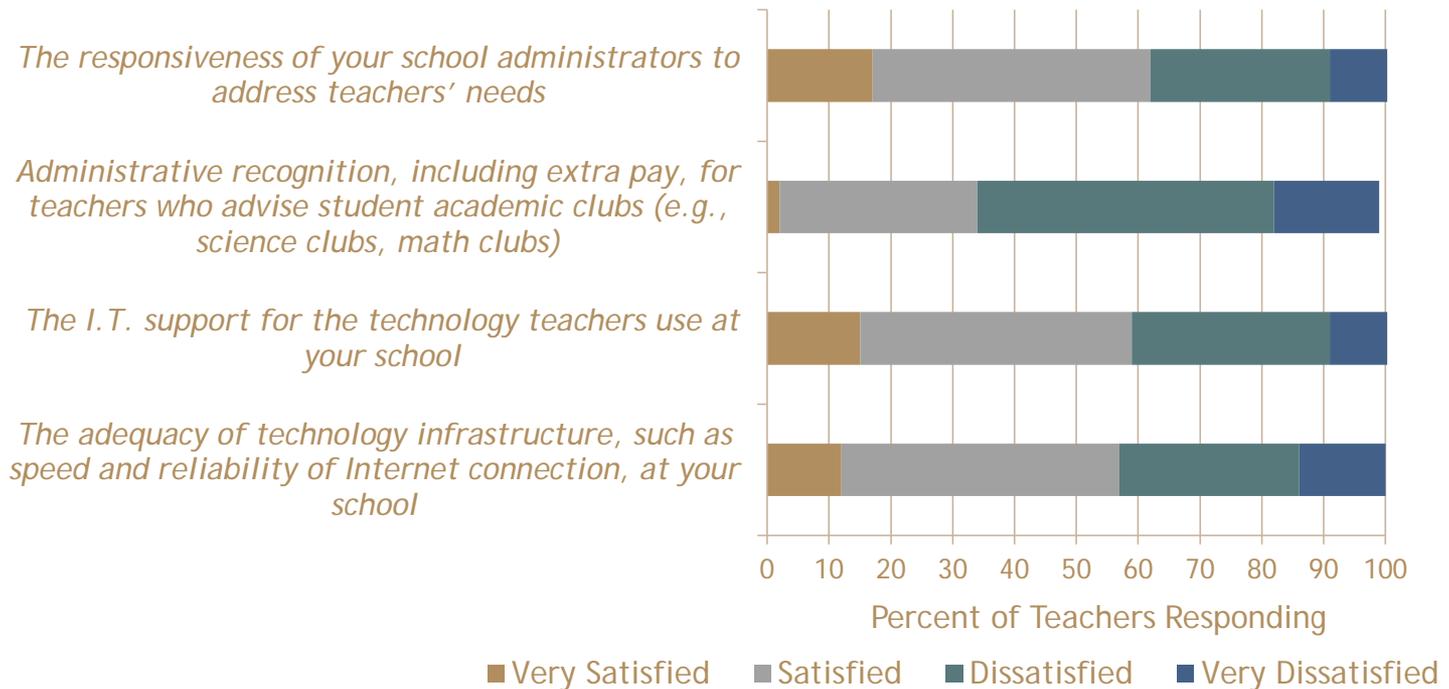


Click [HERE](#) to see related comments from the 2011 teacher focus groups

Teacher Satisfaction: Administrative and Technical Support

A majority of teachers indicated they were satisfied with their school administrators' responsiveness to teachers' needs although there were 10% who were very dissatisfied. Teachers were dissatisfied with administrators' recognition of teachers who advise student academic clubs. A majority of teachers indicated satisfaction with their I.T. support and technology infrastructure, while some teachers were very dissatisfied with these.

Please indicate how satisfied or dissatisfied you are currently with each of the following at your school:



Click [HERE](#) to see related comments from the 2011 teacher focus groups

Teacher Satisfaction: Job Demands and Funding

Please indicate how satisfied or dissatisfied you are currently with each of the following at your school:

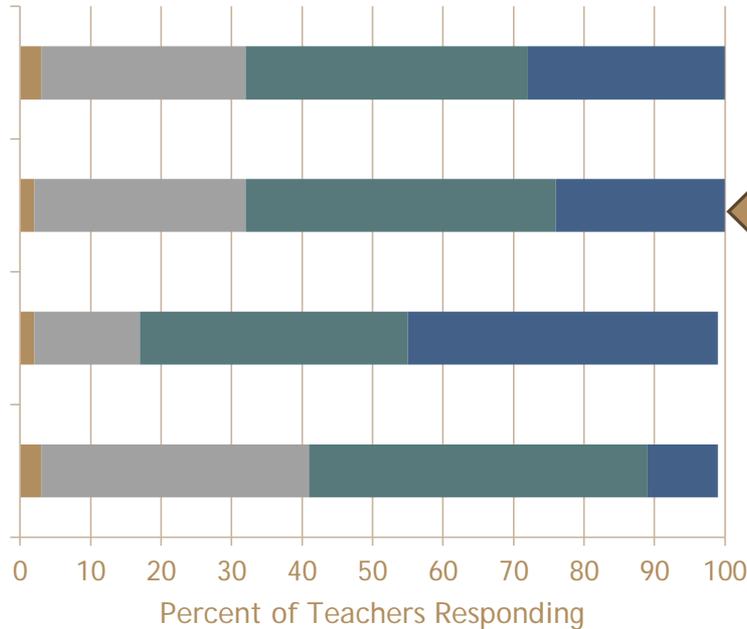
The time available during regular work hours to do the basic requirements of your job including creating lesson plans and grading

Your salary

**The total funding available to support your classroom instruction*

***The resources available to develop and introduce hands-on learning exercises in class*

■ Very Satisfied ■ Satisfied ■ Dissatisfied ■ Very Dissatisfied



More than 80% of full-time teachers in the sample reported earning a base salary between \$30k and \$58k annually, with a median estimated to be just under \$45k. Since teachers checked a box with a range for their salaries, an average from the survey is not practical to report. Still, this seems to align with the Idaho State Department of Education average (State was unable to provide median data) teacher salary for 2012-13 of \$43,945 (secondary) and \$45,498 (elementary) full-time public teachers k-12.

Click [*HERE](#) and [**HERE](#) to see related comments from the 2011 teacher focus groups

“Are there other topics about current teaching environments not covered in this survey that make it difficult for teachers to teach effectively? If so, please explain.”

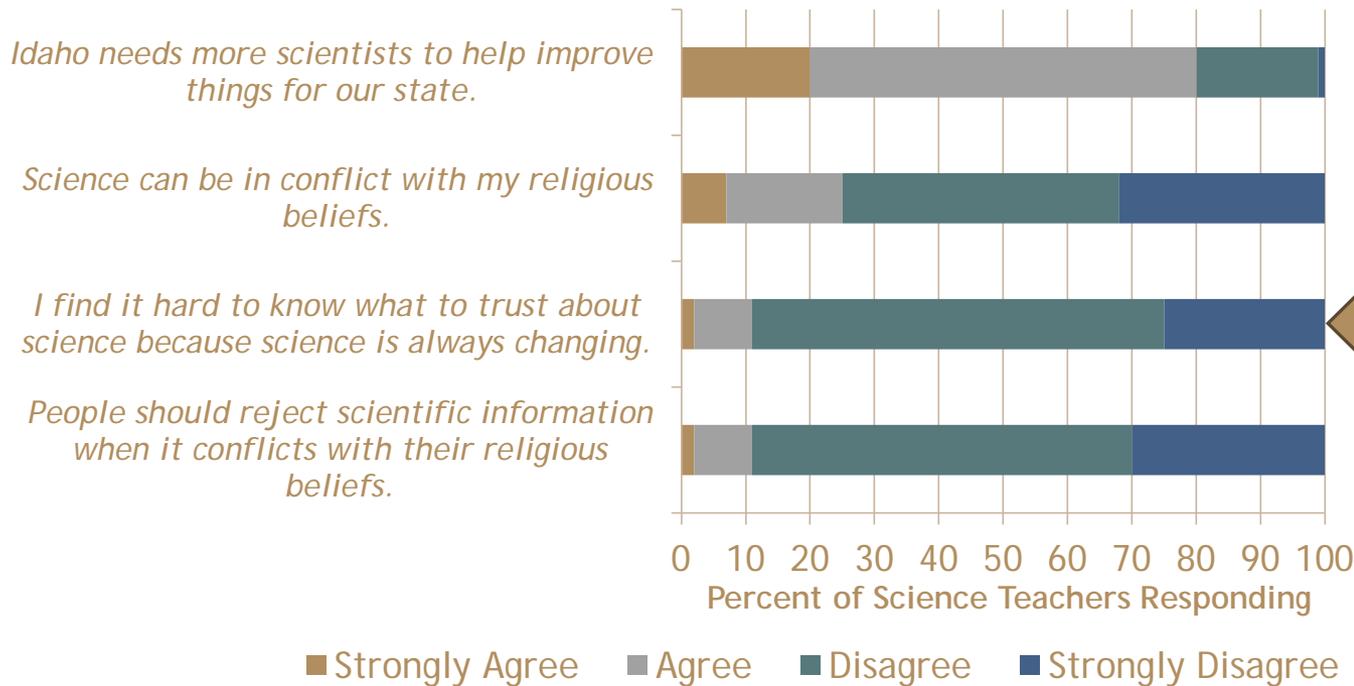
The greatest number of write-in responses to the above question were negative comments about the state legislature, recent legislation/repeals and the Idaho State Department of Education. Some of the other topics mentioned less frequently and in descending order included funding and wages, parents, insufficient time for all tasks required of teachers, classroom management, CCSS, administrative support, and class sizes. Note the question asked about current teaching environments and CCSS were yet to be implemented in fall 2013. Additionally it asked for topics not covered in the survey so even though teachers may feel strongly about various topics, they may have felt their concern was adequately addressed by the survey.

Click [HERE](#) to see related comments from the 2011 teacher focus groups

Teacher Attitudes and Perspectives on Student Motivation and Success

In this section we look at teacher attitudes and perspectives about science and religion, student achievement, the math/science culture at their schools, and relative influences of different groups on student academic motivation.

Teachers' Personal Attitudes about Science and Religion



Previous Surveys in this Study:
 While only 11% of teachers agreed with this, 33% of the parents in the parent surveys as well as 52% of adults in the statewide survey agreed with the statement. This may indicate a higher level of trust in science among teachers relative to the general population of adults.

Click [HERE](#) to see related comments from the 2011 teacher focus groups

Secondary Science Teacher Challenges to Teaching Controversial Concepts

Only science teachers at the junior high/high school levels were asked the questions on this graph.

As a science teacher...

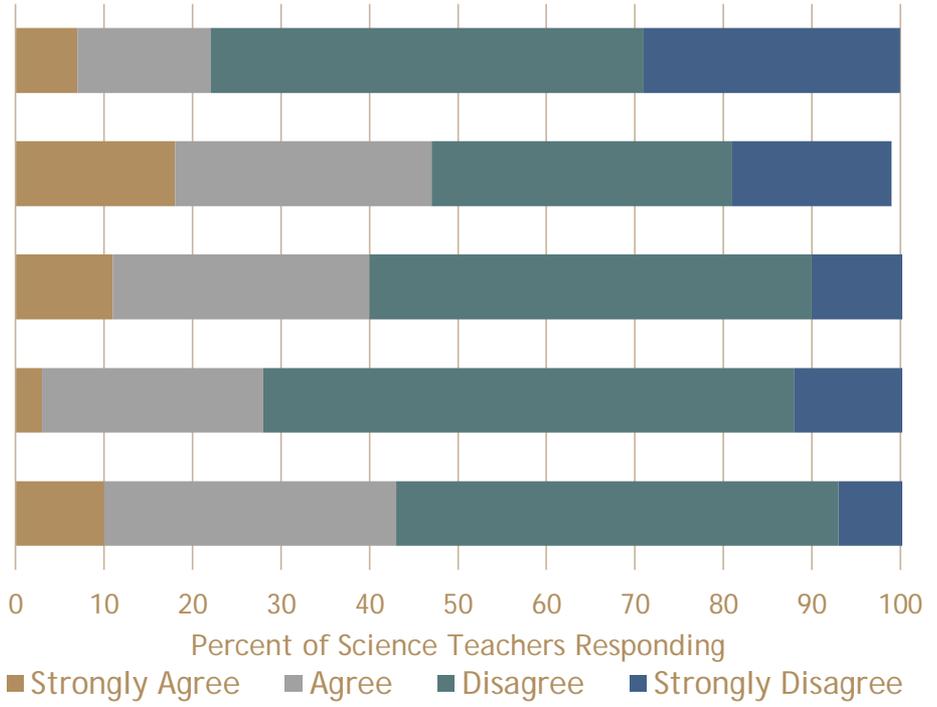
...I feel my supervisors are more inclined to carefully monitor the content of my courses than for my peers teaching other subjects.

**...I anticipate potential opposition from parents if I were to teach the subject of evolution.*

**...I anticipate potential opposition from parents if I were to teach the subject of humans' impact on global climate change.*

***...I find students' religious beliefs interfere with their ability to embrace scientific principles, theories, and evidence taught in school.*

****...I find it difficult to help students learn about science because of misinformation they learn from parents, media, and other sources.*



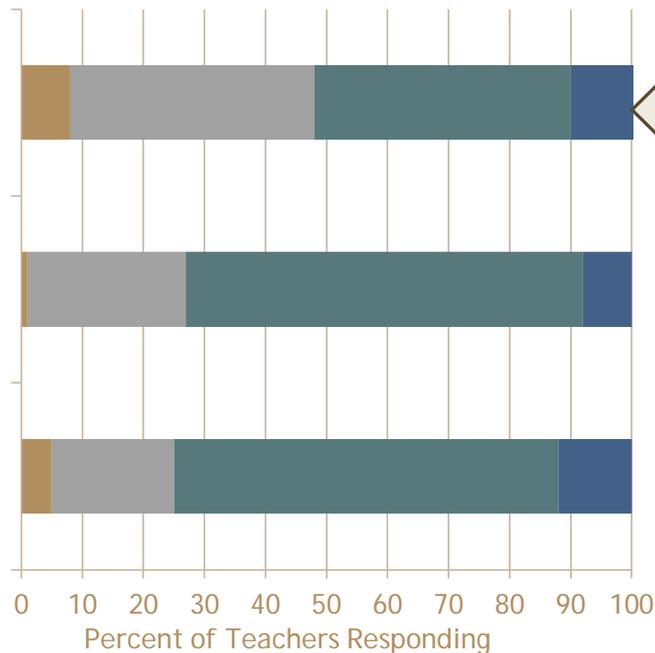
Click [*HERE](#) and [**HERE](#) and [***HERE](#) to see related comments from the 2011 teacher focus groups

Influence of Various Factors on Student Achievement

**Many of my students are not motivated to work in school because they feel education has no place in the futures they see for themselves.*

***Student achievement in math is mostly a reflection of their natural abilities.*

There is not much I can do as a teacher to overcome the influence of adverse family conditions on students' learning.



Sub-groups: 34% of elementary teachers agreed with this statement, while 57% of secondary teachers agreed.

Click [*HERE](#) and [**HERE](#) to see related comments from the 2011 teacher focus groups

Teacher Perspectives on Student Motivation and Influences on Learning

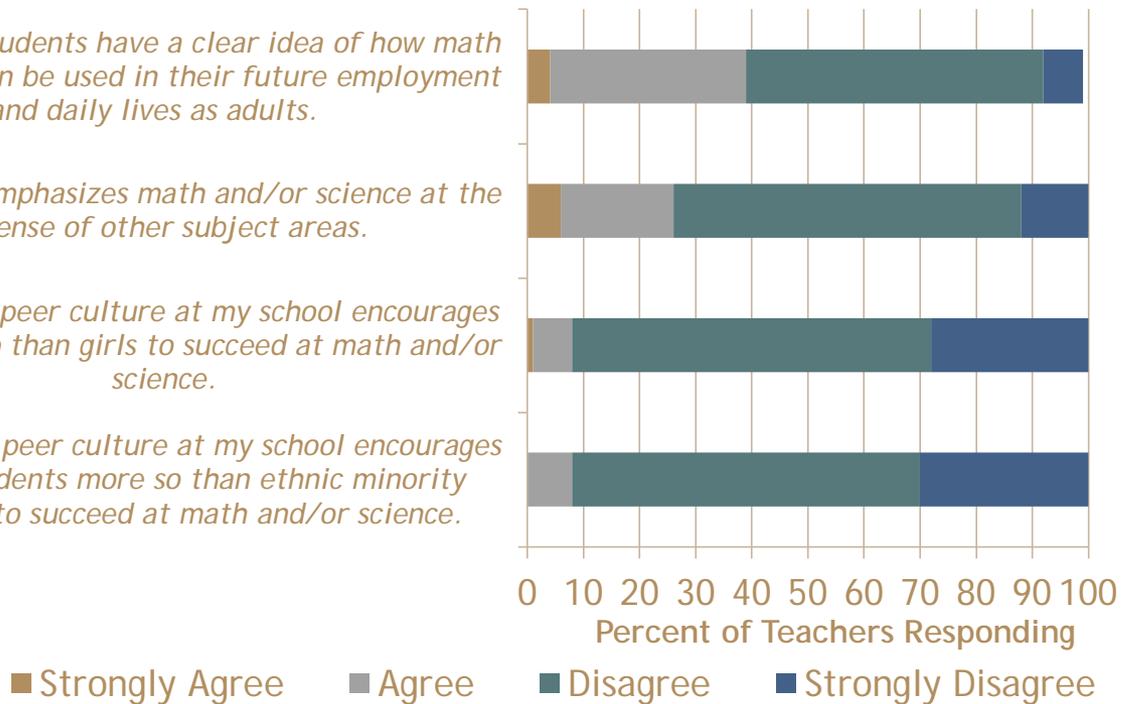
Teachers Indicate Student Math/Science Experiences at Their Schools

**Most of my students have a clear idea of how math and science can be used in their future employment and daily lives as adults.*

***My school emphasizes math and/or science at the expense of other subject areas.*

The student peer culture at my school encourages boys more so than girls to succeed at math and/or science.

The student peer culture at my school encourages white students more so than ethnic minority students to succeed at math and/or science.

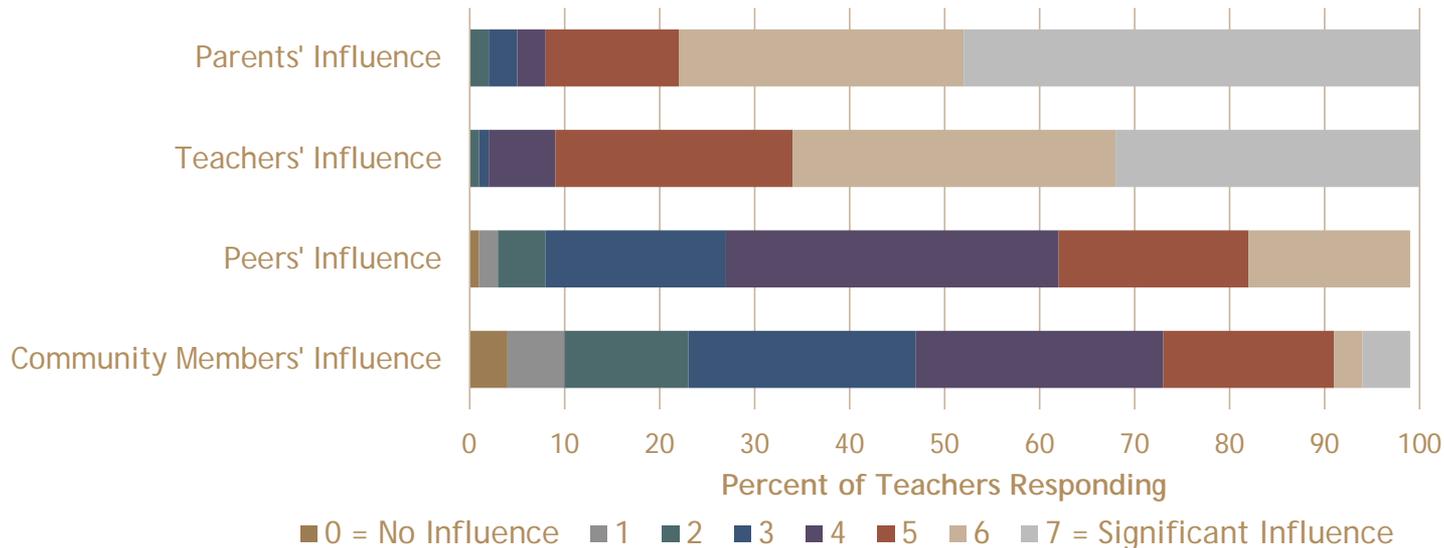


Click [*HERE](#) and [**HERE](#) to see related comments from the 2011 teacher focus groups

Teacher Perspectives on Student Motivation and Influences on Learning

Teachers indicate themselves and parents as having more significant influence than peers and community members for students' academic motivation. A very similar distribution occurred for a parallel question about influences on a student's decision to attend college or not.

Student Academic Motivation: Teachers Indicate Amount of Influence of Each Group



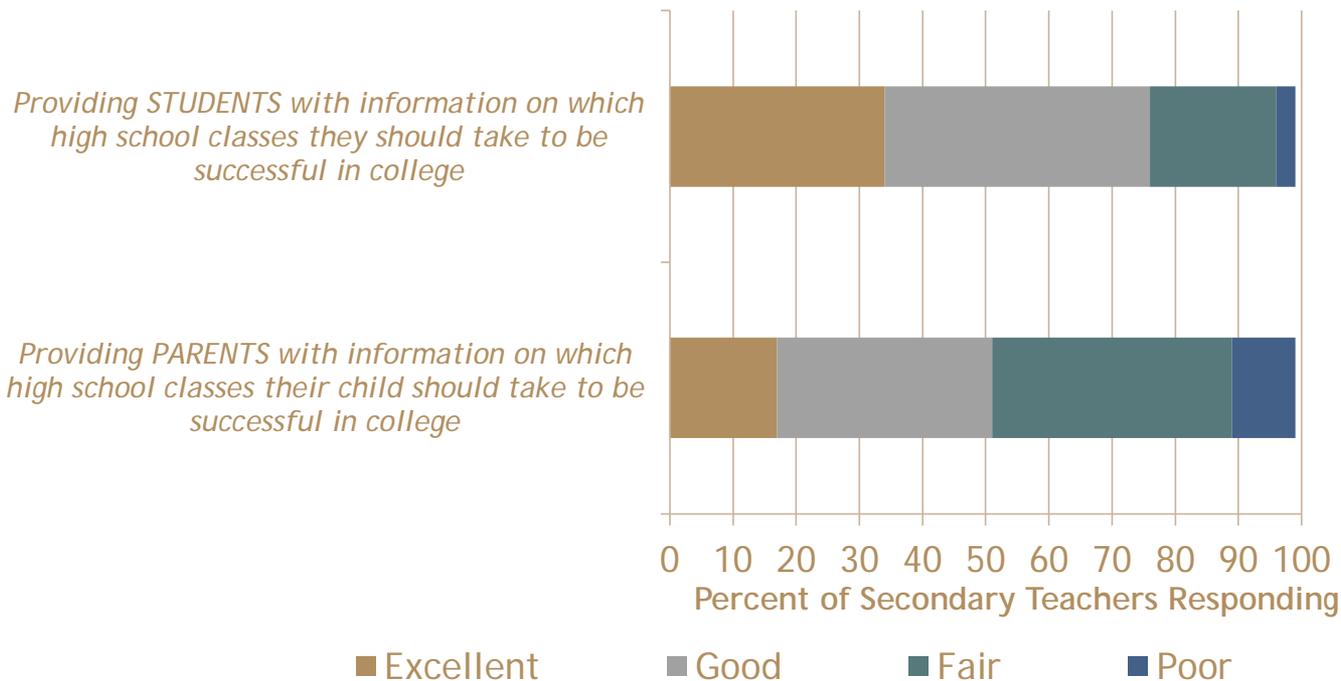
Click [HERE](#) to see related comments from the 2011 teacher focus groups

Preparations for College: High School Courses for College Readiness, College Applications and Financial Aid

These questions were only asked of junior high and high school teachers. While there are some references to results from prior surveys, the highest grade level of students surveyed was tenth grade. Teachers' responses correspond to their schools and not a particular grade level.

Secondary Teachers Rate Schools on Informing Students and Parents: Which High School Classes to Take to be Successful in College

Please rate your school's performance in the following activities:



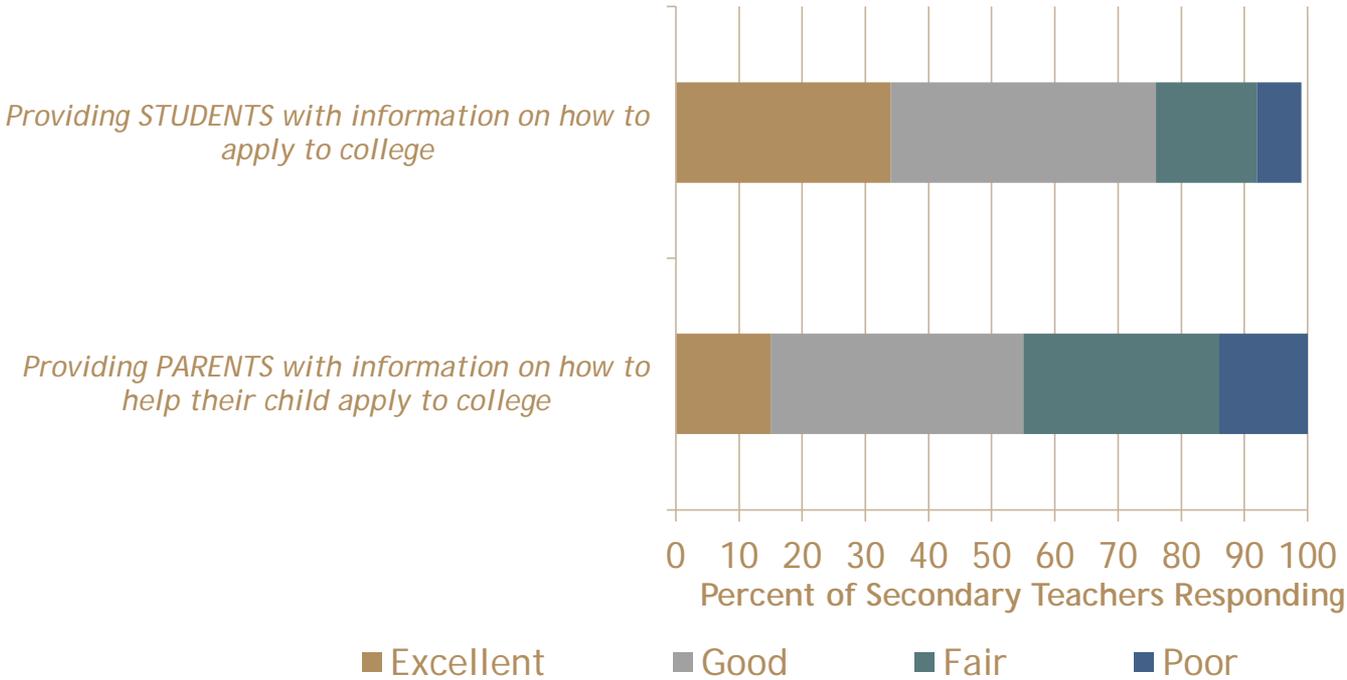
At the start of tenth grade, students have already selected half of their total high school courses, yet:

In the fall 2012 student surveys, 29% of tenth graders indicated they do *not* know which courses they should take to be successful in college.

In the spring 2013 parent surveys, 19% of parents of tenth graders indicated they do *not* know which courses their child should take to be successful in college.

Secondary Teachers Rate Schools on Informing Students and Parents: Applying to College

Please rate your school's performance in the following activities:



In the fall 2012 student surveys, 42% of tenth graders (the highest grade surveyed) agree that they know how to apply for college.

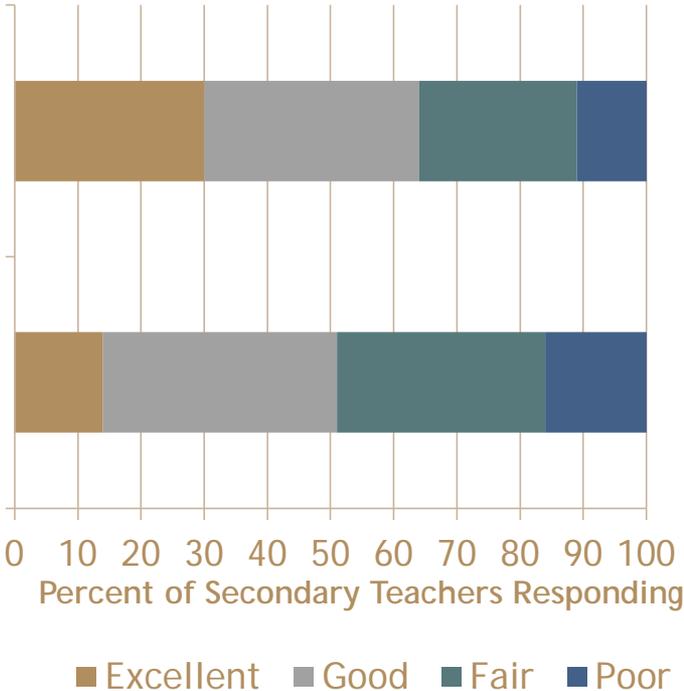
In the spring 2013 parent surveys, more than 70% of parents indicated they know how to help their child apply to college

Secondary Teachers Rate Schools on Informing Students and Parents: Applying for Financial Aid

Please rate your school's performance in the following activities:

Providing STUDENTS with information on the availability of financial aid for college and how to apply for it

Providing PARENTS with information on the availability of financial aid for their child's college education and how to apply for it



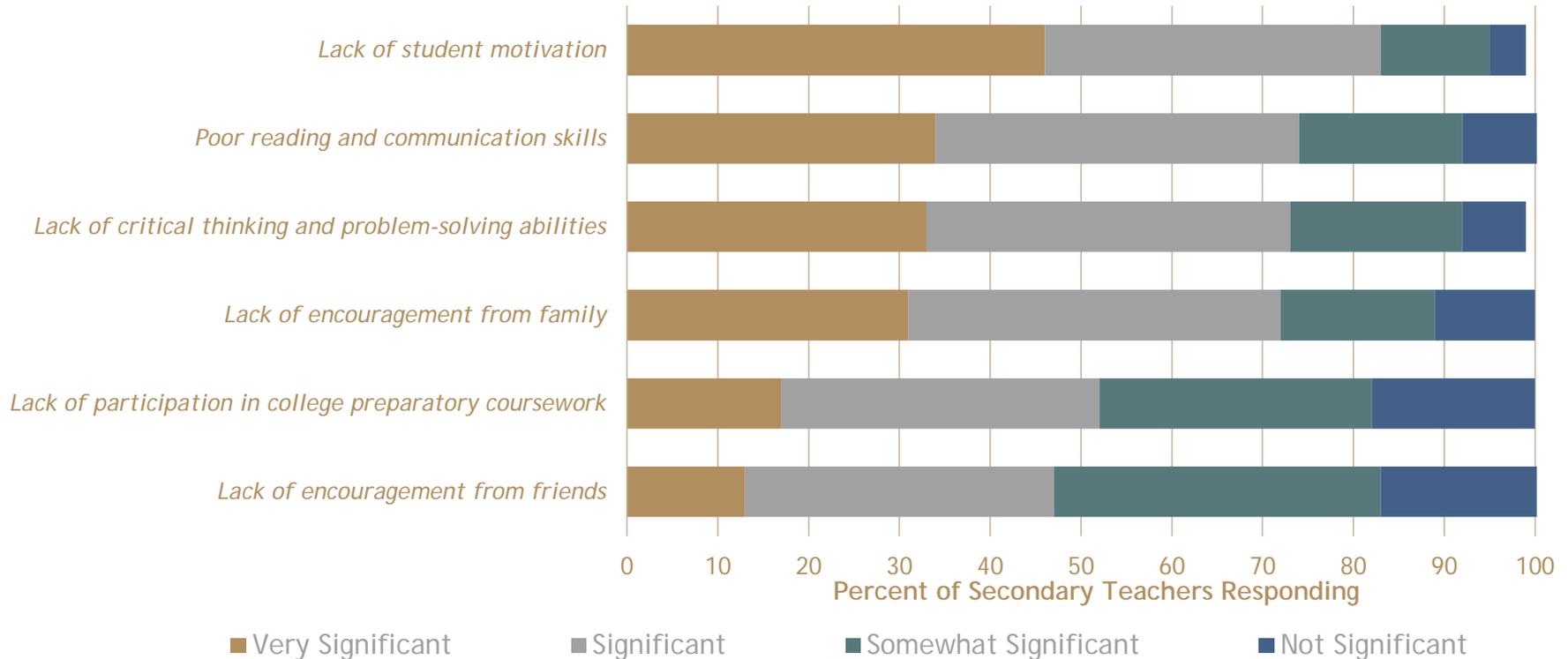
In the fall 2012 student surveys, 29% of tenth graders (the highest grade surveyed) agree that they know how to apply for financial aid for college.

In the spring 2013 parent surveys, 69% of tenth-grade parents indicated they know how to help their child apply for financial aid for college.

Preparations for College: Reasons Why Some Students Not Ready

Teachers evaluated the impact of various factors on students who are not prepared for college. Only junior high and high school teachers were asked these questions.

“How significant are each of the following factors in explaining why students in your school may leave high school unprepared or unable to succeed in a 2- or 4-year college?”



Methodology of STEM Teacher Survey

A sampling frame of potential Idaho teachers was obtained through LITe (Low Incidence Targeting), with a total of 3,183 names. LITe is designed to help reach rare populations and difficult demographic groups. LITe collects self-reported information from across the US from tens of millions of questionnaires through a full spectrum of mass media including online, coupons, magazines, and mailers. Of this sample 1473 had phone numbers and addresses listed and 1710 contained only addresses. After beginning the study we found that the sample included retired teachers, college professors, and preschool teachers as well as individuals who were never teachers.

The survey took 12 minutes on average to complete and was approved by the University of Idaho Institutional Review Board. All Social Science Research Unit (SSRU) telephone interviewers receive training in proper telephone interviewing, phone etiquette, and the use of Computer Assisted Telephone Interviewing (CATI) software. In addition, interviewers receive training specific to the survey, including what kinds of questions respondents may have regarding the study and how to code specific types of responses. Each interviewer is required to complete an online National Institutes of Health training course in human subject research, including confidentiality rules and regulations. Interviewers were monitored during each calling session by trained supervisors. Data were collected in WinCati, a computer-assisted telephone interviewing system, and analyzed using SAS¹.

Methodology of STEM Teacher Survey

To increase the telephone survey response rate, a pre-calling postcard was sent to respondents who had a phone number and address listed prior to the telephone calls (8 February 2013). The postcard stated the SSRU would be contacting the household within the next week, the purpose of the survey, and provided a toll-free number to call the SSRU if they had any questions or concerns regarding the study. Interviewers were trained and calls began 12 February 2013 and continued until each number in the sample was called at least eight times and up to eleven times in an attempt to complete an interview. Interviewers made calls during the work week in the mornings, afternoons, evenings, as well as on Saturdays 10:00 a.m. - 2:00 p.m. PST.

Final survey dispositions for the telephone only surveys included 145 completed interviews, 2 duplicates, 785 ineligible (e.g. administrators, pre-school teachers, college professors, did not teach in Idaho), and 73 refusals.

A mail version of the survey was sent to respondents who only had an address listed (1710) and to respondents whom we were unable to reach on the phone and had a valid address (436). The total number of mail surveys sent was 2146. Mail surveys were sent on May 6, 2013, a reminder postcard was sent on May 14, 2013, and a follow-up mailing was sent on May 29, 2013.

Final survey dispositions for respondents who received a mail version of the survey (1710) included 94 completed surveys, 898 non-contacts, 606 ineligible (e.g. administrators, pre-school teachers, college professors, did not teach in Idaho), 102 non-deliverables and 10 refusals.

Final survey dispositions for respondents who received a mail version of the survey after telephone calls (436) included 29 completed interviews, 197 non-contacts, 204 ineligible (e.g. administrators, pre-school teachers, college professors, did not teach in Idaho), and 6 non-deliverables.

Methodology of STEM Teacher Survey

Due to the unusually high proportion of ineligibles as a result of frame limitations, and the high amount of non-responses, the best representation of the final disposition rates includes an estimation of the proportion of cases of unknown eligibility that are eligible. This estimate is based on the proportion of eligible units among all units in the sample for which a definitive determination of status was obtained (a conservative estimate). In this case our estimated proportion of cases of unknown eligibility is 17.7 percent.

The final response rate not including estimated proportions of cases of unknown eligibility is 17.2 percent, the cooperation rate (the proportion of interviews conducted from all eligible units actually contacted) is 76.4% percent, the refusal rate is 5.3 percent and the contact rate is 22.6 percent².

The final response rate including this estimation is 47.5 percent. Cooperation rate is unaffected and remains at 76.4 percent. The refusal rate is 14.7 percent and the contact rate is 62.2 percent.

Coding Process: Respondents were asked to answer several open-ended questions. Those who completed the mail version of the survey wrote down their answers, which were then entered into our database. Respondents who completed the survey via telephone were asked each question and interviewers transcribed each answer verbatim. At times probes were needed such as 'Could you explain further?' Both mail and phone responses were combined and submitted into a vigorous coding process. An initial coder creates code categories and assigns each response a code with a secondary validation by a second coder. Each of the coders are trained using the most up-to-date methods in research. Coders are given standardized written instruction on how to create codes and categorize responses properly.

After the first coder has completed coding, a second coder reviews the work. Each coder may only ask for clarification or input from one common supervisor. After the second coder makes their changes, the two coders come together and discuss all responses they do not agree upon. The two coders must come to a consensus on every response. After the responses have been reviewed and agreed upon, a supervisor conducts a final review. If there are any changes to be made the two coders and supervisor come together to discuss and reach consensus once again.

References

¹SAS, Version 9.3. 2009. SAS Institute, Cary, NC.

²The American Association for Public Opinion Research (AAPOR). 2006. Standards Definitions: Final Disposition of Case Codes and Outcome Rates for Surveys, 4th Edition. Lenexa, KS: AAPOR. Available at: http://www.aapor.org/pdfs/standarddefs_4.pdf

³U.S. Census Bureau Idaho Quickfacts. Acquired October 20, 2013, <http://quickfacts.census.gov/qfd/states/16000.html>

⁴U.S. Department of Education, National Center for Education Statistics Quickfacts. (2010). *Teacher Attrition and Mobility: Results from the 2008-09 Teacher Follow-up Survey* (NCES 2010-353). Acquired October 20, 2013, <http://nces.ed.gov/FastFacts/display.asp?id=28>

⁵National Governors Association Center for Best Practices, Council of Chief State School Officers. 2010. Common Core State Standards. Washington D.C. Acquired October 20, 2013, <http://www.corestandards.org>

⁶National Research Council. *Next Generation Science Standards: For States, By States*. Washington, DC: The National Academies Press, 2013. Acquired October 20, 2013, <http://www.nap.edu/NGSS/>

Appendix: Comments from Teacher Focus Groups in 2011

In each of Idaho's six educational regions, one rural and one urban district was selected to be in the UI Micron STEM Education Research Initiative. Focus groups were conducted in each of these districts, with one of the focus groups in each community comprised of teachers. The primary goal of the focus groups, which were conducted in 2011, was to assist in the development of questions for upcoming surveys of statewide adults, selected districts' students and their parents, and statewide teachers. The quotes on the following slides were excerpted from transcripts from the teacher focus groups.

Comments from participants provide deeper insight into at least some teachers' attitudes and concerns addressed in some of the teacher survey questions. Not all of the topics addressed in the survey were raised in the focus groups.

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Standardized Testing

Although there was no mention of the Common Core State Standards in the teacher focus groups, the comments below provide some insight into teachers' views of the emphasis on standardized testing and limited subjects. Comments were overwhelmingly negative, and included that the focus on limited standards and the method of testing meant that teachers were unable to include much problem solving and hands-on activities, often viewed as an important means for helping students become excited about STEM subjects and for helping them understand application. Some suggested that the testing emphasis on a few specific subjects did not leave much time for teaching other subjects, including science.

"I think that's one of the things that scares me the most about the standardized testing running the universe is we are forced into teaching to the test, which usually means we've got to get the bookwork done. We can't really teach you concepts, because you've got to memorize stuff for tests."

"We used to teach science in the younger grades, but it's totally neglected because it's not one of the tests."

"We're moving toward standard-spaced grading, and administrators ... they care about failure rates, and, you know, achievement scores, proficiency scores on ISAT tests. ... How do you justify, especially if it's you that's going to be judged by the scores that your students take, how do you justify spending four days on a hands-on project when you know that in three more weeks they're going to take a test that is going to require them to multiply fractions and to find a percent and do this and that, and, you know, factor a polynomial, and, if you haven't...if we haven't drilled those things, then they're not going to do it."

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Satisfaction With The Level Of Parents' Involvement In Their Child's Education

Many teachers discussed parental involvement as important for student success. Some provided opinions regarding why they believe some parents are not as involved as teachers might like, including a lack of time, knowledge of the subject, or concern about their child's education.

"When they get home late, they don't necessarily want to do all that kind of stuff and discipline or any of that. They just want to be parents on a lot of cases because they've been gone all day. So they don't want to come home and deal with the discipline, the homework, the ...they just want to be parents."

"Last month I sat at parent teacher conferences and had several parents tell me that they couldn't help their students with their homework. We're talking third- and fourth-grade level math. It was a sad day when I sat across the table from a father saying that 'I can't help him with that math.'"

"There's options, but they don't have that support pushing them. I had a kid, and ... he's probably one of the smartest kids I've ever taught, but his mom was happy with a C. He had the potential to be 4.0 and valedictorian and out the door just a couple years ago. It's just sad because mom was content with 'Eh, passing's fine.' But there was no push so he's still here. We've all pushed him. I know [a teacher] was really giving him college information on engineering things and really trying to get him out of here. It just fizzled because mom didn't keep pushing."

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The Adequacy Of Technology Infrastructure, Such As Speed And Reliability Of Internet Connection, At Your School

Most comments about technology infrastructure addressed problems with access to the internet in students' homes in rural areas, though a few mentioned problems with insufficient technology in the schools.

"I got so excited about the technology aspect of this, and hopefully, it will open it up to kids. But I think wireless internet needs to be available to all, and I think ... that's why technology is limited, because of the social economics of our area. There are kids that absolutely cannot afford it."

Focus group moderator: "So if you had a fantasy about how you would change school ... have there been some fantasies that you've had about how it would look?"

"More and better technology available, making them do it, though. It would be definitely available for them. More computers in each room and better internet that doesn't drag like a plow."

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The Total Funding Available To Support Your Classroom Instruction

Many focus group members discussed problems with lack of funding to support STEM education and some expressed particular concern over limited funding for rural schools.

“They give a lot of lip service to STEM education without the foundation to support it. You’re talking about how far away we are in the world. The number one in the world is Singapore. They spend in the neighborhood of 4-5 times as much per student for education than we do.”

“When I think of STEM, I think of money and the lack thereof where not having money can make it so that we’re not able to do all the things that we want to do. There are things that I want to do in my classroom that I can’t because we only have one set of mobile labs and someone else has it and stuff like that. The lack of money means lack of technology and things that we do with that.”

“I hear about the fear of funding cuts affecting us all. I worry about the kids in smaller schools. They don’t have the opportunities to experience some of these things handed on either with class offerings or whatever just simply because of budget restraints, time restraints, maybe not the expertise in staff that they’re able to fund and with possible teacher reduction and cutbacks and the drive toward other ISAT areas that it may eliminate some opportunities for some of these programs.”

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The Resources Available To Develop And Introduce Hands-on Learning Exercises In Class

Many focus group members were concerned about the reduction in funding available to engage in hands-on instruction, particularly since those types of activities help provide motivation and real-world applications.

“All the things that do motivate our kids, they’re the things that are on the chopping block. They’re the things that are getting cut because of our funding.”

“The first thing that we get notified when we’re going to start looking at cuts is the hands-on class is the first to go. Which it’s kind of scary in a way. That’s the one place the students do excel and they do tie their real world to their abstract education. And that’s the first place we are going to cut.”

“Private donations, that’s all of our field trips are now done by people who have money and are donating it because we don’t.”

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Class Sizes

Teachers were concerned that reductions in funding are leading to larger class sizes.

"So you're looking upwards of 150 kids per day. Not all of the science classes are so overloaded. We ended up with 30 in some of the classes, which means that it's not only bad that way, but we're violating all sorts of safety codes to have that many kids in a lab."

Focus group moderator: "So you're beyond capacity in your rooms, I'm guessing."

"I have kids sitting on the floor."

"And when I started 26 years ago, I had 34 second graders for my first two years. We worked to get that changed, and now we're going back to it. We're going back 30 years."

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Idaho Needs More Scientists To Help Improve Things For Our State

Most of the discussion regarding the importance of science or STEM focused on why STEM education is important rather than explicitly why Idaho needs more scientists; however, many teachers mentioned that jobs and progress will require training in science.

“One of the reasons I suspect that Idaho may be behind the rule a bit of other states is that we don’t have the scientific infrastructure to give those people careers once they get them.”

“What’s the advantage for Idaho youth pursuing these areas? I think it’s plain and simple. The direction our society is going to rely on all this technology we need the mathematicians. We need the science to continue the progress or, as we just saw in Japan, to be able to solve problems when they come up in that situation. We need these.”

“And besides computer technology I mean look at the wind energy we have, and we have the solar panels. The renewable energy out there, I mean that takes people’s know-how and they have to take the science courses.”

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I Anticipate Potential Opposition From Parents If I Were To Teach The Subject Of Evolution

Teachers had mixed opinions as to whether teaching evolution resulted in opposition from parents and students.

"I taught in [a rural community]. I taught 1st-8th grade science. For the standards in the 8th grade was to hit a little on evolution. I had parents pull a kid out just during that unit."

"Sometimes you know they are being taught something in school like evolution that they are going to come home and that's going to be contradictory and I could see why parents would be concerned about that."

"I've taught evolution now for 20 some years, 25. I've not had anybody directly say anything to me."

"If you're just talking about general 'I don't trust that biology teacher because they taught Darwinism', I don't think that's really an issue."

I Anticipate Potential Opposition From Parents If I Were To Teach The Subject Of Humans' Impact On Global Climate Change

The issue of climate change did not arise as frequently as evolution in the teachers' focus groups, but when it did, teachers overwhelmingly mentioned skepticism among members of the community.

"I was shocked at the number of students that felt that this [climate change] was a myth perpetuated by the left-wing."

"You mentioned climate change here, and there's not many people who think it's real."

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I Find Students' Religious Beliefs Interfere With Their Ability To Embrace Scientific Principles, Theories, And Evidence Taught In School

Similar to the teaching of evolution, teachers' comments about potential problems with students' religious beliefs interfering with science education were mixed.

"We did a persuasive essay on global warming. They had to pick a side. ... The eleventh-hour video that I showed from a lot of parents' perspective it was kind of a continuation of Al Gore and *Convenient Truths* and the same subject matter, a lot of scientists talking about the damage that we're doing to the earth. From some of my kids' perspective it was all a bunch of BS. That this is not actually happening, and it's a fairly big conspiracy from the left-wing somehow trying to extort money from the right-wing."

"Our Idaho is very conservative and very religious, and that puts two things against science in that way."

"I don't think it's controversial in our town, I don't think."

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I Find It Difficult To Help Students Learn About Science Because Of Misinformation They Learn From Parents, Media, And Other Sources

Teachers who discussed skepticism of science among students often mentioned or implied that students' attitudes were shaped by parents and sometimes the media.

"It's all coming from the parents. You say evolution to the kids and it's like over their heads. They have no idea what you are talking about but they go 'my parents say I can't learn about that and I am not supposed to believe that.' And it's like science is not a belief system; you have to break away from that."

"And we do the earth in fifth grade. And so I have a whole thing I show of the creation of the earth and I always have to preface it with this is a group of scientists' opinion about how things could have happened. Because I always have someone say 'No, that's not the way my mom says it. God created it. Poof! That's it!' So they don't want to discuss it. And luckily so far we have been able to discuss it but there definitely is a distrust of that."

"I still have many, many people who will come up to me and say, 'They haven't really proven anything, and scientists don't agree.' You go, 'Pretty much we do. Yeah, we do. We're all pretty much on the same page.' But the media has taken this turn and said, 'Well, anytime there's data...anytime we disagree with our data, which that's what science is about, trying to disprove yourselves.' If you finally do it, 'Now you guys were just lying to us. You weren't telling the truth.' I think media has blown it out of order and, as I tell my kids, through technology in the last 10 years, how science has changed."

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Many Of My Students Are Not Motivated To Work In School Because They Feel Education Has No Place In The Futures They See For Themselves

This was a common concern that teachers expressed as a reason for students' lack of motivation in school.

"I had a little girl one time who said 'Why do I need to do all this because I am just going to work at McDonalds? It's all I'm ever going to do.' And my heart broke but that was her ultimate goal because that's all the farther she saw the adults that she interacted with, that's what she knew. And it's hard to get past that and we have to try to give as many opportunities to exposure to lots of different things to try to get past things like that."

"Many kids that I've struggled with that aren't that motivated. One of the common things they'll say is 'oh, I'm just going to be a farmer'."

"I think a lot of our kids don't see the benefit in the end of what they're getting one way or the other."

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Student Achievement In Math Is Mostly A Reflection Of Their Natural Abilities

Participants most often spoke of achievement in STEM in general, rather than math specifically. Only a few suggested that achievement is primarily a function of natural abilities. The majority argued that motivation, outside influences, and work ethic were primarily responsible for achievement.

"I also think that people come with aptitudes. I think that some students just have an aptitude to it."

"Sometimes you run into these students who are really, really sharp in these areas. I feel like, hey, just let them work on that."

"Those who know how to use their resources have the support behind them and then learn that at a young age continue that and then they go further."

"You just have to push them in the right direction but I think every single kid is good at every single one of these."

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Most Of My Students Have A Clear Idea Of How Math And Science Can Be Used In Their Future Employment And Daily Lives As Adults

Many teachers commented that students do not understand the value of learning math and science.

"I think that the kids would be more encouraged to take these kinds of classes if they had a better idea of what the connection would be to the real world. ... I hear that a lot. 'We're never going to use this.' When you go to college you are going to need it in college. But I think it would be helpful if I said you are going to need it in this area or that area beyond college. Because really that's what they want to know."

"Well one thing we talked about on those lines already is being a fairly agrarian community that's going to affect first the types of science that we can relate to the kids and second of all the fact that they don't see the heavy industry where the technology jobs would be. That makes it difficult."

"I was in math classes, and one of the things we have to ask them is, 'Why are you doing this? How does this apply?' I can't tell you how many times in math they're like 'I have no idea. I have to take the test'."

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My School Emphasizes Math And / Or Science At The Expense Of Other Subject Areas

Some teachers expressed frustration that STEM subjects were given priority over other subjects, while others discussed the importance of balance without suggesting that other subjects were necessarily de-emphasized.

“As far as the balance part of it, I think it...Going back to the basics of education, everything needs a balance. There has to be a balance because if you focus too much one way, unless you’re heading that direction in your life, you still need a well-rounded education. As far as putting it in the school, I think that there should be a balance of everything. Because if you can’t read, how do you read a science textbook? There has to be connectedness with everything and a balance between them all in order to all be well-rounded.”

“We need that education [STEM], yes, but I think that the arts and history, social sciences, psychology, sports even, keep our kids in school.”

“I honestly really think it’s an incomplete list without social science. I honestly do. Political science, social science, philosophy, psychology is all studied like these other sciences are studied, and it’s part of the human behavior. Why is it not on here?”

“There’s no art. If you don’t...if you can’t develop that part of your thinking, that artistic side where you look at something and you...or you can picture something in your head and then put it down on paper, how can you be creative when you’re a 20-some-year-old engineer?”

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Student Academic Motivations: Parents, Teachers, Peers, Community Members

Parents and teachers were most commonly mentioned as having a significant influence on students' academic motivation, though peers were also mentioned as an important influence.

"There are exceptions to the rules, but if the parents have attitudes that they want their kids to do better, the kids do better. We had one here a while ago where mom... 'whatever happens in school happens in school. It's no big deal.' The kid didn't even graduate. Whereas I know there are some parents in here because I've had their kids, those kids better toe the line and better do their best."

"They have somebody pushing them, whether that be a teacher or parent or somebody else and their belief in themselves, and the ability to stay with something because all of the STEM process takes thinking time and processing time."

"When you get those teachers with the young grades that are really, really good with math and science at those grades and get them to love it, then it just perpetuates because you could see that it's all with the teacher."

"But there is some of that influence. Sometimes I'll say 'Tell me how many ways we can solve this problem' and I do that on purpose so that some of the kids that think a little differently about things can have a chance to share and really play up the 'Oh, what a great way to think about that.' And then you can see the other kids kind of looking and thinking 'Gosh, wow I didn't know he knew math or she knew math or whatever.' They can think about it intuitively maybe instead of the logical sequential way. And they can see things differently."

"I had this one kid in middle school a few years ago, and we were doing some very basic intro programming stuff. He was having a hard time and not getting it, and he asked some questions about it. He was starting to understand. You could just see that he was just starting to get a glimmer of it. Then the other kids started teasing him for asking questions and understanding it. You could just see he just shut right down and refused to do it anymore. He gave up. I lost a kid then. I never could get him back. That culture of it's cool to be dumb is really, really heartbreaking. It's a big, big problem that I face."