GREATNESS STEMS FROM IOWANS

GOVERNOR'S STEM ADVISORY COUNCIL

2014-2015 HIGHLIGHTS

Real-World Teacher Externships

290 Teacher Externships have been carried out across Iowa to date in **104** businesses and agencies.

- **96%** of Business Hosts agree or strongly agree that Teacher Externs provide significant contributions.
- **90%** of Teacher Externs agreed or strongly agreed that the Externship impacted their teaching and improved their own views of mathematics or science teaching (88%).
- **91%** of Teacher Externs indicated the experience is more valuable than other professional development they have participated in.
- **A slight overall increase** in interest in science, engineering, mathematics and STEM careers is seen among students of Teacher Externs with a significant increase among females.

Microsoft IT Academy

In its **2nd** year of deployment across Iowa, Microsoft IT Academy is in **150** schools and community colleges.

- **1,797** Student Certifications have been issued plus **147** Professional Development Exams for teachers.
- **6** Iowa students qualified for the Microsoft Office National Championship in Word, Excel and PowerPoint.
- **19** individuals earned their Microsoft Office Master Certification.
- A new Iowa IT Academy website is live at www.IowaSTEM.gov/mita.

Code Iowa

Code Iowa is a partnership with Google and Code.org to support the "Hour of Code" in Iowa.

- **466** Iowa schools participated in the "Hour of Code."
- **5** schools received **$4,000** tech awards, sponsored by Google.
- **50+** schools became Certified Code Iowa partners with more than **10,000** students participating in the event.

STEM Council's Seal of Approval

So far, **9** programs have been awarded with the Seal of Approval since its launch in March 2015.

- Seal recipients span the spectrum from industry to informal and community club to local school.
- Approved programs focus on IT to agriculture science and family fun to summer camps.
- The age range of targeted audiences include preschool through middle school to citizen science.
- **10** outstanding STEM Council and Regional Board members and friends make up the Seal of Approval review panel.

IOWA STEM PROGRAMMING

Iowa STEM BEST and RLE

5 STEM BEST (Businesses Engaging Students and Teachers) consortia received **$122,558** in state funding, and **$804,087** was brought in as local cost-share.

- Awardees proposed in the fall a total of **94** community partners and by June there were **145** partners.
- **24** educators will help teach **315** students with **30%** who are females and **11%** identify as racial minorities.

Students who participated in STEM RLE (Redesigned Learning Environments) experienced **higher rates** of success. For example, at Davenport West's RLE, a **37%** increase in the Earth and Space Science class average was seen.

STEM SCALE-UP PROGRAM

EDUCATORS

1,235 Iowa classrooms and clubs were awarded Scale-Up programs in 2014-15, a gain of **407** from 2013-14.

81% of educators agreed or strongly agreed they have more confidence teaching STEM content.

86% of educators have increased their knowledge of STEM topics.

79% of educators are better prepared to answer students' STEM-related questions.

76% of educators have learned effective methods for teaching in STEM content areas.

Educators reported working with an estimated **1,162** existing business partnerships and established **376** new business-education partnerships during 2014-2015.

STUDENTS

A higher percentage of students who participated in a Scale-Up program said, "I like it a lot," or were very interested in STEM subjects and careers compared to non-participants.

Scale-Up program students scored an average of **6 percentage points** higher on Iowa Assessments for both mathematics and science than their peers.

At the elementary level, females were significantly **more interested** in mathematics than males, while males were significantly more interested in engineering.

By middle school, males were significantly more interested in STEM, and differences between genders on mathematics disappears.

STUDENT INTEREST INVENTORY

Among the 252,000 students who completed the STEM interest questions of Iowa Testing in 2014-15, interest in each area of STEM increased from 2012-13. However, student interest in all subjects decreases as students progress from elementary to middle school to secondary school.

A FEW KEY INDICATORS OF PROGRESS

- From 2011 to 2014, the average number of students meeting mathematics proficiency on the Iowa Assessments appears to be on the rise across demographic groups, including students who are female, African American, Hispanic and/or with low income.
- Comparing 2011 to 2014 graduates in Iowa who took the ACT, the proportion meeting benchmarks for college readiness increased by seven percentage points for science, but decreased four percentage points for mathematics.
- Compared to the 2010 ACT-tested graduating class, a greater percentage of the 2014 class have an interest in STEM, from 47% in 2010 to 49% in 2014. This trend is also observed across all demographic subgroups, including males, females, African American and Hispanic.
- In each of the last three years, more students took Advanced Placement STEM-related courses and more scored high enough to earn college credit than the previous year.
- In the past year, the number of high school teachers with initial licenses in STEM-subject areas increased by approximately 9.4%.
- Community College STEM-related degrees remain steady over time, though minority completions increased by 69% since 2010.
- Since 2010, STEM degrees at Iowa's public universities have increased 12%. At private colleges, STEM degrees have increased by 11%.
- STEM jobs are growing at a faster rate than other sectors and have higher mean salaries. The fastest growing STEM employment sectors are in computers and healthcare.
- According to a STEM Network Analysis by ISU's Research Institute for Studies in Education (RISE), 391 Iowans from 126 different zip codes have served as key decision makers since 2011, each with average of 31 connections.

PUBLIC ATTITUDES ON IOWA STEM

From 2012 to 2014, the percentage of Iowans who have heard of STEM increased from 26% to 41%.

The majority of Iowans believe too few females and students from minority groups by race and ethnicity are encouraged to study STEM topics.

Iowans with some college and/or who live in large cities are more aware of STEM.

89% of Iowans agree or strongly agree that "Increased focus on STEM education in Iowa will improve the state economy."

96% of Iowans believe that STEM education would be improved if elementary students had more hands-on learning and if high schoolers had internship opportunities in business.

96% of Iowans agree or strongly agree that "Advancements in science, technology, engineering and mathematics will give more opportunities to the next generation."

The percentage of Iowans who agree or strongly agree that the overall quality of STEM education is high: 59% (down from 65% in 2012); that Iowa's colleges and universities are doing a good job of preparing students for careers in STEM fields: 82% (down from 83% in 2012).

IOWA STEM COMMUNICATIONS

SOCIAL MEDIA

Twitter: **1,518** followers
Up **56%** from last year

Facebook: **587** likes
Up **20%** from last year

Instagram: **57** followers
NEW since May 2015

YouTube: **4,635** views
Up **349%** from last year

E-Newsletter: **2,523** readers
Up **35%** from last year

Other social media includes Pinterest and LinkedIn.

WEBSITE

APRIL 2015:
New website launched at www.IowaSTEM.gov

118,373 total page views

22,212 new visitors since last year in:

10 countries

50 states

385 Iowa cities

MEDIA COVERAGE

The Ben Silberman "Greatness STEMs from Iowans" PSA aired **10,000+** times across **42** TV stations in Iowa with an estimated **561,258** total views and a combined value of more than **$185,000.**

Nearly **203,000** billboard spots were delivered in multiple regions, which resulted in more than **455,000** views.

Total PR efforts resulted in local and statewide media coverage in all six regions, appearing before **19 million** sets of eyes.

91% of the PR coverage contained at least two of three key messages:

1) Economic development
2) Tied efforts back to the Advisory Council/legislative funding
3) Included a specific STEM example/story

IOWA STEM NETWORK

100,000 The Regional STEM Managers oversaw the implementation of 10 exemplary STEM programs to about 1,300 educators in and out of schools, impacting an estimated 100,000 Iowa youth in 2014-15.

14,970 The managers orchestrated 45 STEM events and festivals across Iowa in 2014-15, drawing in 14,970 participants both young and old.

293 The managers conducted 293 speaking engagements and meeting presentations.

100s The managers forged hundreds of ties between business, economic development, workforce and education leaders.

7,453 All together, the managers have approximately 7,453 newsletter subscribers, 1,357 Twitter followers and 528 Facebook likes.

GRANTS AND PRIVATE SECTOR INVESTMENTS

A total of **$5,533,562** in grants, private sector gifts and cost-sharing by STEM Scale-Up program providers was invested in Iowa STEM for 2014-15.

51 private sector investors contributed **$362,365** in 2014-15, a **32%** increase in private investments over 2013-14. [Investors are listed at www.IowaSTEM.gov/corporate-partners.]

A total of **$905,000** in grants from the National Science Foundation supported Iowa STEM in 2014-15.

Cost sharing partners, including Strategic America, Hub Institutions, Teacher Externships Business Hosts and Scale-Up programmers contributed a total of **$4,266,197** to Iowa STEM in 2014-15.

ACTIVE LEARNING COMMUNITY OUT OF SCHOOL

270 Iowans representing **171** organizations make up the STEM Active Learning Community Partners for Iowa STEM.

STEM Scale-Up Programs were awarded to **129** STEM Active Learning Community Partner organizations for 2015-16.

221 out-of-school educators enjoyed professional development through the ALCP working group.

These partners contributed to regional STEM Festivals, STEM Day the Iowa State Fair, STEM Day at the Capitol and a slew of conferences in 2014-15.

Iowa STEM Monitoring Project

2014-2015 Annual Report

Report No. 3.1
Updated September 2015

Prepared for
Iowa Governor's STEM Advisory Council

Prepared by
Erin O. Heiden, PhD, MPH
Mari Kemis, MS
Kathleen E. Gillon, PhD
Matthew Whittaker, PhD
Ki H. Park, PhD, MPH
Mary E. Losch, PhD

With assistance from
Heather Rickels
Elisabeth Callen, MS
Mitch Avery, MPP
Jill Wittrock, PhD
Disa L. Cornish, PhD, MPH

This project involved the participation of the Governor of Iowa and the Iowa Governor's STEM Advisory Council, Grant Agreement Number, UNI-CSBR_FY2015_01.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Governor of Iowa, the Iowa Governor's STEM Advisory Council, or The University of Northern Iowa.

The authors would like to thank the many individuals and organizations who contributed to this report. This includes great cooperation and data sharing from several "partners in STEM" at ACT, Inc., Iowa Department of Workforce Development, and the Iowa Department of Education. In addition, several students at Iowa State University, The University of Iowa, and the University of Northern Iowa made valuable contributions to this effort. Special thanks to Kathleen Gillon, Elisabeth Callen, Heather Rickels, Larissa Hall, Salomi Aladia, Jessica Jones, and Kristin Broussard for providing valuable assistance. Finally, we especially thank the nearly 1,900 participants of the statewide survey, the over 800 Scale-Up educators, and over 15,700 Scale-Up student participants who shared their time, views, and personal experience about STEM efforts and programming in Iowa. Their generosity of time and thoughtful reflections make this report possible.

For additional information about this project, contact:
Jeffrey Weld | Executive Director
Governor's STEM Advisory Council
214 East Bartlett Hall | University of Northern Iowa
Cedar Falls, IA 50614-0298
319.273.2723 | www.IowaSTEM.gov | weld@iowastem.gov

For additional information about this report, contact:
Erin O. Heiden | Senior Research Scientist
Center for Social and Behavioral Research | University of Northern Iowa
Cedar Falls, IA 50614-0402
319-273-2105 | www.uni.edu/csbr/ | erin.heiden@uni.edu

Author Information:
Erin O. Heiden, PhD, Senior Research Scientist, Center for Social and Behavioral Research (UNI)
Mari Kemis, MS, Assistant Director, Research Institute for Studies in Education (ISU)
Kathleen E. Gillon, PhD, Fellow, University Innovation Alliance (ISU)
Matthew Whittaker, PhD, Assistant Research Scientist, Iowa Testing Programs, College of Education (UI)
Ki H. Park, PhD, Senior Research Scientist, Center for Social and Behavioral Research (UNI)
Mary E. Losch, PhD, Director, Center for Social and Behavioral Research (UNI)

Recommended Citation:
Heiden, E. O., Kemis, M., Gillon, K. E., Whittaker, M., Park, K. H., & Losch, M. E. (2015). *Iowa STEM Monitoring Project: 2014-2015 Annual Report.* Cedar Falls, IA: University of Northern Iowa, Center for Social and Behavioral Research.

List of updates since original publication

September 2015	Corrected legend in Figure 73 (page 158). The category ‘More interested” was incorrectly labeled as ‘Less interested.’

Table of Contents

List of Tables

List of Figures

List of Acronyms

AP	Advanced Placement
AWIM	A World in Motion
BEDS	Basic Educational Data Survey
CASE	Curriculum for Agricultural Science Education
CIP	Classification of Instructional Programs
CSBR	Center for Social and Behavioral Research
EiE	Engineering is Elementary
GIS	Geographic Information System (maps)
ISMP	Iowa STEM Monitoring Project
ISU	Iowa State University
ITP	Iowa Testing Programs
IWD	Iowa Workforce Development
LEA	Local Education Agencies
NAEP	National Assessment of Educational Progress
NCES	National Center for Education Statistics
NCRC	National Career Readiness Certificate
NPR	National Percentile Rank
RISE	Research Institute for Studies in Education
SCED	School Codes for the Exchange of Data
SOC	Standard Occupational Classification
STEM	Science, Technology, Engineering, Mathematics
UI	University of Iowa
UNI	University of Northern Iowa

Executive Summary

The Iowa STEM Monitoring Project (ISMP) is a multi-faceted and collaborative effort that works in support of the Iowa Governor's STEM Advisory Council. ISMP partners include the University of Northern Iowa (UNI) Center for Social and Behavioral Research (CSBR), the Iowa State University (ISU) Research Institute for Studies in Education (RISE), and Iowa Testing Programs (ITP) at the University of Iowa (UI). The purpose of the ISMP is to systematically observe a series of defined metrics and sources to examine changes regarding STEM education and economic development in Iowa centered on the activities of the Iowa Governor's STEM Advisory Council. The ISMP is comprised of four components: 1) eighteen Iowa STEM Indicators; 2) the Statewide Survey of Public Attitudes Toward STEM; 3) a Statewide Student Interest Inventory; and 4) STEM Scale-Up program monitoring. Data for these four components come from publicly available data at the national, state, and regional levels (Component 1); nearly 1,900 Iowans who participated in a statewide survey (Component 2); over 15,000 student surveys from students statewide who participated in a Scale-Up program (Components 3 and 4), and the over 800 Scale-Up educators who completed a teacher/leader survey (Component 4).

Section 1. The Iowa STEM Indicators The Iowa STEM Indicators are used to track annual benchmarks using publicly available data on a variety of STEM topics in education and economic development by systematically assessing the progress and condition of the state's STEM landscape. The STEM Indicators assess eighteen benchmarks across four primary areas of focus: a) STEM achievement and interest among K-12 students, b) STEM preparation of K-12 students, c) STEM college completions, and d) STEM employment.

Select findings from the Iowa STEM Indicators, with emphasis on changes from 2012-2013 to 2014-2015 when possible, are presented below.

<u>STEM achievement and interest among K-12 students</u>

Indicator 1: In *mathematics* achievement, the average percentages of proficient students in the 2012-2014 biennium period were higher than the 2011-2013 biennium period among 4th, 8th, and 11th grade students (from 78% to 79% among 4th grade, 74% to 75% among 8th grade, and from 82% to 83% among 11th grade, respectively). Increases were also observed in *science* achievement among 8th grade students, from 76% in 2011-2013 to 80% in 2012-2014, but not among 11th grade students (from 85% to 82%, respectively). Caution should be used when interpreting these trends since the 2011-2013 and 2012-2014 biennium periods overlap by one year, and may be better assessed next year when non-overlapping biennium periods may be compared.

Indicator 2: Small gains were observed in the percent of Iowa students in 4th and 8th grades scoring at or above "proficient" in *mathematics* on the National Assessment of

Educational Progress from 2011 to 2013 (net difference of +5% and +2%, respectively). These are the same results as reported in Year 2 as the math and science assessments were not scheduled to be administered until 2015.

Indicator 3: In 2014, 48% of graduating seniors who took the ACT are meeting benchmarks for *math*, and 47% are meeting benchmarks for *science.* Comparing 2012 (the most recent year preceding Year 1 of the statewide STEM programming) to 2014, the proportion of Iowa ACT takers meeting benchmarks increased by seven percentage points for *science*, but decreased four percentage points for *mathematics*.

Indicator 4: From 2012 to 2014, the number of students taking Advanced Placement courses in STEM-related subjects increased from 4,968 to 5,600, as well as the number of students who qualified to receive college credit from these courses (from 3,197 in 2012 to 3,753 in 2014). Comparing 2012 (the year immediately preceding statewide STEM programming) to 2014, the proportion of students scoring 3 or better on the biology AP exam increased in Biology, Calculus BC, Computer Science A, and Statistics. However, the proportion decreased in Calculus AB, Chemistry, Environmental Science, and all Physics courses.

Indicator 5: Interest in STEM remains high, with almost half (49% in 2014, 49% in 2013, and 48% in 2012) of students in the respective year, ACT-tested graduating class having an expressed and/or measured interest in STEM majors or occupations.

Indicator 6: Among students who have an expressed and/or measured interest in STEM, 54% aspire to obtain a bachelor's degree, 15% a master's degree, and 26% a doctorate or professional degree. While the percentage of students in 2014 with an interest in pursuing a doctorate degree in STEM is lower than in 2010, 54% of students aspire to a bachelor's degree compared to 46% five years ago. This trend also holds for minority students, which may reflect a growing awareness of STEM careers accessible with a bachelor's degree.

Indicator 7: In 2014, the top five majors for females with interest in STEM were in health-related fields (nursing, medicine, and physical therapy), animal sciences, and veterinary medicine. For males with interest in STEM, the top five majors were engineering (mechanical and general), medicine, athletic training, and computer science and programming. This finding is nearly the same as 2013.

Indicator 8: Student interest in individual STEM topics or in pursuing STEM careers started high in 2012-2013, and has remained high in 2013-2014 and 2014-2015. This includes 40% of students who were *'very interested'*, and another 40% who reported they were *'somewhat interested'* across all grades from elementary, middle school, and into high school.

<u>STEM preparation of K-12 students</u>

Indicator 9: The number of high school teachers with *initial* licenses in STEM-subject areas increased by approximately 9% from 2013-14 to 2014-15.

Indicator 10: The number of teachers with middle school science endorsements continued to rise, an increase of 34% since 2013-14. While agriculture continues to be the least prevalent STEM-related teaching endorsement across the state, the percentage of districts with at least one teacher with an agriculture endorsement (Agriculture 5-12 or Agriscience/Agribusiness 5-12) increased from 64% in 2013-14 to 72% in 2014-15.

Indicator 11: Almost one-quarter of all new teachers recommended for licensure by an Iowa college or university are also being endorsed to teach at least one STEM-related subject. In 2008-09, the percentage of new teachers that were recommended by an Iowa college or university for licensure with at least one STEM-related endorsement was 15%. Seven years later that number has increased by almost 8 percentage points to 23%.

Indicator 12: Seventy-five percent of all first-time high school teachers charged with teaching advanced high school STEM subjects return for a second year of teaching advanced high school STEM subjects.

Indicator 13: Enrollment in high school engineering courses across the state of Iowa has increased by 68% since 2009-10. At the same time, continued attention needs to be paid to the gender disparity in enrollment in high school engineering courses. Currently only 15% of the students enrolled in high school engineering courses are female.

STEM college completions

Indicator 14: There were small fluctuations in the percent change of awards from Iowa's community colleges between 2010 and 2014, with overall awards decreasing by 1%, awards among males increasing by 8%, and awards among females decreasing by 2%. Notably, awards to minority graduates increased by 69% in 2014 compared to 2010.

Indicator 15: From 2010-2011 to 2012-2013, there has been a 1% increase in STEM awards at Iowa's 2-year community colleges, a 12% increase at 4-year public, and an 11% increase at 4-year private colleges and universities, respectively

STEM employment

Indicator 16: On average in 2012, individuals in STEM occupations earned $7 more per hour and $14,000 more in annual salaries compared to all occupational groups. Specifically, STEM occupations earned $26.12 in mean wages in 2014 and $54,300 in mean salaries, compared to all occupations overall earning $19.35 in mean wages and $40,200 in mean salaries, respectively.

Indicator 17: From 2014-2015, there were an estimated 8,744 vacancies in STEM jobs statewide.

Indicator 18: The percent of individuals deemed workforce-ready based on the results of the NCRC assessment remained relatively constant at around one-half of test-takers each year from 2010 to 2014. The percent deemed workforce-ready increased from 51% in 2010 to 55% in 2014.

Section 2. Statewide Survey of Public Attitudes Toward STEM To assess change in public awareness and attitudes toward STEM, a statewide public survey of Iowans was conducted from June through August 2014. A similar survey was conducted in 2012 and 2013.

In 2014, 41% of Iowans had heard of the acronym STEM. In contrast, only 26% of Iowans had heard of the acronym in 2012. This represents a 58% increase in awareness of the acronym STEM from the beginning of Year 1 to Year 3, but no measureable change from Year 2 to Year 3.

In a question that explored visits to out-of-school settings where exposure to STEM may occur, 63% of Iowans had visited a public library in the past year. Notably, this did not vary by urban or rural place of residence, which suggests that libraries may be a setting where future STEM programs should be held to reach a statewide audience.

Respondents were also asked about groups and events promoting STEM education and careers, as well as awareness of the slogan *Greatness STEMs from Iowans*. An estimated 25% of Iowans reported awareness of the Governor's STEM Advisory Council, and from 10-17% reported an awareness of a specific event (e.g. STEM Summit, STEM Festival). In December 2013, the Iowa Governor's STEM Advisory Council launched a public awareness campaign, *Greatness STEMs from Iowans*. Approximately six months later in the 2014 statewide awareness survey, an estimated 14% of Iowans reported having heard the slogan *Greatness STEMs from Iowans.* As the campaign continues to reach across the state, the 2015 statewide surveys will continue to gauge the statewide recognition of the campaign and its purpose.

The 2014 survey found that over half of Iowans rate the quality of science, technology, and math education in their community as 'Excellent' or 'Good.' Most Iowans agree (61%) or strongly agree (34%) that math and science courses teach important critical thinking skills. Among Iowans, the two most commonly cited barriers to STEM education were not enough access to or availability of resources for STEM, and personally held perceptions that suggest "STEM is not for me."

The majority of Iowans (87%) express at least some support for state efforts to devote resources and develop initiatives to promote STEM education in Iowa (44% Very supportive, 43% Somewhat supportive). In addition, 71% of Iowans said student internships with businesses and 75% said hands-on science and technology activities for elementary students' would make a major improvement to math and science education. This opinion aligns with content offered by Scale-Up programs and other efforts by the Governor's STEM Advisory Council to provide these opportunities.

From 2012 to 2014, the proportion of Iowans who *strongly agree* that science and technology make our lives better has decreased from 40% to 35%, but the proportion of Iowans who believe in its value for the next generation has increased from 28% to 40%. In addition, there were some decreases in public assessment of STEM education in 2014 compared to the survey in 2012 (from 65% to 59%, respectively). Overall, most adults agree that schools do well in teaching STEM topics; however, awareness may lead some to more keenly assess the quality of STEM education.

Section 3. Statewide Student Interest Inventory For the past three years, an 8-item interest inventory was added to the Iowa Assessments taken annually by nearly every student in 3rd through 11th grades in the state. The Interest Inventory was developed in part to serve as a data source for both the Iowa STEM Indicators, and as a way to compare students who participate in Scale-Up Programs with all students statewide. Among all students statewide who took the Iowa Assessments, interest in individual STEM subjects is highest among elementary students, followed by middle school and high school students, respectively. While interest in all subjects decreases as students' progress through school, the proportion of students who are *'very interested'* in pursuing a STEM career remains steady at 38-43%.

Section 4. Regional Scale-Up Program Monitoring As part of the Iowa STEM Monitoring Project, all local education agencies implementing a Scale-Up Program were asked to complete three submissions to help evaluate the STEM Scale-Up program initiative. This included: 1) a teacher/leader survey, 2) a student participant list, and 3) student surveys. Taken together, the three submissions inform the ISMP by providing the project partners with consistent information across all Scale-Up programs

In 2014-2015, Scale-Up student survey respondents were 46% female and 54% male. The distribution of student survey respondents by race/ethnicity was 84% White, 9% Hispanic, 2% African American, and 6% Other. This reflects a small decrease in the distribution of females and African American student respondents from Year 2, which was 48% females to 52% males, and 80% White, 5% Hispanic, 9% Black, and 6% Other, respectively. This may be an artifact of non-response bias, as Scale-Up programs intended to reach underserved populations are more likely to be in out-of-school settings with less access to student information to complete a student participant list. The average age of student survey respondents was 10 years (range taken from student surveys: 5-19 years). Elementary students (ages 5-10 years old) returned 54% of the total sample of questionnaires (n = 8,481), followed by middle school students (ages 11-13 years old; 28%, n = 4,385) and high school students (ages 14-19 years old; 18%, n = 2,745), respectively. Among the ten Regional Scale-Up programs offered in 2014-2015, all of the selected programs had positive effects on student interest and awareness in STEM topics and STEM careers. Among students who participated in a Scale-Up program, 9 out of 10 participants reported higher interest in at least one STEM subject or in a STEM career following Scale-Up program participation.

Teachers and leaders reported several important impacts as a result of implementing Scale-Up programs this year. Teachers and leaders reported that they gained skills and confidence in teaching STEM topics as a result of their participation in the Scale-Up programs. Most teacher/leaders agreed or strongly agreed that they now have more confidence to teach STEM content (81%), have increased their knowledge of STEM topics (86%), are better prepared to answer students' STEM-related questions (79%), and have learned effective methods for teaching in STEM content areas (76%). In addition, teachers and leaders reported working with an estimated 1,162 existing business partnerships and established 376 new school-business partnerships during 2014-2015. Some of the larger schools reported having more than 50 existing partnerships, while others reported that they benefited from only one or two. Over 80% of the teachers and leaders reported observing an increase in both student awareness and interest in STEM topics, while over 50% stated they observed an increase in awareness in STEM careers. Similar to last year, teachers and leaders again reported that students demonstrated an increase in motivation, engagement, and interest in STEM content areas as well as STEM careers. Educators also reported that students' critical thinking, problem solving, and teamwork skills showed improvement throughout the Scale-Up program.

Conclusion The data compiled, collected, and synthesized for this report come from a variety of sources. Following the benchmarks established in Year 1, Year 3 showed small but measureable gains in some indicators and some losses in others. The ISMP will continue to follow these indicators, identify and/or refine other metrics of STEM progress, and strengthen relationships with other data partners in the state. Taken together, this report provides a picture of Iowa's STEM landscape, and how it is evolving following the targeted initiatives of the Iowa Governor's STEM Advisory Council to improve STEM education and workforce development surrounding STEM in Iowa.

Introduction

The Iowa STEM Monitoring Project (ISMP) is a multi-faceted and collaborative effort that works in support of the Iowa Governor's STEM Advisory Council. ISMP partners include the University of Northern Iowa (UNI) Center for Social and Behavioral Research (CSBR), the Iowa State University (ISU) Research Institute for Studies in Education (RISE), and Iowa Testing Programs (ITP) at the University of Iowa (UI). The purpose of the ISMP is to systematically observe a series of defined metrics and information sources to examine changes regarding STEM education and economic development in Iowa centered on the activities of the Iowa Governor's STEM Advisory Council.

The ISMP was developed within an evaluation framework developed in collaboration with the University of Iowa Center for Evaluation and Assessment. This framework included multiple levels of evaluation, additional resources leveraged in support of evaluation, and alignment of evaluation activities with Iowa's STEM initiative goals and priorities. This evaluation framework for the STEM initiative informed the ISMP that was implemented and the findings from which are reported here. The ISMP monitors changes in Iowa STEM on three levels. Most broadly, the project monitors Iowa STEM in the national context by comparing it to other state initiatives and data collection efforts. At the state level, the project assembles and tracks indicators of progress toward Advisory Council goals and objectives. Within the statewide STEM initiative, the ISMP tracks the processes and potential impacts of Scale-Up programs and other regional efforts.

As the project name and purpose implies, monitoring of the Advisory Council activities in Iowa includes tracking national, state, and program data, analyzing data for trends, and observing the STEM landscape in the state in a systematic way. To that end, the ISMP is comprised of four components: 1) The Iowa STEM Indicators; 2) Statewide Survey of Public Attitudes Toward STEM; 3) Statewide Student Interest Inventory; and 4) Regional Scale-Up Program Monitoring. Figure 1 shows the Iowa STEM Monitoring Project. The UNI CSBR coordinates all four ISMP components. Each ISMP partner has specific areas of responsibility with areas of overlap. Ongoing collaboration among ISMP partners in year three continues to serve as one of the keys to the success of the ISMP. This report summarizes the findings from year three of the Iowa STEM Monitoring Project.

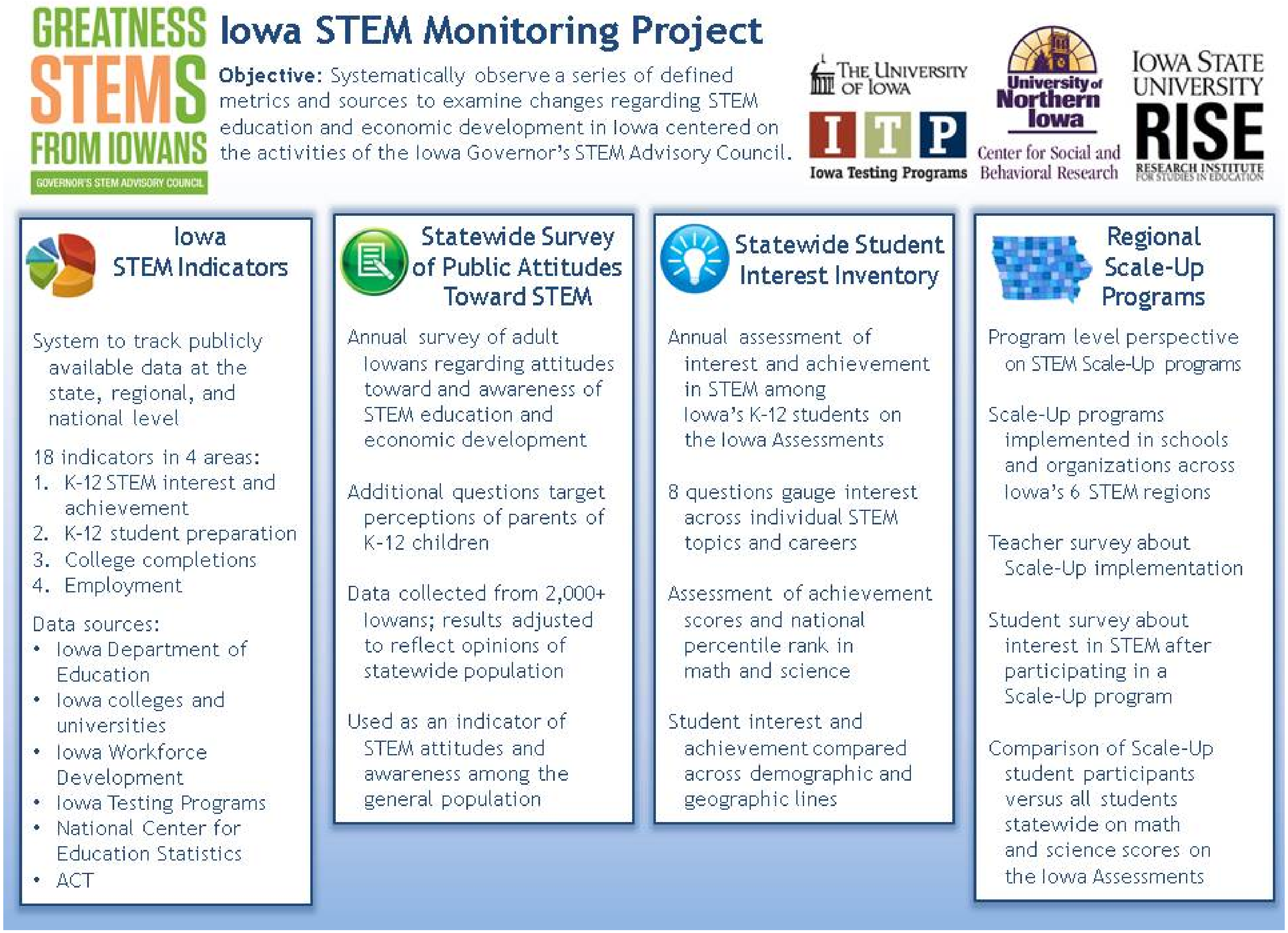


Figure 1. Iowa STEM Monitoring Project

Section 1. Iowa STEM Indicators

The Iowa STEM Indicators track publicly available data at the national, state, and regional levels. The purpose of the indicators is to provide annual benchmarks on a variety of STEM topics in education and economic development by systematically assessing the progress and condition of the state's STEM landscape. The indicators fulfill the need for benchmarks related to a variety of sub-topics in the area of STEM education and workforce development. Iowa's STEM indicators include eighteen indicators across four primary areas of focus: 1) STEM achievement and interest among K-12 students, 2) STEM preparation of K-12 students, 3) STEM college completions, and 4) STEM employment (Figure 2). When possible, these indicators are analyzed to include comparisons across demographic, geographic, and other characteristics of respondents. Data used to track Iowa's STEM indicators are publicly available and come from sources such as the Iowa Department of Education, the National Center for Education Statistics (NCES), Iowa Workforce Development (IWD), ACT, and Iowa Testing Programs (Table 1). Each data source has its own dissemination schedule in the timing of data collection, analysis, and reporting, which does not always overlap with the timeline of this report. This variability limits the ability to report on all indicators at the same time annually. All indicators are reviewed each year for continued data quality and applicability in providing useful benchmarks; and decisions are made regarding whether or not to continue ongoing surveillance of the indicator (Table 2). In addition, new or updated indicators are explored as other data and data sources were identified or became available. No changes were made to the 18 indicators in Year 3 from what was reported in Year 2.

For Year 3, all indicators have been updated with the most recent data available. For Indicator 2, data presented in the Year 2 Annual Report remain the most up to-date. In addition, a special addendum has been added as Indicator 19, and highlights the results from the professional network analysis of the Iowa STEM Initiative.

GIS data mapping of Indicators

Selected data for Indicators 10, 11, and 13 are available as GIS maps which were produced by the Research Institute for Studies in Education at Iowa State University. Data analyzed in this way are plotted and displayed on a state map that includes district boundaries, STEM region boundaries, and locations of Iowa colleges and universities. Decisions about what types of data and analyses are appropriate for mapping continue to evolve throughout the Iowa STEM Monitoring Project. Maps for Indicators 10 and 11 continue to show basic frequency distributions of teachers, while maps for Indicator 13 show female student enrollment relative to the average enrollment of female students.

Iowa STEM Indicators

Purpose: Benchmark a variety of STEM topics in education and economic development by systematically measuring the progress and condition of the state's STEM landscape. The Iowa STEM Indicators are focused on four primary areas: 1) STEM achievement and interest among K-12 students, 2) STEM preparation of K-12 students, 3) STEM college completions, and 4) STEM employment.

GREATNESS STEMS FROM IOWANS

STEM Achievement and Interest among K-12 Students

A. STEM Achievement (Iowa Testing Programs)
- *Indicator 1:* Iowa student achievement in mathematics and science

B. STEM Achievement (National Center for Education Statistics, ACT, College Board)
- *Indicator 2:* Iowa student achievement on NAEP mathematics and science tests
- *Indicator 3:* Number of students taking the ACT and average scores in mathematics/science
- *Indicator 4:* Number and scores of students taking Advance Placement STEM courses in high school

C. STEM Interest (ACT, Iowa Testing Programs)
- *Indicator 5:* Interest in STEM among ACT test-takers
- *Indicator 6:* Educational aspirations of ACT test-takers with interest in STEM
- *Indicator 7:* Top 5 majors among ACT test-takers with interest in STEM
- *Indicator 8:* Number/Percentage of K-12 students interested in STEM topic areas

STEM Preparation of K-12 Students

A. STEM Teachers (Iowa Department of Education)
- *Indicator 9:* Number of current Iowa teachers with licensure in STEM-related subjects
- *Indicator 10:* Number of current Iowa teachers with endorsement to teach STEM-related subjects
- *Indicator 11:* Number of beginning teachers recommended for licensure/endorsement in STEM-related subjects
- *Indicator 12:* Teacher retention in STEM-related subjects

B. STEM Educational Opportunities
- *Indicator 13:* Enrollment in STEM-related courses in high school

STEM College Completions
(Iowa Department of Education)
- *Indicator 14:* Community college awards in STEM fields
- *Indicator 15:* College and university enrollment and degrees in STEM fields

STEM Employment (Iowa Workforce Development, ACT)
- *Indicator 16:* Percent of Iowans in workforce employed in STEM occupations
- *Indicator 17:* Job vacancy rates in STEM occupational areas
- *Indicator 18:* STEM workforce readiness

Updated July 2014

Figure 2. Iowa STEM Indicators

Table 1. Indicators tracked for 2014-2015

Indicator		Description	Data source	Year 1	Year 2	Year 3
STEM Achievement and Interest among K-12 Students	1	Iowa student achievement in mathematics and science	Iowa Testing Programs	✓	✓	✓
	2	Iowa student achievement on NAEP mathematics and science tests	National Center for Education Statistics	✓	✓	✓
	3	Number of students taking the ACT and average scores in mathematics/science	ACT	✓	✓	✓
	4	Number of students taking STEM Advanced Placement tests and average scores	College Board	✓	✓	✓
	5	Interest in STEM among ACT test-takers	ACT	*	✓	✓
	6	Educational aspirations of ACT test-takers with interest in STEM	ACT	✓	✓	✓
	7	Top 5 majors among ACT test-takers with interest in STEM	ACT	*	✓	✓
	8	Number/Percentage of K-12 students interested in STEM topic areas	Iowa Testing Programs	✓	✓	✓
STEM Preparation of K-12 Students	9	Number of current Iowa teachers with licensure in STEM subjects	Iowa Department of Education	✓	✓	✓
	10	Number of current Iowa teachers with endorsement to teach STEM subjects	Iowa Department of Education	✓	✓	✓
	11	Number of beginning teachers recommended for licensure/endorsement in STEM subjects	Iowa Department of Education	**	✓	✓
	12	Teacher retention in STEM subjects	Iowa Department of Education	**	✓	✓
	13	Enrollment in STEM courses in high school	Iowa Department of Education	**	✓	✓
STEM College Completions	14	Community college degrees and certificates in STEM fields	Iowa Department of Education	✓	✓	✓
	15	College and university enrollment and degrees awarded in STEM fields	Integrated Postsecondary Education Data System	✓	✓	✓
STEM Employment	16	Percent of Iowans in workforce employed in STEM occupations	Iowa Workforce Development	✓	✓	✓
	17	Job vacancy rates in STEM occupational areas	Iowa Workforce Development	✓	✓	✓
	18	STEM workforce readiness	Iowa Workforce Development	✓	✓	✓

* The initial indicator was under review, and not reported in Year 1. The indicator was replaced in Year 2.

**Indicator was under analysis, no data included in Year 1 annual report.

Table 2. Summary of revisions to Iowa STEM Indicators, Year 1 to Year 2[1]

Ind.	2012-2013 Indicator (Year 1)	2013-2014 Indicator (Year 2)	Reason(s) for change
5	Predicted ACT scores among 10th grade ACT-Plan test-takers	Interest in STEM among ACT test-takers	Based on discussions between ISMP partners and ACT researchers, it was decided that tracking predicted ACT scores was unnecessary when Indicator 3 tracks the number of students in Iowa taking the ACT, and actual ACT scores in mathematics and science. Following the release in 2014 of ACT's report *The Condition of STEM 2013: Iowa,*[2,] ISMP partners decided to explore ACT data related to expressed and measured interest in STEM.
6	Percentage of ACT test-takers interested in majoring in a STEM area in college	Educational aspirations of ACT test-takers with interest in STEM	This indicator was revised slightly to focus more specifically on the educational aspirations of ACT test-takers who have either an *expressed* interest in pursuing a STEM major or occupation, or a *measured* interest in STEM based on the ACT Interest Inventory in different occupations and majors.
7	Percentage of Iowa 8th graders interested in STEM careers and educational paths	Top 5 majors among ACT test-takers with interest in STEM	It was decided that Indicator 7 in Year 1 was redundant to the interest in STEM tracked across all grade levels in Indicator 8. Therefore, Indicator 7 was changed to be a descriptive indicator of the top 5 majors of students with interest in STEM as a way explore the specific majors of students with interest in STEM
14	Number of college students who complete degrees in individual STEM majors (AA, BA, other)	Community college awards in STEM fields	The data source for Indicators 14 and 15 was changed from the National Center for Education Statistics in Year 1 to the Iowa Department of Education in Year 2. In addition, Indicators 14 and 15 were divided by degrees awarded from community colleges versus Iowa's four-year colleges and universities. Indicator 14 includes degrees and certificates; Indicator15 includes data for enrollment, bachelor's and graduate/professional degrees. Enrollment data for community colleges was not reported due to variability in the data.
15	Number of college students who complete graduate degrees in individual STEM majors	College and university enrollment and awards in STEM fields	

1. No changes or modifications were made to the 18 indicators from Year 2 (2013-2014) to Year 3 (2014-2015).

2. ACT, Inc. (2014). The Condition of STEM, 2013: Iowa. Iowa City, IA: ACT, Inc. Available from http://www.act.org/stemcondition/13/pdf/Iowa.pdf

Indicator 1: Iowa student achievement in mathematics and science

Data source Iowa Testing Programs, The University of Iowa

This indicator tracks the proportion of Iowa students statewide who were proficient in mathematics and science on the Iowa Assessments. Data are reported in biennium periods. Biennium periods represent the average percentages of proficient students for the two school years represented, e.g., 2012-2014 represents the average of the 2012-2013 and 2013-2014 school years.

Beginning in 2011-2012, biennium data were based on the new Iowa Assessments and 2010 national norms while the previous biennium periods data were based on the Iowa Tests of Basic Skills/Iowa Tests of Educational Development (ITBS/ITED) A/B forms and 2000 national norms. Therefore, the average percentages of proficient students for the 2010-2012 biennium cannot be combined due to different benchmarks of proficiency and national norms that were used for each respective year. This also limits the ability to interpret trends from the 2011-2013 and 2012-2014 biennium periods to periods prior to 2011.

In addition, this limits the ability to interpret trends over the three-year period of the Governor's STEM Advisory Council as the biennium periods of 2011-2013 and 2012-2014 overlap by one year.

Key findings

- In *mathematics* achievement, the average percentages of proficient students in the 2012-2014 biennium period are higher than the 2011-2013 biennium period among 4th, 8th, and 11th grade students (Table 3). In the 2012-2014 biennium period, 83% of students in 11th grade were proficient in *mathematics*.
- From 2011-2014, the average proportions of students meeting *mathematics* proficiency appears to be on the rise across demographic groups, including students who are female, African American, Hispanic, and/or with low income.
- In *science* achievement, the average percentages of proficient students in the 2012-2014 biennium period are higher than the 2011-2013 biennium period among 8th grade students, but lower among 11th grade students. (Table 4)
- Overall, there are disparities in proficiency. The proportions of minority students, those of low socioeconomic status, and students with disabilities that exhibit proficiency are consistently lower than the overall rates. This is true in all biennium periods, all grade levels, and in both *mathematics* and *science*.
- Use caution interpreting these trends since the 2011-2013 and 2012-2014 biennium periods overlap by one year. A better picture will emerge next year when non-overlapping biennium periods may be compared.

Table 3. Proportion of Iowa students statewide who are proficient in *mathematics*

Grade		2010-2012[1]	2011-2013	2012-2014	Trend
4th	Overall		78%	79%	↑
	Male		78%	80%	↑
	Female		77%	78%	↑
	White		81%	83%	↑
	African American		48%	50%	↑
	Hispanic		65%	66%	↑
	Low income		66%	67%	↑
	Disability		45%	44%	↓
8th	Overall		74%	75%	↑
	Male		74%	74%	↔
	Female		74%	75%	↑
	White		78%	79%	↑
	African American		41%	42%	↑
	Hispanic		55%	56%	↑
	Low income		58%	59%	↑
	Disability		25%	27%	↑
11th	Overall		82%	83%	↑
	Male		82%	82%	↔
	Female		82%	83%	↑
	White		85%	86%	↑
	African American		53%	53%	↔
	Hispanic		65%	69%	↑
	Low income		67%	69%	↑
	Disability		42%	42%	↔

Source: Iowa Testing Programs, The University of Iowa

Retrieved from *The Annual Condition of Education*, Iowa Department of Education, 2014. https://www.educateiowa.gov/sites/files/ed/documents/2014ConditionOfEducation_0.pdf

[1]Data notes: Percentages for each biennium period represent average percentages of proficient students for the two school years represented, e.g., 2012-2014 represents the average of the 2012-13 and 2013-14 school years.

Beginning in 2011-2012, biennium data were based on the new Iowa Assessments and 2010 national norms while the previous biennium periods data were based on the ITBS/ITED A/B forms and 2000 national norms.

The average percentages of proficient students for the 2010-2012 biennium cannot be combined due to different metrics of proficiency and national norms that were used for each respective year.

Caution should be used when comparing data from the 2011-2013 and 2012-2014 biennium periods to biennium periods prior to 2011.

Table 4. Proportion of Iowa students statewide who are proficient in *science*

Grade		2010-2012[1]	2011-2013	2012-2014	Trend
8th	Overall		76%	80%	↑
	Male		77%	80%	↑
	Female		74%	79%	↑
	White		80%	84%	↑
	African American		43%	49%	↑
	Hispanic		58%	64%	↑
	Low income		62%	67%	↑
	Disability		37%	44%	↑
11th	Overall		85%	82%	↓
	Male		84%	81%	↓
	Female		87%	84%	↓
	White		88%	85%	↓
	African American		60%	53%	↓
	Hispanic		71%	69%	↓
	Low income		73%	69%	↓
	Disability		49%	43%	↓

Source: Iowa Testing Programs, The University of Iowa

Retrieved from *The Annual Condition of Education*, Iowa Department of Education, 2014.
https://www.educateiowa.gov/sites/files/ed/documents/2014ConditionOfEducation_0.pdf

[1]Data notes: Percentages for each biennium period represent average percentages of proficient students for the two school years represented, e.g., 2012-2014 represents the average of the 2012-13 and 2013-14 school years.

Beginning in 2011-2012, biennium data were based on the new Iowa Assessments and 2010 national norms while the previous biennium periods data were based on the ITBS/ITED A/B forms and 2000 national norms.

The average percentages of proficient students for the 2010-2012 biennium cannot be combined due to different metrics of proficiency and national norms that were used for each respective year.

Caution should be used when comparing data from the 2011-2013 and 2012-2014 biennium periods to biennium periods prior to 2011.

Indicator 2: Iowa student achievement on NAEP mathematics and science tests

Data source National Assessment of Educational Progress (NAEP), National Center for Education Statistics (NCES)

For this indicator, data presented in the Year 2 Annual Report remain the most up to-date. NAEP Assessments in *mathematics* have been administered to 4th, 8th, and 12th grades students on odd numbered years since 2007. NAEP Assessments in *science* were administered in 2009, 2011 (8th grade only), and 2015. Data from 2015 are not yet available. Results are published six months to a year after the assessment is complete.

In addition, a new assessment in *technology and engineering literacy (TEL)* was scheduled in the winter of 2014. TEL assesses how well students apply technology and engineering principles to real life situations, and is computer-based. Results are expected to be available sometime in 2015, but may take longer since this was the first implementation of a new framework. For more information, see http://nces.ed.gov/nationsreportcard/tel/

Key findings

- From 2011 to 2013, *mathematics* scores increased an average of 3 points among 4th grade students overall, females, and males in 4th grade ($p<.05$ for all). While not significant, 4th grade students who are Hispanic had increased average scale scores by 5 points from 2011 to 2013 (Table 5).
- Among 4th grade students who are African American, *mathematics* scores decreased by 6 points, from 224 in 2011 to 218 in 2013 (Figure 3).
- There has been little to no change in average scale scores in *mathematics* among 8th grade and 12th grade students overall (Figure 4). There have been small decreases in average scale scores among 8th grade students who are African American or Hispanic from 2011 to 2013. These differences do not reach statistical significance, but will be something to watch going forward. 2013 *mathematics* scores remained consistent with previous years.
- Among 12th grade students, the *mathematics* scores of African American students decreased by 13 points from 2009 to 2013. Scores among Hispanic 12th graders increased by 5 points during that time period.
- Since 2011, Iowa's national rank has improved to 14th in the nation regarding 4th grade *mathematics* scores (compared to 20th in 2011). The national rank of 25th regarding 8th grade *mathematics* has not changed from 2011.
- Small, but significant, gains were observed in the percent of Iowa students in 4th grade scoring at or above "proficient" in *mathematics* on the National Assessment of Educational Progress from 2011 to 2013 (net difference of +5%, respectively). While not

reaching significance, small gains were also observed among 8th grade students in the percent of students at or about “proficient”, from 34% in 2011 to 36% in 2013.

- Less than half of 4th graders, approximately one-third of 8th graders, and approximately one-fourth of 12th graders who took the NAEP mathematics test scored well enough to be rated at or above “proficient” in *mathematics*.
- Limited data are available regarding NAEP *science* scores (Table 6). For those years and grades where data are available, disparities exist in average scale scores when comparing African American and Hispanic student scores to students overall. Among 8th grade students in 2011, average scale scores among Black and Hispanic students are 29 and 14 points lower, respectively, than the average score for all students in Iowa.
- NAEP Assessments in *science* were administered in 2015, but data are not yet available.

Table 5. *Mathematics* scores for Iowa students on the National Assessment of Educational Progress

Grade	Variable		2007	2009	2011	2013	Trend since 2011
4th	Scale score (0-500)	All students	243	243	243	246*	⇧
		Males	244	243	244	247*	⇧
		Females	241	242	242	244*	⇧
		African American	224	226	224	218	⇩
		Hispanic	230	223	229	234	⇧
	National rank[1]		15	19	20	14	⇧
	Num. jurisdictions significantly higher than IA[2]		7	6	10	4	⇧
	Percent at or above Proficient (>249)		43%	41%	43%	48%*	⇧
	Percent at Advanced		5%	5%	6%	9%*	⇧
8th	Scale score (0-500)	All students	285	284	285	285	⇔
		Males	287	285	286	286	⇔
		Females	284	284	284	284	⇔
		African American	257	259	258	255	⇩
		Hispanic	261	266	269	265	⇩
	National rank		18	28	25	25	⇔
	Num. jurisdictions significantly higher than IA		7	16	18	17	⇧
	Percent at or above Proficient (>299)		35%	34%	34%	36%	⇧
	Percent at Advanced (>333)		7%	7%	8%	7%	⇩
12th	Scale score (0-300)	All students		156		156	
		Males		156		158	
		Females		156		154	
		African American		138		125	
		Hispanic		134		139	
	National rank[3]			--		--	
	Num. jurisdictions significantly higher than IA[3]			--		--	
	Percent at or above Proficient (>176)			25%		26%	
	Percent at Advanced (>216)			1%		1%	

*Significant at p<.05, 2013 versus 2011

Source: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), Mathematics Assessments

Retrieved from: http://nces.ed.gov/nationsreportcard/statecomparisons/
http://nces.ed.gov/nationsreportcard/naepdata/dataset.aspx

1. In 2007 and 2009, national rank is out of 51 jurisdictions (50 states plus the District of Columbia). In 2011 and 2013, national rank is based out of 52 jurisdictions (50 states, the District of Columbia, and Department of Defense Education Activity).
2. A jurisdiction is defined as any government defined geographic area sampled in the NAEP assessment.
3. Grade 12 NAEP data available from 11 jurisdictions in 2009 and 13 jurisdictions in 2013, respectively. Data not reported.

Table 6. *Science* scores for Iowa students on the National Assessment of Educational Progress[1]

Grade	Variable		2007	2009	2011	2013	Trend since 2011[2]
4th	Scale score (0-300)	All students		157			n/a
		Males		158			n/a
		Females		157			n/a
		African American		130			n/a
		Hispanic		134			n/a
	National rank[3]			11			n/a
	Num. jurisdictions significantly higher than IA[4]			5			n/a
	Percent at or above Proficient (>167)			41%			n/a
	Percent at Advanced (>224)			1%			n/a
8th	Scale score (0-300)	All students		156	157		n/a
		Males		158	159		n/a
		Females		154	155		n/a
		African American		127	128		n/a
		Hispanic		133	143		n/a
	National rank			17	17		n/a
	Num. jurisdictions significantly higher than IA			7	12		n/a
	Percent at or above Proficient (>170)			35%	35%		n/a
	Percent at Advanced (>215)			1%	1%		n/a

Source: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), Science Assessments.

Retrieved from: http://nces.ed.gov/nationsreportcard/statecomparisons/
http://nces.ed.gov/nationsreportcard/naepdata/dataset.aspx

1. The science assessment was only administered to 4th and 8th grade students in 2009 and only to 8th grade students in 2011; the science assessment was not administered to any grade in 2007 or 2013.
2. Trend not reported due to limited data. NAEP Assessments in science were administered in 2009, 2011 (8th grade only), and 2015. Data from 2015 are not yet available.
3. In 2007 and 2009, national rank is out of 51 jurisdictions (50 states plus the District of Columbia). In 2011, national rank is based out of 52 jurisdictions (50 states, the District of Columbia, and Department of Defense Education Activity).
4. A jurisdiction is defined as any government defined geographic area sampled in the NAEP assessment.

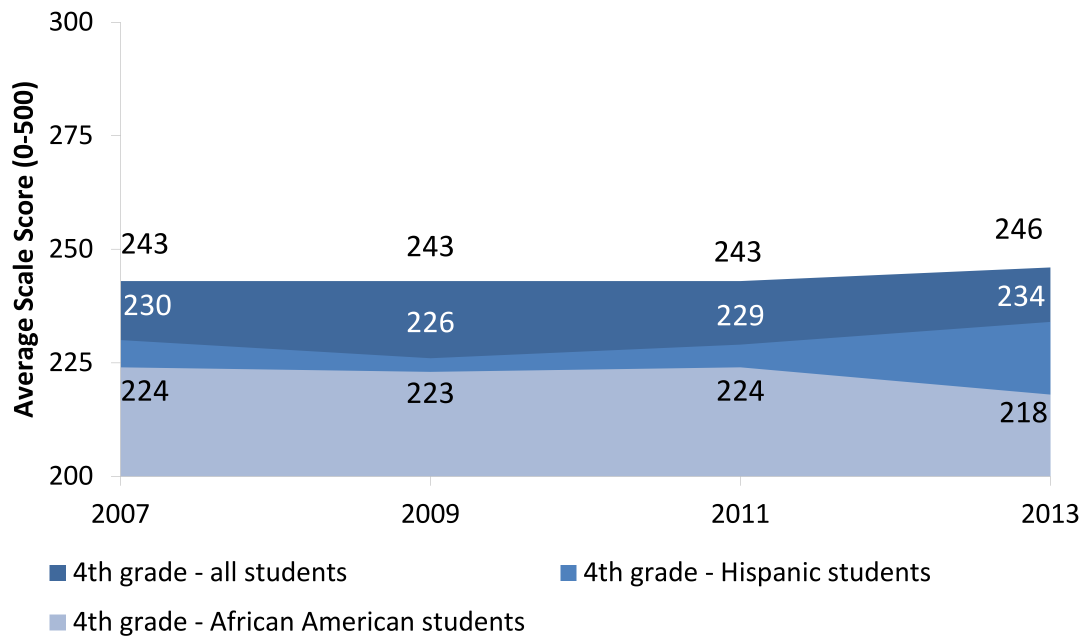


Figure 3. NAEP mathematics scores among Iowa 4th grade students

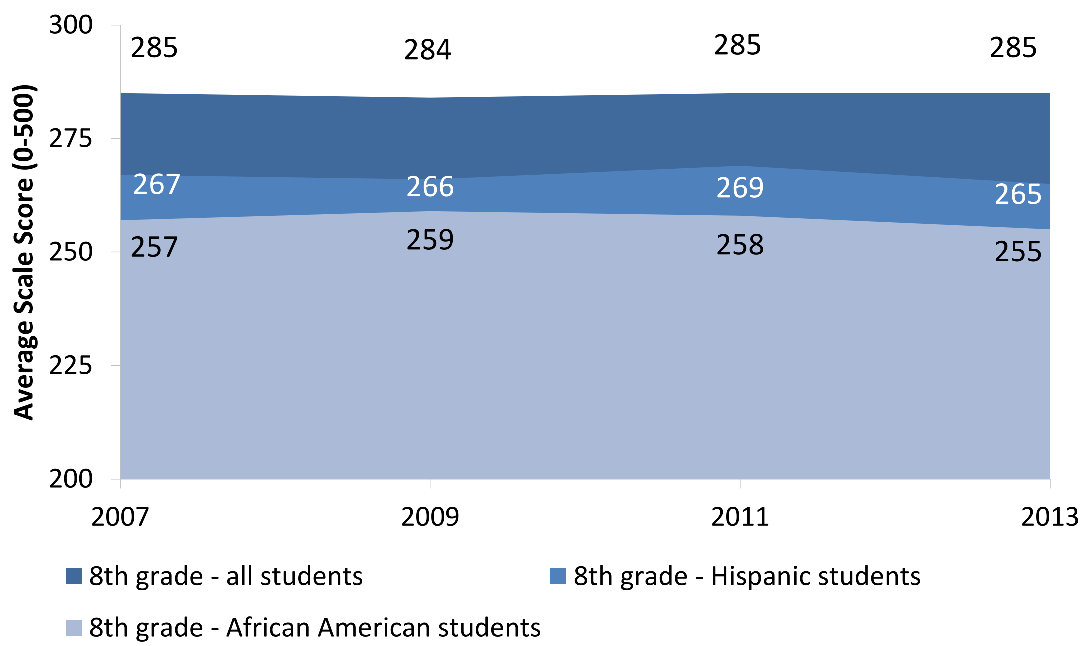


Figure 4. NAEP mathematics scores among Iowa 8th grade students

Indicator 3: Number of students taking the ACT and average scores in mathematics and science

Data source ACT, Inc.

Math and science achievement on the ACT is reported by year reflecting the performance of graduating seniors in that year who took the ACT as a sophomore, junior, or senior and self-reported that they were scheduled to graduate in the respective year, e.g. 2014 reflects 2014 graduating seniors who took the ACT in the 10^{th}, 11^{th}, or 12^{th} grade (which corresponds to 2011/12, 2012/13, and 2013/14 academic years, respectively). As such, ACT data by year does not align to the corresponding year of existence of the Governor's STEM Advisory Council from 2011 to present. In reviewing trends since Year 1 (i.e., 2011/12) of the Council's activities for the current annual report, a decision was made to look at ACT data from 2011 (which would reflect students who took the ACT in 2008/09, 2009/10, or 2010/11) compared to 2014 (which reflects students who took the ACT anytime within the first three years of Council activities). In 2014, the proportion of Iowa's graduating class who had taken the ACT was 68%.

Key findings

- Average ACT scores of graduating seniors in *mathematics* and *science* have changed very little from 2011 to 2014, marginally decreasing by a few tenths each year (Table 7). This is consistent with National trends, and across demographic groups by gender and Hispanic ethnicity. In 2014, Iowa's average ACT score was 21.4 in *mathematics* and 22.2 in *science*, compared to 20.9 and 20.8 nationwide, respectively.
- Disparities exist in average ACT scores by race/ethnicity with an average of 5 points lower among students who are African American, and an average of 3 points lower among students who are Hispanic compared to their White counterparts (Table 8, Figure 5, and Figure 6).
- In 2014, 48% of graduating seniors who took the ACT are meeting benchmarks for *mathematics*, and 47% are meeting benchmarks for *science*. Comparing 2011 to 2014, the proportion of Iowa ACT takers meeting benchmarks increased by seven percentage points for *science*, but decreased four percentage points for *mathematics*.
- By gender, the proportion of males and females who met college readiness benchmarks in *science* increased by nine percentage points between 2011 and 2014, from 45% to 54% among males, and 35% to 44% among females (Figure 7). However, the percent meeting college readiness benchmarks in *mathematics* decreased by three percentage points among males, and two percentage points among females between 2011 and 2014, respectively.
- Disparities exist among students by race/ethnicity with only about 26% of Hispanic students and 14% of African American students meeting benchmarks in *mathematics* and *science*, compared with 51% of White students in 2014 (Figure 8). In addition, a disparity

exists by race/ethnicity in the number of students who take the ACT. Of the over 22,900 students reflected in the 2014 data, approximately 1,300 (5%) were Hispanic and 600 (3%) were African American, respectively, compared to comprising 8% and 6% of the 15-19 year old statewide adolescent population (Table 8).

Table 7. ACT scores and benchmarks for Iowa students, 2011-2014[1]

			2011	2012	2013	2014	Trend since 2011
Overall	Number of students tested		22,968	23,119	22,526	22,931	↓
	Average ACT scores[2]						
		Composite	22.3	22.1	22.1	22.0	↓
		Math	21.9	21.7	21.6	21.4	↓
		Science	22.4	22.2	22.2	22.2	↓
	Percent meeting benchmarks[3]						
		Math	52%	51%	50%	48%	↓
		Science	40%	38%	46%	47%	↑
Males	Number of students tested		10,636	10,684	10,406	10,350	↓
	Average ACT scores						
		Composite	22.5	22.4	22.3	22.5	↔
		Math	22.6	22.5	22.3	22.3	↓
		Science	23.1	22.9	22.8	23.0	↓
	Percent meeting benchmarks						
		Math	58%	57%	56%	55%	↓
		Science	45%	45%	52%	54%	↑
Females	Number of students tested		12,181	12,380	12,091	11,937	↓
	Average ACT scores						
		Composite	22.1	21.9	21.9	22.0	↓
		Math	21.2	21.1	21.0	20.9	↓
		Science	22.0	21.7	21.7	21.8	↓
	Percent meeting benchmarks						
		Math	47%	46%	45%	45%	↓
		Science	35%	33%	42%	44%	↑

Source: ACT, Inc.

Retrieved from: www.act.org/newsroom/data

1. Year reflects performance of graduating seniors in that year who took the ACT as a sophomore, junior, or senior and self-reported that they were scheduled to graduate in the corresponding year, e.g. 2014 reflects 2014 graduating seniors who took the ACT in the 10^{th}, 11^{th}, or 12^{th} grade.
2. Scores: Include both an overall Composite Score and individual test scores in four subject areas (English, Mathematics, Reading, Science) that range from 1 (low) to 36 (high). The Composite Score is the average of the four test scores, rounded to the nearest whole number.
3. College Readiness Benchmarks: the minimum score needed on an ACT subject-area test to indicate a 50% chance of obtaining a B or higher or about a 75% chance of obtaining a C or higher in the corresponding credit-bearing college courses. The benchmark scores, updated in August of 2013, for math and science were 22 and 23 respectively.

Table 8. ACT scores and benchmarks for Iowa students by student race/ethnicity, 2011-2014[1]

		2011	2012	2013	2014	Trend since 2011
White	Number of students tested	19,652	19,515	18,712	18,475	↓
	Average ACT scores[2]					
	Composite	22.6	22.5	22.5	22.6	↔
	Math	22.1	22.0	21.9	21.9	↓
	Science	22.8	22.5	22.6	22.7	↓
	Percent meeting benchmarks[3]					
	Math	54%	53%	53%	52%	↓
	Science	42%	40%	49%	51%	↑
African American	Number of students tested	583	601	601	600	↑
	Average ACT scores[2]					
	Composite	17.1	17.6	17.3	17.4	↑
	Math	17.2	17.6	17.4	17.4	↑
	Science	17.5	18.1	17.8	17.5	↔
	Percent meeting benchmarks[3]					
	Math	14%	17%	16%	16%	↑
	Science	8%	12%	15%	14%	↑
Hispanic	Number of students tested	927	1,140	1,204	1,264	↑
	Average ACT scores[2]					
	Composite	19.6	19.3	19.1	19.5	↓
	Math	19.4	19.2	18.9	18.9	↓
	Science	19.9	19.8	19.4	19.8	↓
	Percent meeting benchmarks[3]					
	Math	32%	30%	27%	26%	↓
	Science	20%	21%	24%	26%	↑

Source: ACT, Inc.

Retrieved from: www.act.org/newsroom/data

1. Year reflects performance of graduating seniors in that year who took the ACT as a sophomore, junior, or senior and self-reported that they were scheduled to graduate in the corresponding year, e.g. 2014 reflects 2014 graduating seniors who took the ACT in the 10th, 11th, or 12th grade.
2. Scores: Include both an overall Composite Score and individual test scores in four subject areas (English, Mathematics, Reading, Science) that range from 1 (low) to 36 (high). The Composite Score is the average of the four test scores, rounded to the nearest whole number.
3. College Readiness Benchmarks: the minimum score needed on an ACT subject-area test to indicate a 50% chance of obtaining a B or higher or about a 75% chance of obtaining a C or higher in the corresponding credit-bearing college courses. The benchmark scores, updated in August of 2013, for math and science were 22 and 23 respectively.

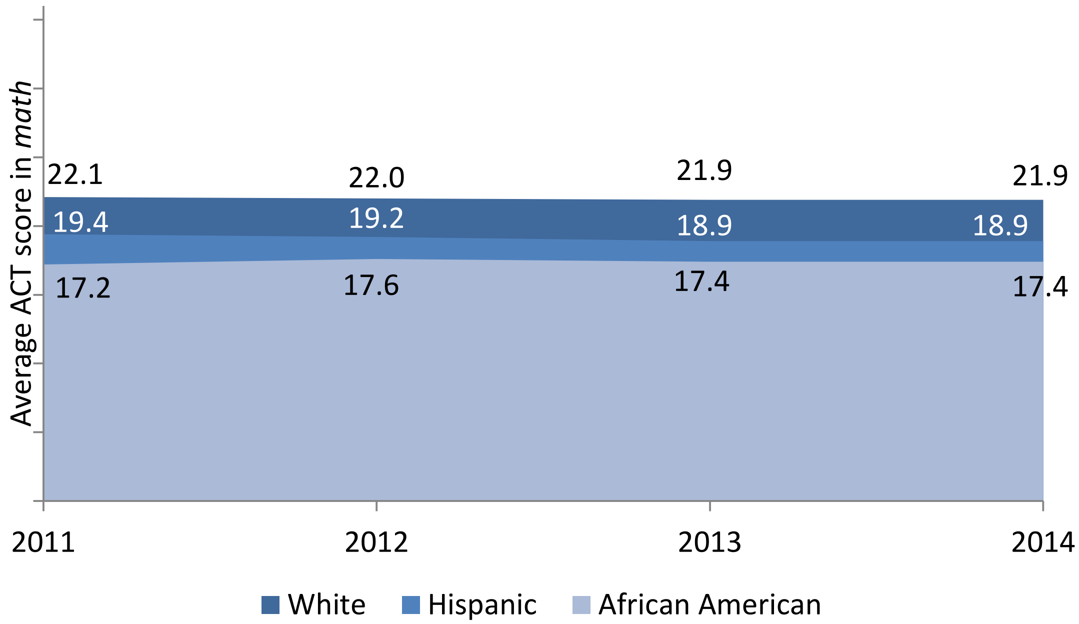


Figure 5. ACT scores in *mathematics* by race and ethnicity

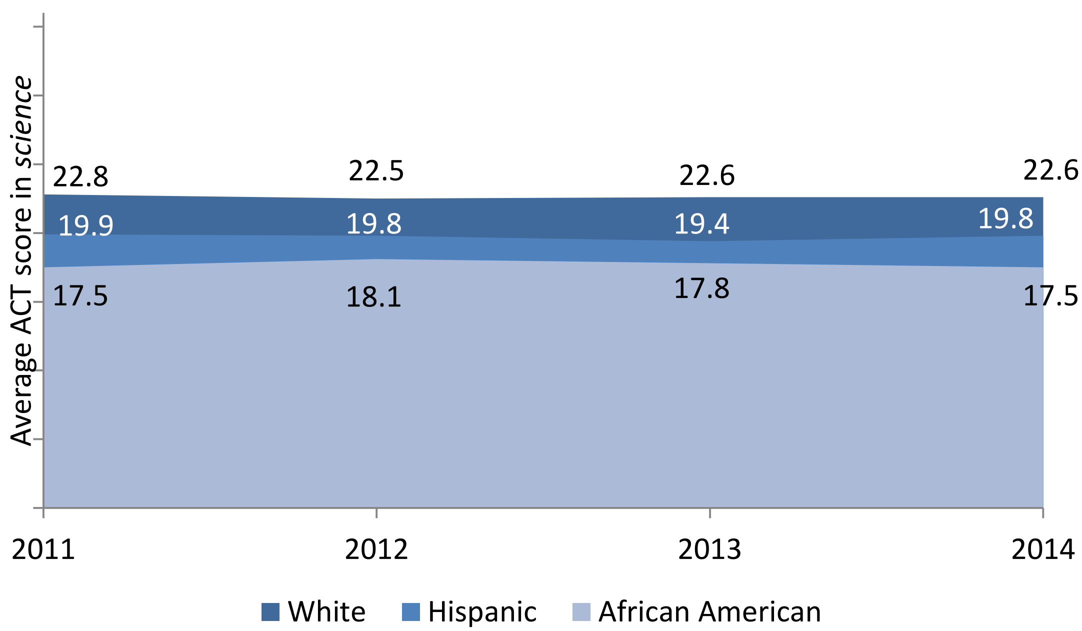


Figure 6. ACT scores in *science* by race and ethnicity

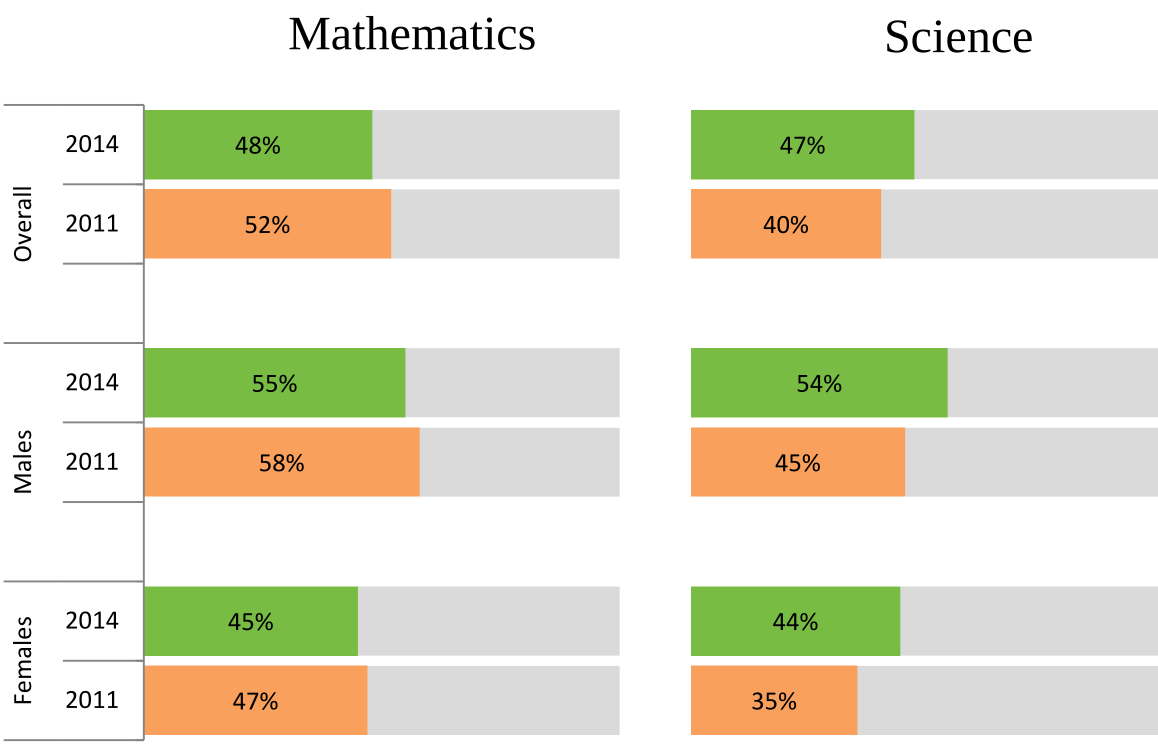


Figure 7. Percentage of Iowa graduating seniors meeting college readiness benchmarks in *mathematics* and *science* based on ACT scores by gender

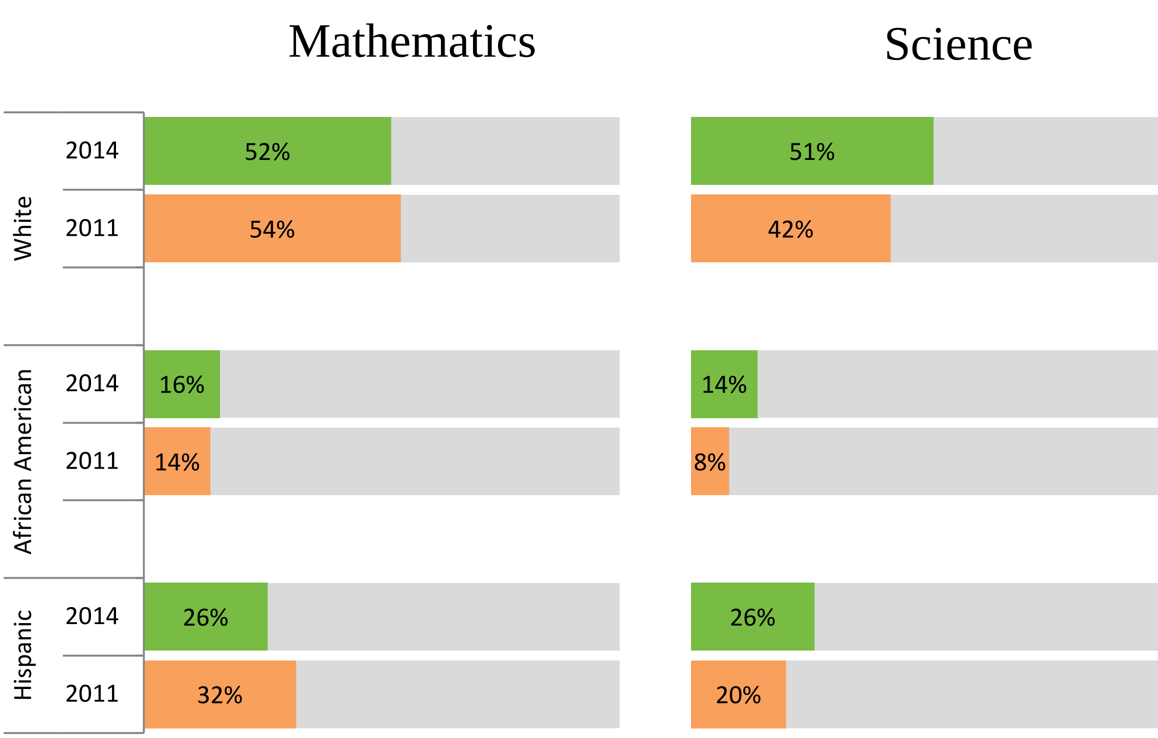


Figure 8. Percentage of Iowa graduating seniors meeting college readiness benchmarks in *mathematics* and *science* based on ACT scores by race/ethnicity

Indicator 4: Number of students taking STEM-related Advanced Placement (AP) tests and average scores

Data source College Board

Key findings

- From 2012 to 2014, the number of students taking Advanced Placement courses in STEM-related subjects increased from 4,968 to 5,600, as well as the number of students who qualified to receive college credit from these courses (from 3,197 in 2012 to 3,753 in 2014).

	2010	2011	2012	2013	2014
Number receiving STEM-related college credit	2,711	2,893	3,197	3,461	3,753
Number taking AP STEM-related courses	4,380	4,625	4,968	5,355	5,600

- The number of students taking the exam has increased over time in all STEM-related subjects tracked for the purposes of this indicator (Table 9).
- Comparing 2012 (the year immediately preceding statewide STEM programming) to 2014, the proportion of students scoring 3 or better on the Biology AP exam increased in Biology, Calculus AB, Calculus BC, Computer Science A, and Statistics. However, the proportion decreased in Chemistry, Environmental Science, and all Physics courses.

Table 9. Percentage of Iowa high school students scoring 3 or higher on Advanced Placement exams in STEM-related topics[1]

	2010 % (n)[2]	2011 % (n)	2012 % (n)	2013 % (n)	2014 % (n)
Biology	54% (525)	57% (531)	55% (588)	70% (735)	75% (877)
Calculus AB	58% (696)	59% (767)	65% (889)	59% (821)	61% (872)
Calculus BC	87% (239)	81% (227)	82% (245)	77% (290)	85% (311)
Chemistry	55% (425)	57% (493)	56% (481)	58% (462)	55% (461)
Computer Science A	81% (65)	79% (57)	77% (53)	80% (94)	83% (99)
Environmental Science	68% (96)	65% (140)	66% (184)	56% (227)	54% (217)
Physics B	76% (238)	72% (240)	73% (243)	71% (277)	69% (278)
Physics C: Elec. & Magnet.	85% (23)	90% (9)	93% (25)	61% (27)	82% (31)
Physics C: Mechanics	70% (53)	81% (63)	87% (78)	67% (79)	77% (89)
Statistics	68% (351)	68% (366)	70% (411)	69% (449)	71% (518)

Source: AP Program Participation and Performance Data, 2010-2014, College Board

Retrieved from: http://research.collegeboard.org/programs/ap/data

1. College-level Advanced Placement (AP) courses are available to Iowa high school students through College Board in 22 subject areas. Optional tests are included with the AP courses. Scores can range from 1 to 5, with 3 or better indicating that the student is qualified to receive college credit in that topic. Percentages reflect the proportion of test takers within each subject who scored 3 or higher on that subject exam.
2. Number in parentheses indicates the numerator in the proportion.

Indicator 5: Interest in STEM among ACT test-takers

Data source ACT, Inc.

This indicator uses an aggregated sample of students who have an expressed and/or measured interest in STEM content. A student who has an expressed interest in STEM is choosing a major or occupation that corresponds with STEM fields. A measured interest utilizes the ACT Interest Inventory, an inventory administered with the ACT that determines interest in different occupations and majors.

The four STEM areas categorized by ACT include: science, computer science/math, medical and health, and engineering and technology.

> *Science* includes majors and occupations in the traditional hard sciences, as well as sciences involving the management of natural resources. This also includes science education.
>
> *Computer science/math* includes majors and occupations in the computer sciences, as well as general and applied mathematics. This also includes mathematics education.
>
> *Engineering* and technology includes majors and occupations in engineering and engineering technologies.
>
> *Medical and health* includes majors and occupations in the health sciences and medical technologies.

Results for this indicator do not include students who have expressed and/or measured interest in other subject areas. Note that the ACT is not taken by all students in Iowa, and mostly by those who are college-bound. In 2014, the proportion of Iowa's graduating class who had taken the ACT was 68%.

Key findings

- Interest in STEM is high, with almost half (49%) of students in the 2014 ACT-tested graduating class having an expressed and/or measured interest in STEM majors or occupations (Table 10).
- Compared to the 2010 ACT-tested graduating class, a greater percentage of students in the 2014 ACT-tested graduating class have an expressed and/or measured interest in STEM, from 47% in 2010 to 49% in 2014. This trend is also observed across all demographic subgroups:
    - Compared to the 2010 ACT-tested graduating class, the proportion increased by 3 percentage points among males, +2% among females, +4% among students who are African American, and +2% among students who are Hispanic in the 2014 ACT-tested graduating class.

- Among all students who have an expressed and/or measured interest in STEM, 44% are in the area of medical and health, 24% in science, 22% in technology/engineering, and 10% in computer science/math (Figure 9).
    - Compared to males who have interest in STEM more evenly distributed across individual STEM topic areas and where the greatest percentage of 37% is in the area of technology and engineering, 61% of female interest is in the area of medical and health.
- The distribution of interest in STEM topic areas among students who are African American or Hispanic mirrors the distribution across topic areas among all students combined.
    - For African American students, 17% have an expressed and/or measured interest in science, 21% in technology/engineering, 10% in computer science/math, and 53% in medical and health.
    - For Hispanic students, 24% have an expressed and/or measured interest in science, 20% in technology/engineering, 8% in computer science/math, and 47% in medical and health.

Table 10. Percentage of Iowa high school students who have taken the ACT with an expressed and/or measured interest in STEM-related topics, 2010-2014[1]

STEM Interest		2010	2011	2012	2013	2014	Trend since 2010
All STEM	All Students	47%	48%	48%	49%	49%	⇧
	Male	51%	52%	52%	52%	54%	⇧
	Female	44%	45%	45%	46%	46%	⇧
	White	48%	49%	49%	49%	50%	⇧
	African American	38%	40%	41%	43%	42%	⇧
	Hispanic	46%	48%	48%	49%	48%	⇧
Science	All Students	24%	25%	25%	25%	24%	⇔
	Male	24%	24%	24%	22%	23%	⇩
	Female	25%	25%	26%	27%	26%	⇧
	White	24%	25%	25%	25%	25%	⇧
	African American	18%	21%	17%	15%	17%	⇩
	Hispanic	23%	23%	24%	22%	24%	⇧
Technology and Engineering	All Students	23%	22%	22%	22%	22%	⇩
	Male	38%	38%	37%	39%	37%	⇩
	Female	8%	7%	7%	6%	7%	⇩
	White	23%	23%	22%	22%	23%	⇔
	African American	23%	18%	26%	22%	21%	⇩
	Hispanic	24%	27%	18%	23%	20%	⇩
Computer Science/ Math	All Students	10%	10%	9%	10%	10%	⇔
	Male	14%	13%	13%	14%	14%	⇔
	Female	6%	6%	5%	5%	5%	⇩
	White	10%	9%	9%	10%	10%	⇔
	African American	11%	9%	7%	11%	10%	⇩
	Hispanic	10%	8%	9%	9%	8%	⇩
Medical and Health	All Students	43%	43%	44%	43%	44%	⇧
	Male	24%	25%	26%	25%	26%	⇧
	Female	61%	62%	61%	61%	61%	⇔
	White	43%	43%	43%	43%	43%	⇔
	African American	48%	51%	49%	52%	53%	⇧
	Hispanic	44%	43%	49%	47%	47%	⇧

Source: ACT, Inc.

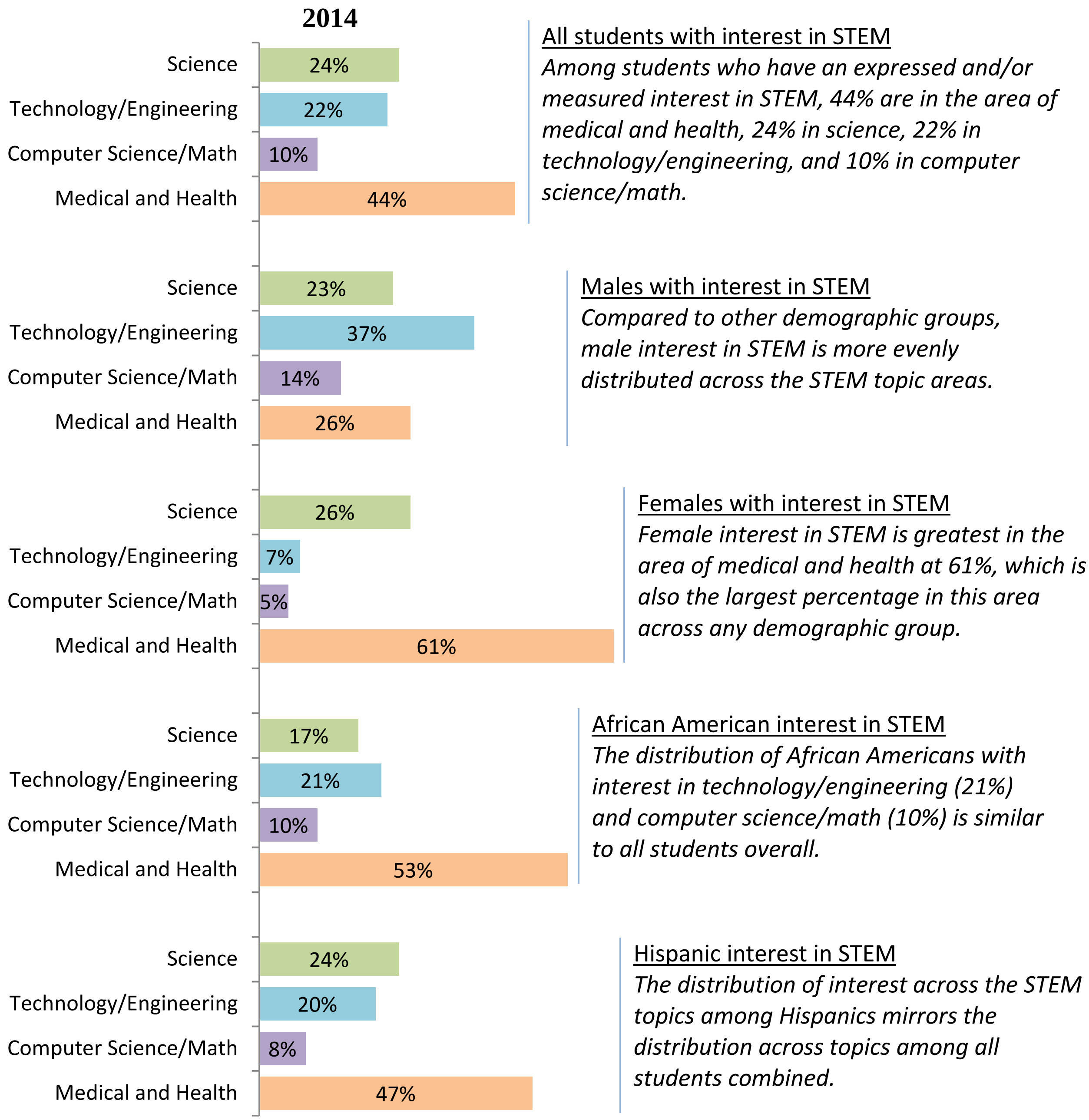


Figure 9. Percentage of Iowa high school students who took the ACT in 2014 who have expressed and/or measured interest in STEM-related topics

Indicator 6: Educational aspirations of ACT test-takers with interest in STEM

Data source ACT, Inc.

This indicator uses an aggregated sample of students who have an expressed and/or measured interest in STEM only. A student who has an expressed interest in STEM is choosing a major or occupation that corresponds with STEM fields. A measured interest utilizes the ACT interest inventory, an inventory delivered with the ACT that determines inherent interest in different occupations and majors. Results do not include students who have expressed and/or measured interest in alternative subject areas. Note that the ACT is not taken by all students in Iowa, and mostly by those who are college-bound. In 2014, the proportion of Iowa's graduating class who had taken the ACT was 68%.

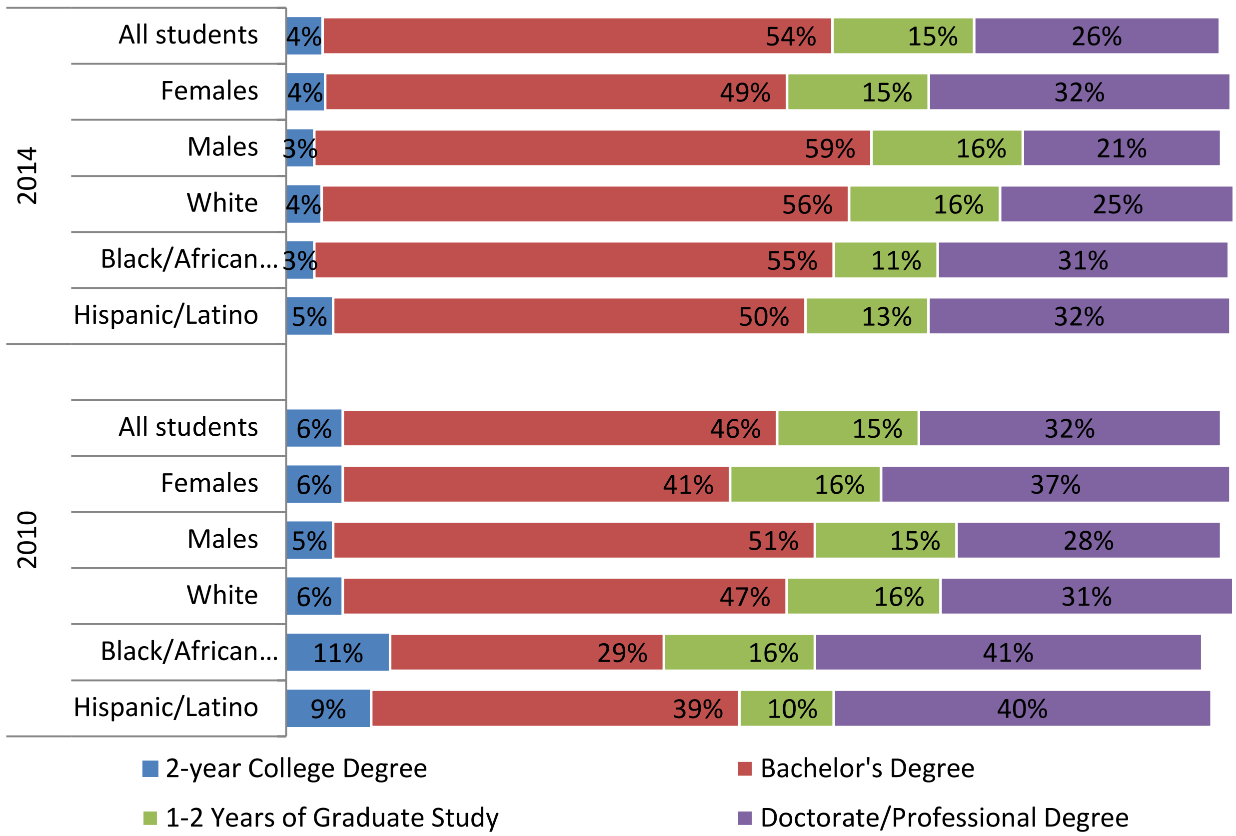
Key findings

- Among students who have an expressed and/or measured interest in STEM, 54% aspire to obtain a bachelor's degree, 15% a master's degree, and 26% a doctorate or professional degree (Table 11).
- Compared to five years ago, a greater proportion of students with an expressed and/or measured interest in STEM have educational aspirations for a bachelor's degree, with proportionally fewer students intending to pursue a doctorate or professional degree (Figure 10). Said another way, while the percentage of students in 2014 with an interest in pursuing a doctorate degree in STEM is lower than in 2010, 54% of students aspire to a bachelor's degree compared to 46% five years ago. This may reflect a growing awareness of STEM careers accessible with a bachelor's degree.
- The biggest proportional increase in educational intent from 2010 to 2014 of those interested in STEM was among students who were African American, among whom 29% aspired to a bachelor's degree in 2010 to 55% in 2014, and from 39% of Hispanic students in 2010 to 50% in 2014.

Table 11. Educational aspirations among Iowa high school students who took the ACT with an expressed and/or measured interest in STEM-related topics, 2010-2014

Group	Degree Intention	2010	2011	2012	2013	2014	Trend since 2010
All Students	Vocational/Tech (< 2 years)	>1%	>1%	>1%	>1%	>1%	↔
	Two-Year College Degree	6%	4%	3%	4%	4%	↓
	Bachelor's Degree	46%	49%	53%	55%	54%	↑
	1-2 Years of Grad Study	15%	15%	16%	14%	15%	↔
	Doctorate/ Prof. Degree	32%	31%	27%	27%	26%	↓
Males	Vocational/Tech (< 2 years)	1%	1%	1%	1%	1%	↔
	Two-Year College Degree	5%	4%	3%	4%	3%	↓
	Bachelor's Degree	51%	55%	57%	60%	59%	↑
	1-2 Years of Grad Study	15%	15%	16%	15%	16%	↑
	Doctorate/ Prof. Degree	28%	25%	23%	20%	21%	↓
Females	Vocational/Tech (< 2 years)	>1%	>1%	>1%	>1%	>1%	↔
	Two-Year College Degree	6%	4%	4%	4%	4%	↓
	Bachelor's Degree	41%	44%	50%	49%	49%	↑
	1-2 Years of Grad Study	16%	15%	15%	14%	15%	↓
	Doctorate/ Prof. Degree	37%	36%	31%	33%	32%	↓
White	Vocational/Tech (< 2 years)	>1%	>1%	>1%	>1%	>1%	↔
	Two-Year College Degree	6%	4%	3%	4%	4%	↓
	Bachelor's Degree	47%	51%	55%	56%	56%	↑
	1-2 Years of Grad Study	16%	15%	16%	15%	16%	↔
	Doctorate/ Prof. Degree	31%	29%	25%	25%	25%	↓
African American	Vocational/Tech (< 2 years)	2%	3%	2%	2%	>1%	↓
	Two-Year College Degree	11%	4%	4%	6%	3%	↓
	Bachelor's Degree	29%	38%	46%	50%	55%	↑
	1-2 Years of Grad Study	16%	13%	12%	12%	11%	↓
	Doctorate/ Prof. Degree	41%	42%	35%	31%	31%	↓
Hispanic	Vocational/Tech (< 2 years)	2%	1%	>1%	1%	>1%	↓
	Two-Year College Degree	9%	5%	5%	5%	5%	↓
	Bachelor's Degree	39%	46%	49%	53%	50%	↑
	1-2 Years of Grad Study	10%	13%	13%	11%	13%	↑
	Doctorate/ Prof. Degree	40%	35%	33%	31%	32%	↓

Source: ACT, Inc.



Note: Degree intentions for a vocational or technology degrees/certificates not shown in figure due to less than or equal to 1% of population for all years and subgroups (see Table 11).

Figure 10. Educational aspirations of the ACT-tested graduating class in 2010 and in 2014 with an expressed and/or measured interest in STEM-related topics

Indicator 7: Top 5 majors among ACT test-takers with interest in STEM

Data source ACT, Inc.

This indicator uses an aggregated sample of students who have an expressed and/or measured interest in STEM only. A student who has an expressed interest in STEM is choosing a major or occupation that corresponds with STEM fields. A measured interest utilizes the ACT interest inventory, an inventory delivered with the ACT that determines inherent interest in different occupations and majors. Results do not include students who have expressed and/or measured interest in alternative subject areas. Note that the ACT is not taken by all students in Iowa, and mostly by those who are college-bound. In 2014, the proportion of Iowa's graduating class who had taken the ACT was 68%.

Key findings

- Among the top five majors indicated by the 2014 ACT-tested graduating class with an expressed and/or measured interest in STEM, four were in health and medical fields and one was in engineering (Table 12), specifically: nursing, pre-medicine, physical therapy, athletic training, and mechanical engineering.
- In 2014, the top five majors for females with interest in STEM were in health-related fields (nursing, medicine, and physical therapy), animal sciences, and veterinary medicine. For males with interest in STEM, the top five majors were engineering (mechanical and general), medicine, athletic training, and computer science and programming.
- Athletic training has become a more popular major over the past five years for all subgroups except for females.

Table 12. Change in top 5 majors among ACT-tested graduating class in 2010 and 2014 who have expressed and/or measured interest in STEM

Group	2010	2014
All Students	1. Nursing, Registered (B.S. /R.N.) 2. Medicine (Pre-Medicine) 3. Physical Therapy 4. Biology, General 5. Engineering, General	1. Nursing, Registered (B.S. /R.N.) 2. Medicine (Pre-Medicine) 3. Physical Therapy 4. Athletic Training 5. Mechanical Engineering
Males	1. Engineering, General 2. Computer Science & Programming 3. Physical Therapy 4. Medicine (Pre-Medicine) 5. Engineering Technology, General	1. Mechanical Engineering 2. Athletic Training 3. Medicine (Pre-Medicine) 4. Computer Science & Programming 5. Engineering, General
Females	1. Nursing, Registered (B.S. /R.N.) 2. Medicine (Pre-Medicine) 3. Physical Therapy 4. Biology, General 5. Physical Sciences, General	1. Nursing, Registered (B.S. /R.N.) 2. Medicine (Pre-Medicine) 3. Physical Therapy 4. Animal Sciences 5. Veterinary Medicine (Pre-Vet)
White	1. Nursing, Registered (B.S. /R.N.) 2. Physical Therapy 3. Medicine (Pre-Medicine) 4. Biology, General 5. Engineering, General	1. Nursing, Registered (B.S. /R.N.) 2. Medicine (Pre-Medicine) 3. Physical Therapy 4. Athletic Training 5. Mechanical Engineering
African American	1. Nursing, Registered (B.S. /R.N.) 2. Medicine (Pre-Medicine) 3. Physical Therapy 4. Nursing, Practical/Vocational (LPN) 5. Computer Science & Programming	1. Medicine (Pre-Medicine) 2. Nursing, Registered (B.S. /R.N.) 3. Athletic Training 4. Health/Medical Technology, General 5. Pharmacy (Pre-Pharmacy)
Hispanic/ Latino	1. Nursing, Registered (B.S. /R.N.) 2. Medicine (Pre-Medicine) 3. Engineering, General 4. Physical Therapy 5. Biology, General	1. Nursing, Registered (B.S. /R.N.) 2. Medicine (Pre-Medicine) 3. Athletic Training 4. Biology, General 5. Physical Therapy

Indicator 8: Number and percentage of students in grades 3-5, grades 6-8, and grades 9-12 interested in STEM topics and careers

Data source Iowa Assessments, Iowa Testing Programs, The University of Iowa

Key findings

- Among all students statewide, interest in individual STEM topics or in pursuing STEM careers started high in 2012-2013, and has remained high in 2013-2014 and 2014-2015. Approximately 75% of all students indicated they were *very interested* or *somewhat interested* in an individual STEM topic or in pursuing a STEM career in Year 1, Year 2, and Year 3 (Figure 11).
- Among all students statewide who took the Iowa Assessments, interest in the four STEM subjects and STEM careers was highest among elementary students followed by middle school and high school students (Figure 12).
- More information and other results from the interest inventory can be found in Section 3. Statewide Student Interest Inventory, Section 4.2 Report of Participant Information, and Appendix A.

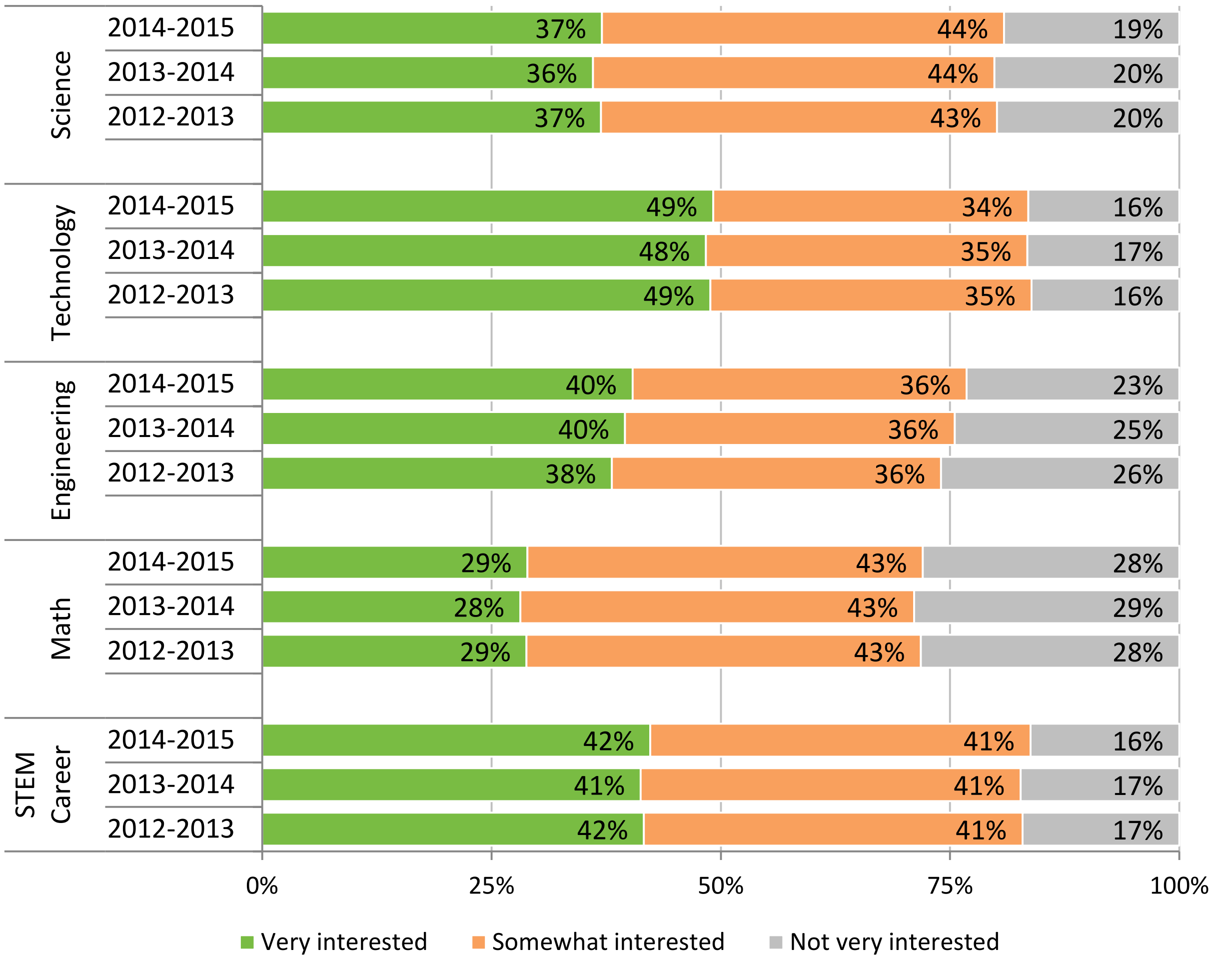


Figure 11. Statewide student interest in individual STEM topics and STEM careers, Year 1 to Year 3

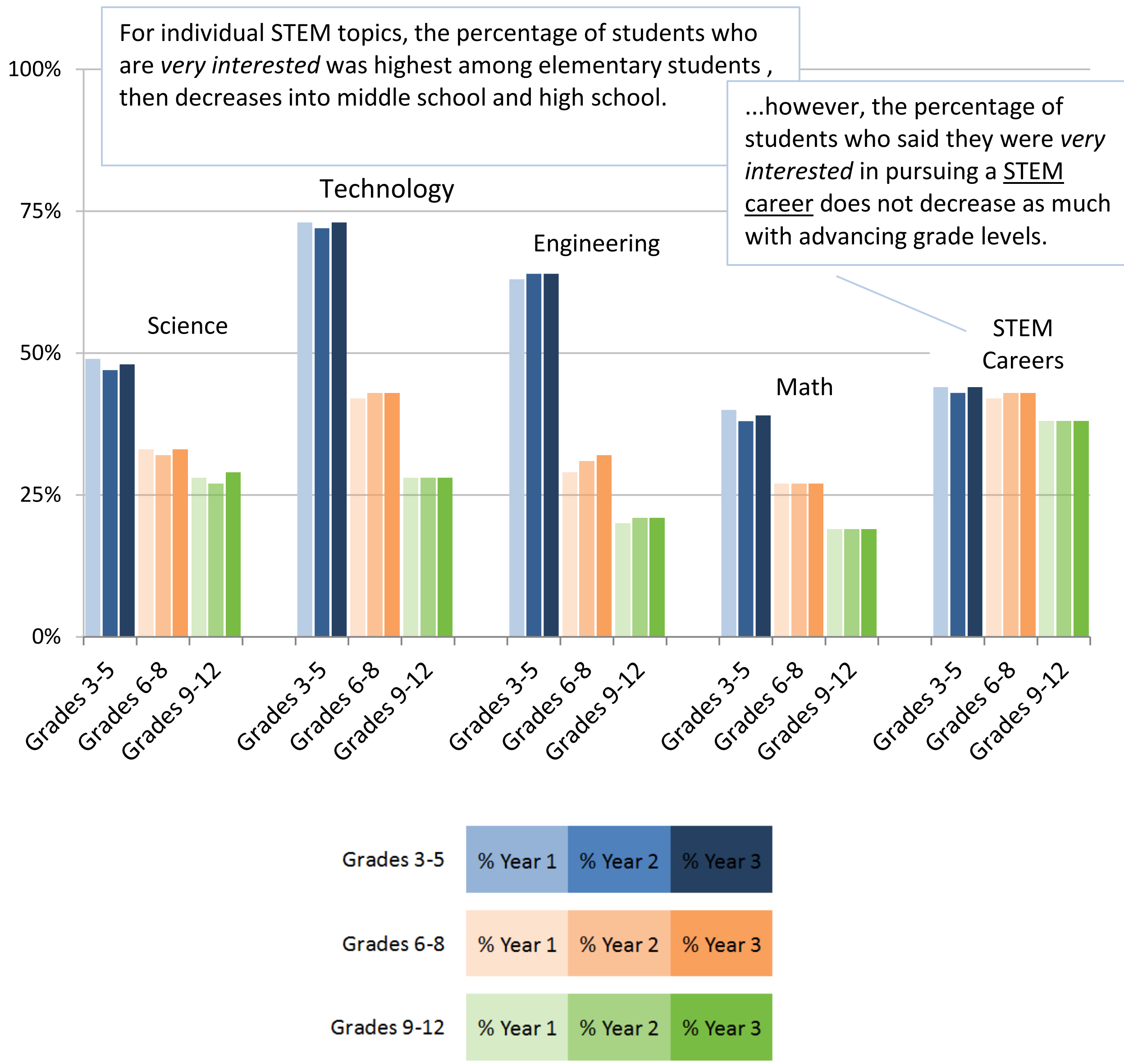


Figure 12. Proportion of students statewide who said they were *very interested* in STEM topics and STEM careers by grade group, Year 1 to Year 3

Indicator 9: Number of current Iowa teachers with licensure in STEM-related subjects

Data source Basic Educational Data Survey (BEDS), Bureau of Information and Analysis Services, Iowa Department of Education

Indicator 9 examines the preparation and qualifications of STEM-related high school teachers in terms of the level or type of licensure they hold. Teachers of STEM-subjects were defined as those who teach STEM subjects within a specified list of SCED codes related to NAEP definitions (See Appendix B). License types reflect career progress from beginning teachers ("Initial") to full professionals ("Standard") and beyond ("Master Educator").

Key findings

- Since 2011-12, the first year of the Governor's STEM Advisory Council, the total number of licensed high school teachers charged with teaching STEM-related courses has decreased by 9% (Table 13).
  - This is primarily due to a decline in the number of high school STEM-related teachers with standard licenses.
  - This decline does not seem to have impacted student enrollment in STEM-related courses. As illustrated in Indicator 13, the number of high school students enrolled in math, science, and engineering courses has actually increased from 2011-2012 to 2014-2015 (Table 13).
- In the past year, the total number of licensed high school STEM-related teachers in Iowa increased by approximately 1.3% between 2013-2014 (Year 2) and 2014-2015 (Year 3).
  - The number of high school teachers with *initial* licenses in STEM-subject areas increased by approximately 9.4%.
  - The number of high school teachers with *standard* licenses in STEM-subject areas remained relatively the same.
  - The number of high school teachers with *master educator* licenses in STEM-subject areas remained relatively the same.
  - In summation, while there was only a slight increase in licensed high school STEM-related teachers between 2013-2014 (Year 2) and 2014-2015 (Year 3), the growth was concentrated primarily in new teachers.

Table 13. Distribution of teacher licensures: Iowa teachers in STEM-subject areas, 2011-2015

	2011-2012	2012-2013	2013-2014	2014-2015	% Change since 2011-2012
Initial	135	171	139	152	13%
Standard	1,213	1,202	999	1,005	-17%
Master Educator[1]	631	646	646	648	3%
Others[2]	50	48	42	44	-12%
	2,029	**2,067**	**1,826**	**1,849**	**-9%**

Source: Iowa Department of Education, Bureau of Information and Analysis Services, Basic Educational Data Survey (BEDS), 2015

Data notes: 1. Teachers with a "Permanent Professional" license are included in this group.

2. Others includes the following licenses: Career and Technical, Class A, Class E, Nontraditional Exchange, One-Year Conditional, Professional Administrator, Regional Exchange, Substitute, and Teacher Intern.

No data were reported for Lisbon Community School District for 2010-11, 2011-12, and 2012-13.

No data were reported for Northeast Hamilton School District for 2013-14.

Table 14, Table 15, and Table 16 provide the number of STEM-related high school teachers by both content area and license type for the past five years.

- While the number of STEM teachers with a standard license declined 13% between 2011-2012 and 2014-2015, the number of newly licensed teachers (i.e. initial licenses) increased by approximately 15% between 2011-2012 and 2014-2015.
    - Between 2011-2012 and 2014-2015, the number of high school STEM teachers with initial licenses charged with teaching advanced **science** courses increased by approximately 12%.
    - Similarly, the number of STEM-related high school teachers with initial licenses charged with teaching advanced **math** courses increased by approximately 8%.
    - The number of **engineering** teachers with initial licenses more than doubled between 2011-2012 and 2014-2015.
- Of special note is the number of engineering teachers with master educator licenses, which increased by 46% between 2011-2012 and 2014-2015.
- Regardless of license type, math and science continue to be the content areas in which most STEM-related high school teachers teach.
- Regardless of license type, the number of STEM-related teachers responsible for teaching technology courses continues to decline. This decline aligns with the decline in the number of high school students enrolled in technology courses between 2011-2012 and 2014-2015 (See Indicator 13).

Table 14. Distribution of high school teachers with *initial* licenses by STEM content area, 2011-2015

	2011-2012	2012-2013	2013-2014	2014-2015	% Change since 2011-2012
Science	75	104	85	84	12%
Technology	10	16	6	5	-50%
Engineering	5	11	8	12	140%
Math	50	44	41	54	8%
Health	1	1	0	0	
TOTAL	**135**	**171**	**140**	**155**	**15%**

Source: Iowa Department of Education, Bureau of Information and Analysis Services, Basic Educational Data Survey (BEDS), 2015

Data notes: No data were reported for Lisbon Community School District for 2010-11, 2011-12, and 2012-13.

No data were reported for Northeast Hamilton Community School District for 2013-14.

The data do not present unique numbers for 2013-14 and 2014-15. Some teachers teach multiple STEM subjects (i.e., one teacher is responsible for both math and science courses), and therefore those teachers are counted more than once in these tables.

Table 15. Distribution of high school teachers with *standard* licenses by STEM content area, 2011-2015

	2011-2012	2012-2013	2013-2014	2014-2015	% Change since 2011-2012
Science	595	581	499	501	-16%
Technology	128	125	70	65	-50%
Engineering	115	123	96	92	-20%
Math	492	428	381	393	-20%
Health	0	1	0	0	
TOTAL	**1,213**	**1,202**	**1,046**	**1,051**	**-13%**

Source: Iowa Department of Education, Bureau of Information and Analysis Services, Basic Educational Data Survey (BEDS), 2015

Data notes: No data were reported for Lisbon Community School District for 2010-11, 2011-12, and 2012-13.

No data were reported for Northeast Hamilton Community School District for 2013-14.

The data do not present unique numbers for 2013-14 and 2014-15. Some teachers teach multiple STEM subjects (i.e., one teacher is responsible for both math and science courses), and therefore those teachers are counted more than once in these tables.

Table 16. Distribution of high school teachers with *master educator* licenses by STEM content area, 2010-2015

	2011-2012	2012-2013	2013-2014	2014-2015	% Change since 2011-2012
Science	303	296	310	312	3%
Technology	61	57	37	38	-38%
Engineering	41	55	60	60	46%
Math	256	272	273	271	6%
Health	0	1	0	0	
TOTAL	**631**	**646**	**680**	**681**	**8%**

Source: Iowa Department of Education, Bureau of Information and Analysis Services, Basic Educational Data Survey (BEDS), 2015

Data notes: No data were reported for Lisbon Community School District for 2010-11, 2011-12, and 2012-13.

No data were reported for Northeast Hamilton Community School District for 2013-14.

The data do not present unique numbers for 2013-14 and 2014-15. Some teachers teach multiple STEM subjects (i.e., one teacher is responsible for both math and science courses), and therefore those teachers are counted more than once in these tables.

Indicator 10: Number of current Iowa teachers with endorsement to teach STEM-related subjects

Data source Basic Educational Data Survey (BEDS), Bureau of Information and Analysis Services, Iowa Department of Education

Indicator 10 examines the preparation and qualifications of STEM-subject teachers in terms of the number and types of endorsements they hold in science, mathematics, and other STEM-related areas. This includes teachers with any science and/or mathematics endorsements, as well as teachers who hold content-specific science endorsements such as biology, chemistry, and physics, STEM-related areas of agriculture, health, and industrial technology, and grade-level science endorsements. There are no specific endorsements for content areas within mathematics such as algebra, calculus, etc. It is important to note that four new STEM-related endorsements were proposed and approved toward the end of the 2013-2014 academic year: 1) Engineering 5-12, 2) STEM K-8, 3) STEM 5-12, and 4) STEM Specialist K-12.

Key findings

- The number of teachers in Iowa with a teaching endorsement in a STEM-related area (Science, Technology, Math, Health Sciences, Agriculture) remained relatively stable from 2013-2014 to 2014-2015 (Table 17).
- The number of teachers who held at least one endorsement in an area of science or math increased by 4% between 2013-2014 and 2014-2015. This increase is noteworthy given that the number of students in Iowa remained stable between those years.
- In the first year of the new STEM endorsements, a total of three endorsements were granted – one in Engineering 5-12, one in STEM K-8 and one in STEM Specialist K-12 endorsement. Given the specific requirements for these endorsements and the time necessary to complete the requirements, these numbers should continue to increase as more individuals complete the requirements necessary for endorsement in these areas.

Table 17. Distribution of Iowa teachers with STEM-related subject endorsements, 2008-2015

STEM Endorsement	2008-2009	2009-2010	2010-2011	2011-2012	% Change 2008/09-2011/12	2012-2013	2013-2014	2014-2015	% Change 2011/12-2014/15
All Sciences	2,616	2,590	2,541	2,546	-3%	2,412	2,740	2,796	10%
All Math	2,768	2,772	2,768	2,824	2%	2,713	3,083	3,191	13%
Biology 5-12	1,599	1,575	1,527	1,533	-4%	1,427	1,560	1,573	3%
Chemistry 5-12	998	994	940	947	-5%	880	970	971	3%
Physics 5-12	652	642	600	585	-10%	525	588	565	-3%
Agriculture 5-12[1]	299	298	280	284	-5%	259	307	313	10%
Health 5-12[2]	21	28	26	28	33%	24	27	28	0%
Industrial Technology 5-12	609	587	558	537	-12%	483	522	515	-4%
Ag, Health & Tech 5-12	929	913	864	849	-9%	766	856	856	1%
Science-Elementary	569	561	563	551	-3%	529	590	587	7%
Science-Secondary	2,123	2,092	2,030	2,022	-5%	1,880	2,065	2,051	1%
Science-Middle	37	44	61	88	138%	109	230	307	249%

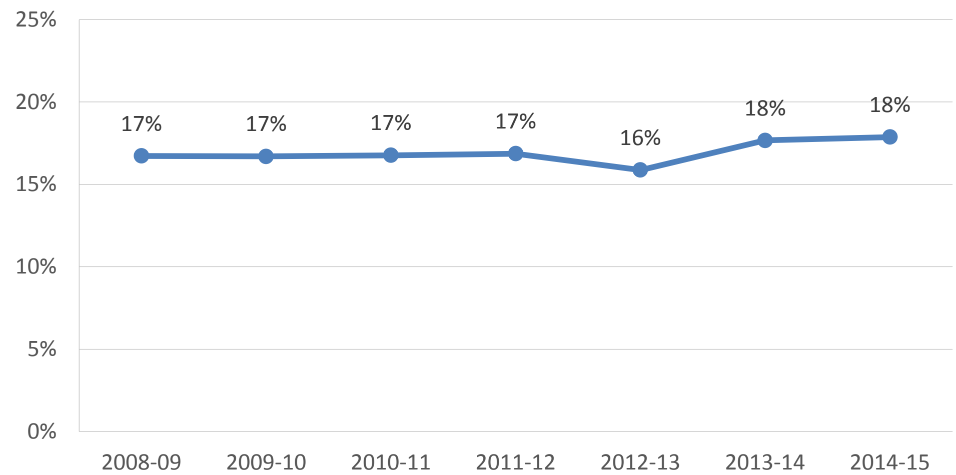
Source: Iowa Department of Education, Bureau of Information and Analysis Services, Basic Educational Data Survey (BEDS), 2015

Data notes: Agriculture 5-12 consists of two endorsements: Agriculture 5-12 and Agriscience/Agribusiness 5-12

Health 5-12 consists of two endorsements: Health Occupations 5-12 and General Health Occupations 5-12

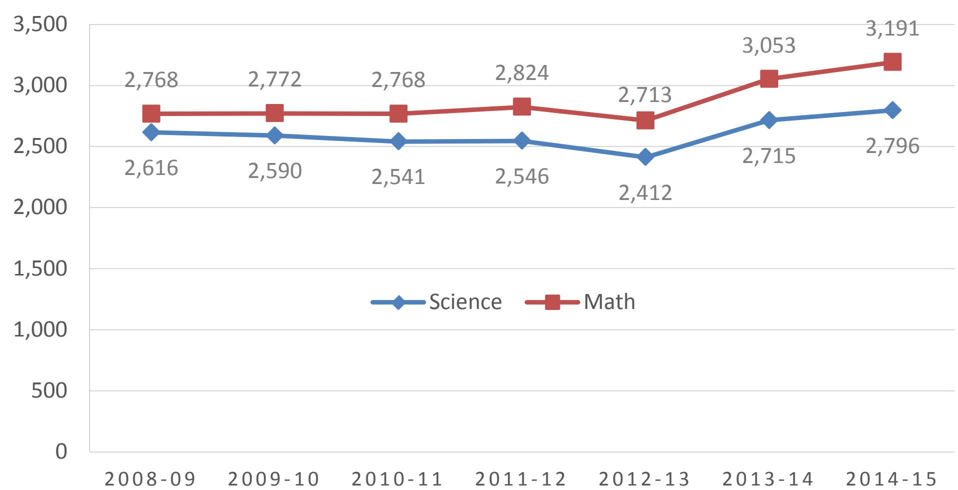
Annual change has occurred between 2008-2009 and 2014-2015 among all STEM endorsement areas. Key findings highlighted in this section reflect change prior to the establishment of the Governor's STEM Advisory Council as well as after the establishment of the Governor's STEM Advisory Council.

- The percentage of Iowa teachers with at least one endorsement in a STEM-related area has increased by 1% between 2011-2012 and 2014-2015. Between 2009-2010 and 2011-2012, the percentage of teachers with a STEM endorsement only increased a quarter of a percentage point (Figure 13).
- The greatest growth observed over time has been in the number of teachers with at least one math endorsement (Figure 14). That number increased by 2% from 2008-2009 to 2011-2012. Since the establishment of the Governor's STEM Advisory Council in 2011-2012, the number of teachers in Iowa with at least one math endorsement has increased by an additional 13%.
- The number of teachers with at least one science endorsement has also increased over time. Between 2008-2009 and 2011-2012, the number of teachers with at least one science endorsement decreased by 3%. However, between 2011-2012 and 2014-2015, the number of teachers with at least one science endorsement increased by 10%.
- The number of teachers with middle school science endorsements has continued to rise, an increase of 138% from 2008-2009 to 2011-2012, and 249% from 2011-2012 to 2014-2015 (Figure 16).



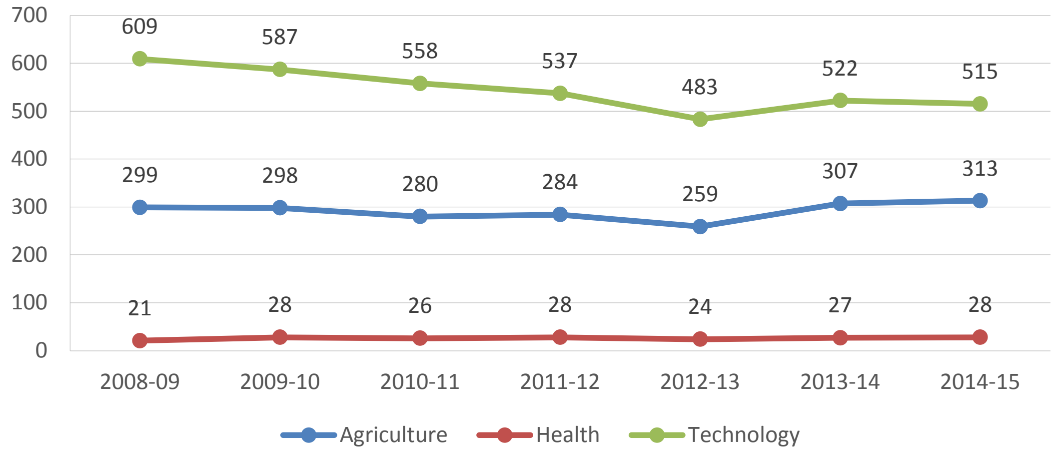
Data source: Basic Educational Data Survey (BEDS), Iowa Department of Education, April 2015

Figure 13. Percentage of K-12 teachers in Iowa with at least one STEM-related endorsement



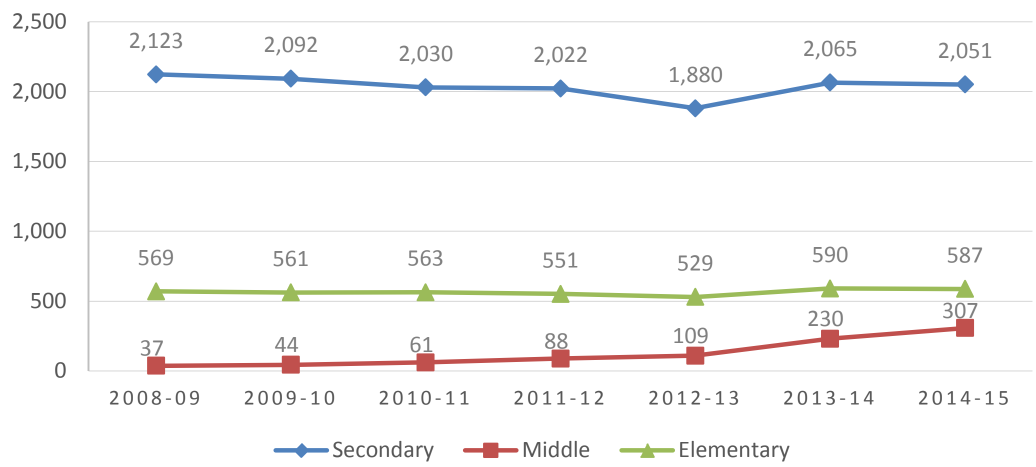
Data source: Basic Educational Data Survey (BEDS), Iowa Department of Education, April 2015

Figure 14. Number of Iowa teachers with an endorsement in math or science



Data source: Basic Educational Data Survey (BEDS), Iowa Department of Education, April 2015

Figure 15. Number of Iowa teachers with an endorsement in a STEM-subject area



Data source: Basic Educational Data Survey (BEDS), Iowa Department of Education, April 2015

Figure 16. Number of Iowa teachers by grade level with an endorsement in science

Maps for Indicator 10 show the geographical distributions of teachers with STEM-subject related endorsements in science, mathematics, biology, chemistry, physics, agriculture, and technology for 2014-15 (Figures 18-24).

Because the ongoing process of district reorganization and/or consolidation creates boundary changes over time, the decision was made to begin data mapping using the 2012-2013 district structure (n=348) which was the most recent district structure when the Iowa STEM Monitoring Project began. Districts that consolidated since 2008-2009 are represented by their current boundaries and data from the previously separate districts have been aggregated and reported under their current configuration. In 2014-2015, seven more districts merged/consolidated and one district was dissolved reducing the number of districts to 338. For a full list of district mergers and consolidations since 2008-2009 see Appendix C.

In reviewing the maps, it is important to note that all of the districts that reported no teachers endorsed in mathematics or science are districts that do not include grades 7-12. Most often, this reflects a school that participates in whole grade sharing and sends their students in grades 7-12 to a different district for instruction. However, there are some districts that do not have grades 7-12, but have STEM-subject related endorsed teachers; their numbers are reported on the maps.

- There continues to be an uneven distribution of teachers with math/science endorsements, and even some districts with no endorsements.
- Biology appears to be the most prevalent course-specific endorsement across the state whereas agriculture appears to be the least prevalent endorsement.
- However, the percentage of districts with at least one teacher with an agriculture endorsement (Agriculture 5-12 or Agriscience/Agribusiness 5-12) increased from 64% in 2013-2014 to 72% in 2014-2015.

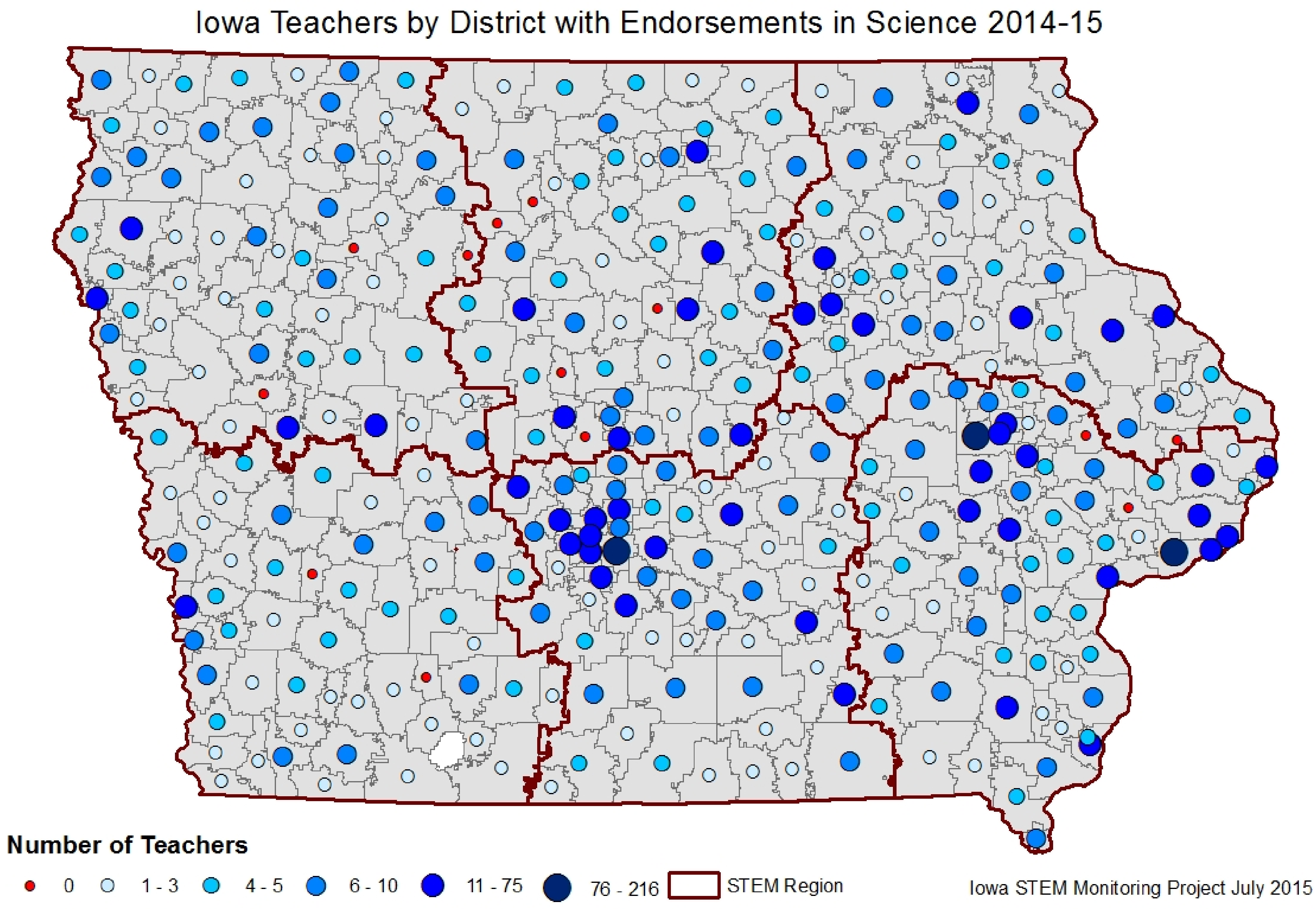


Figure 17. Iowa teachers by district with endorsements in science, 2014-2015

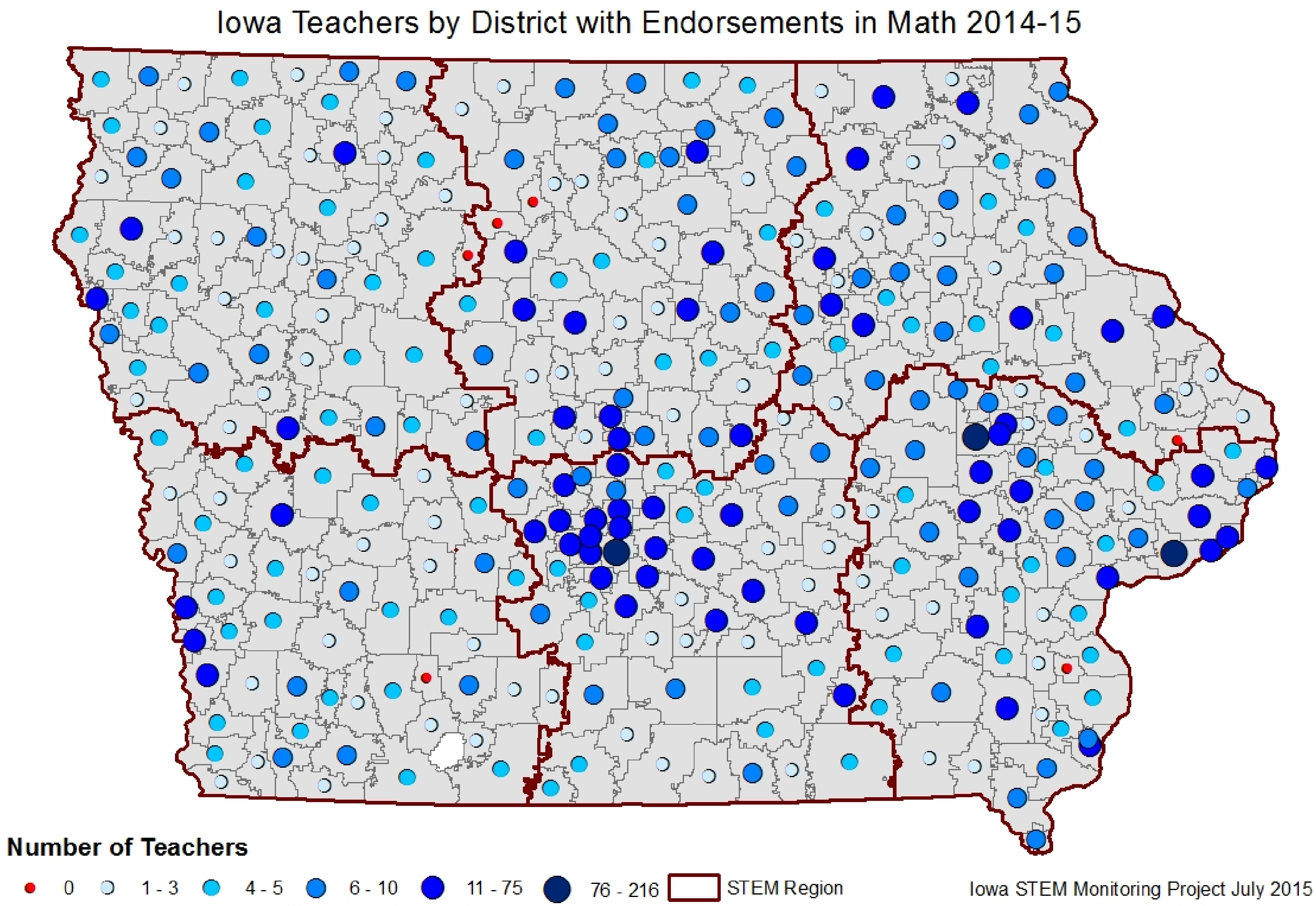


Figure 18. Iowa teachers by district with endorsements in math, 2014-2015

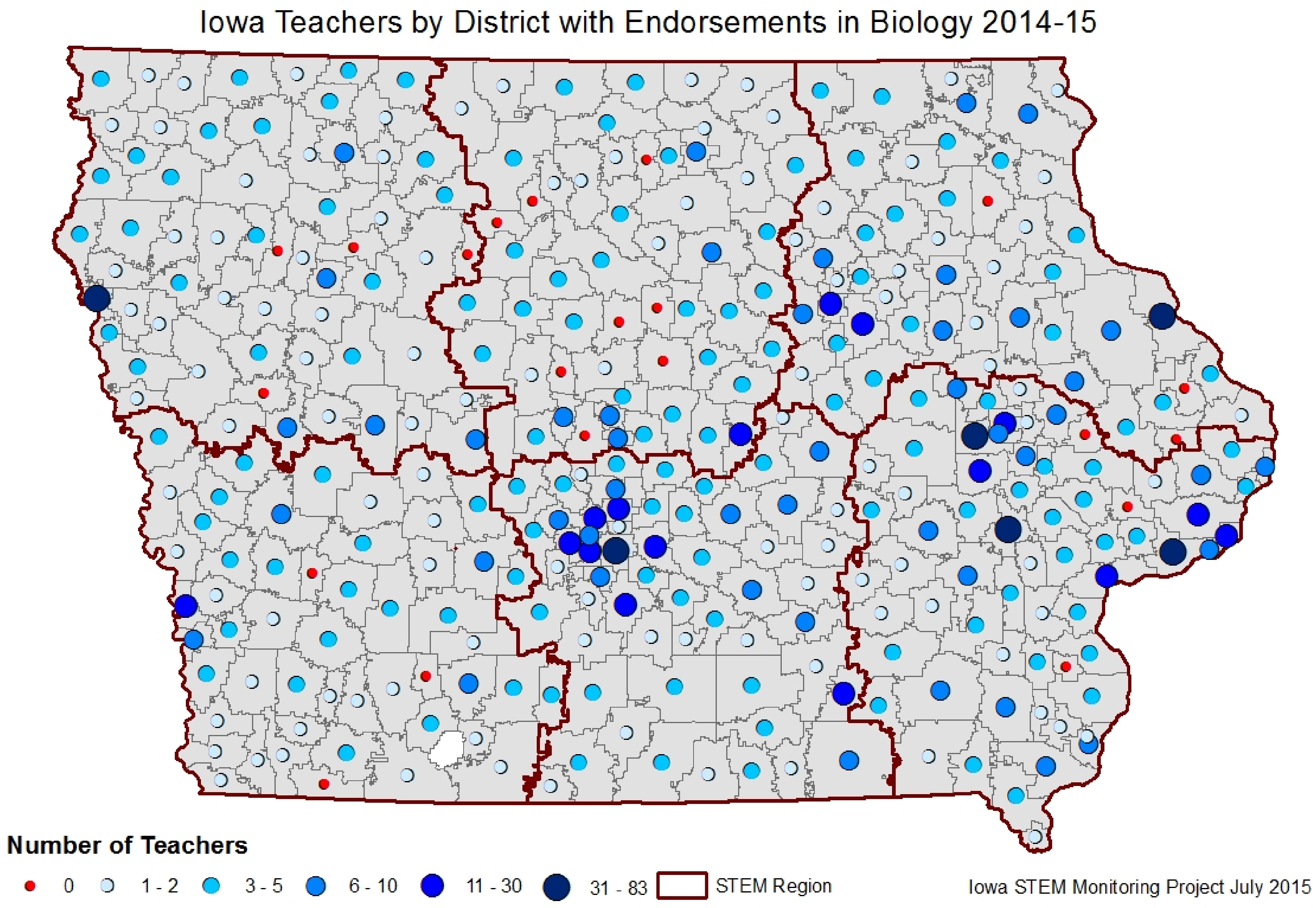


Figure 19. Iowa teachers by district with endorsements in biology, 2014-2015

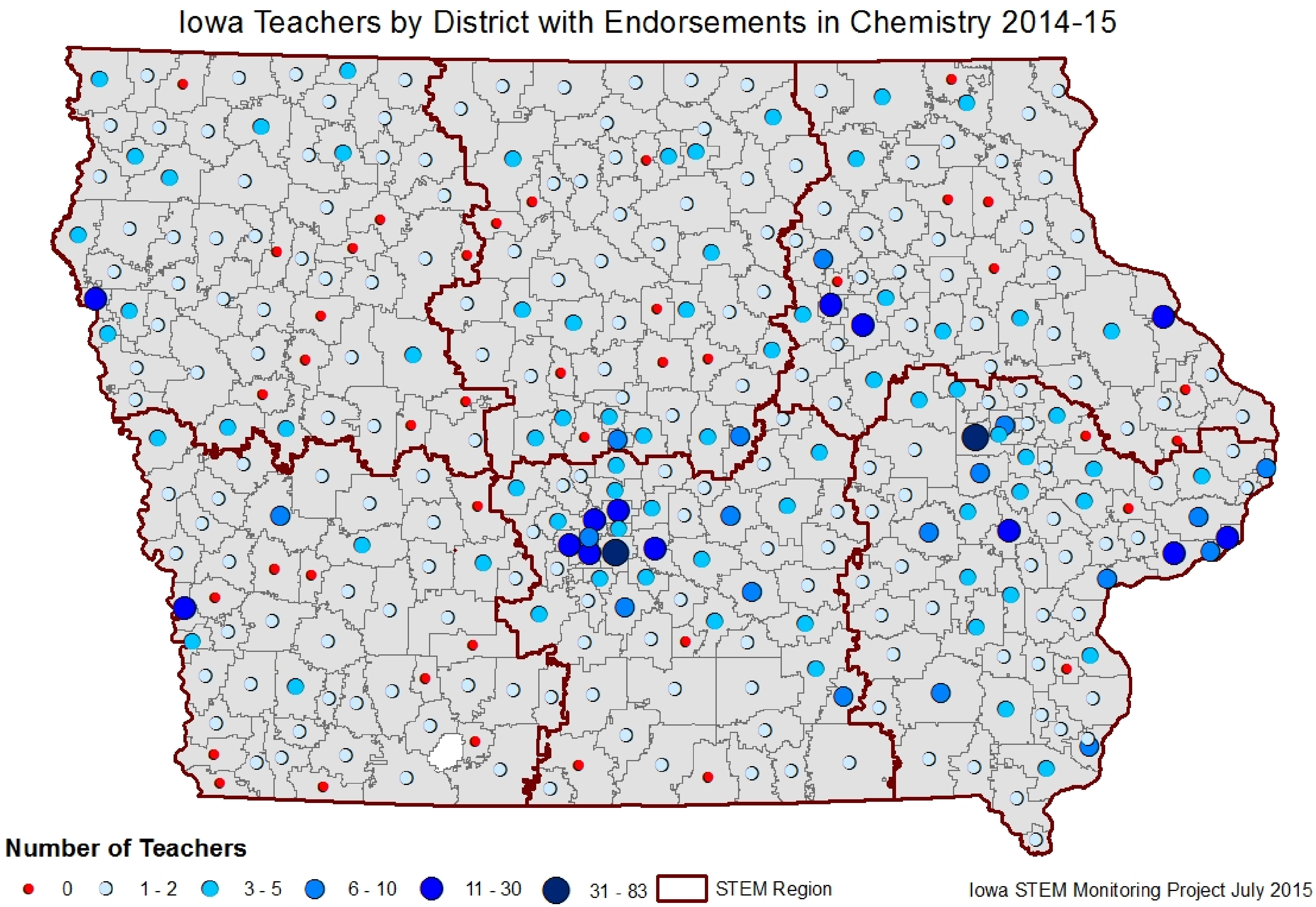


Figure 20. Iowa teachers by district with endorsements in chemistry, 2014-2015

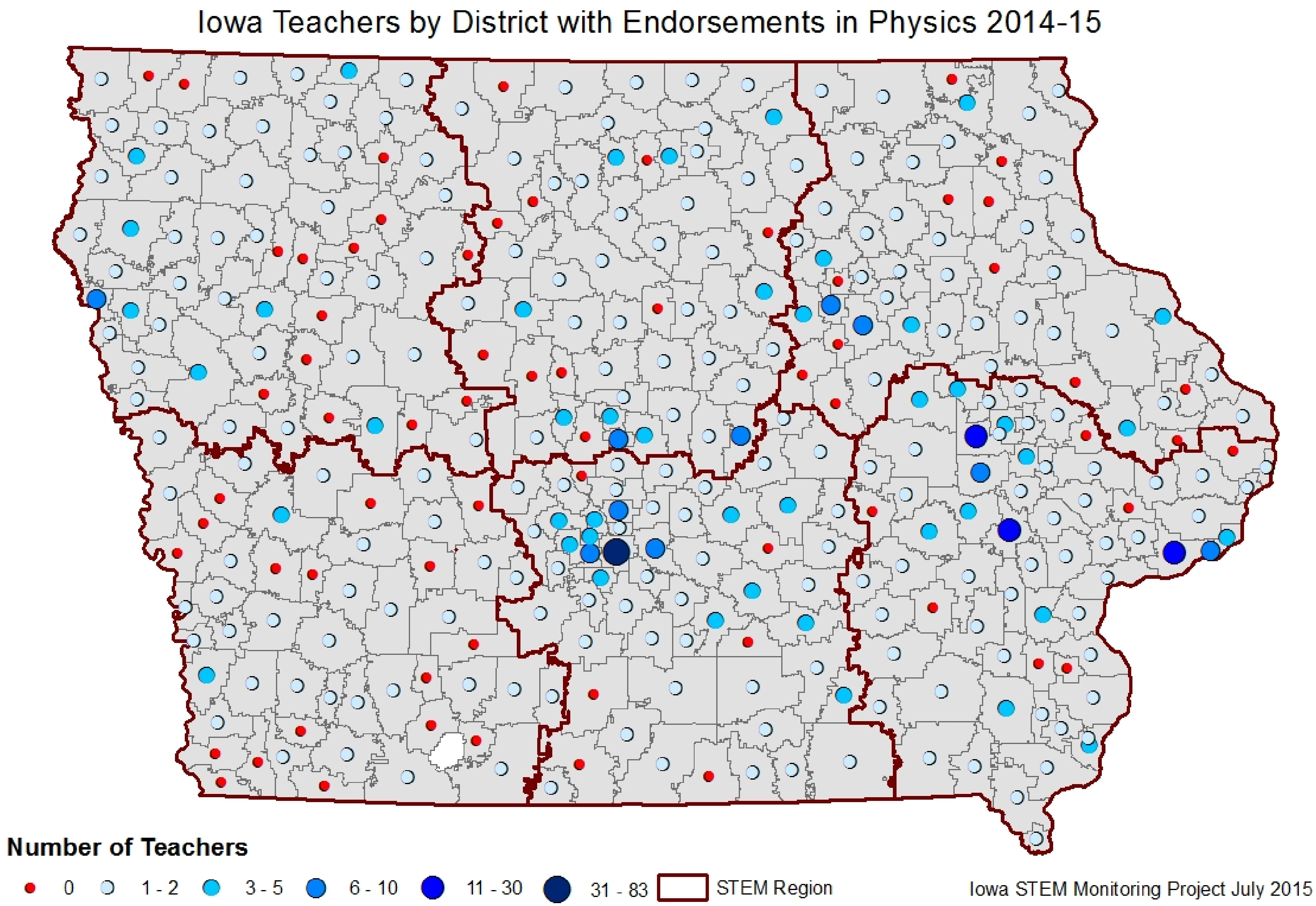


Figure 21. Iowa teachers by district with endorsements in physics, 2014-2015

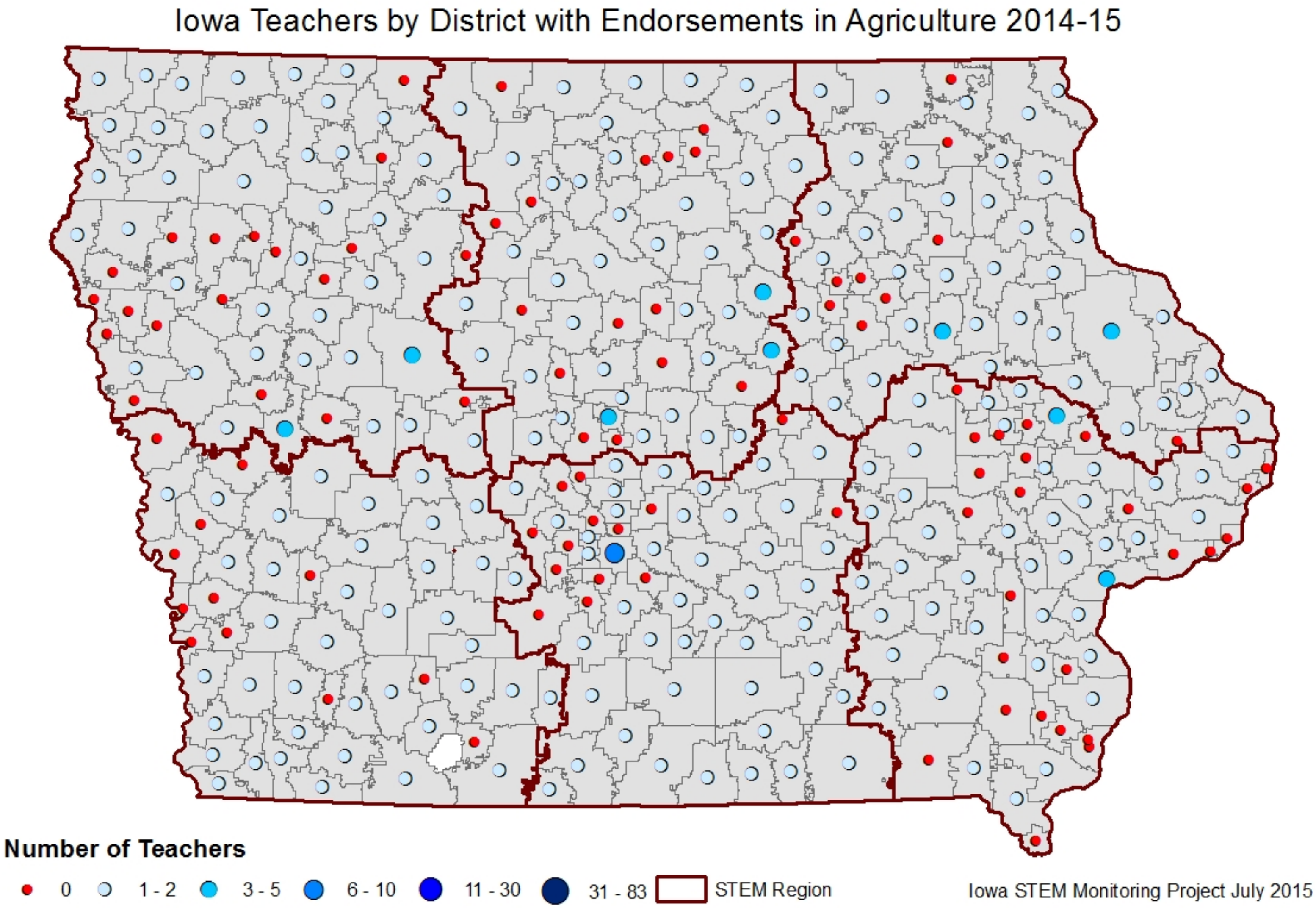


Figure 22. Iowa teachers by district with endorsements in agriculture, 2014-2015

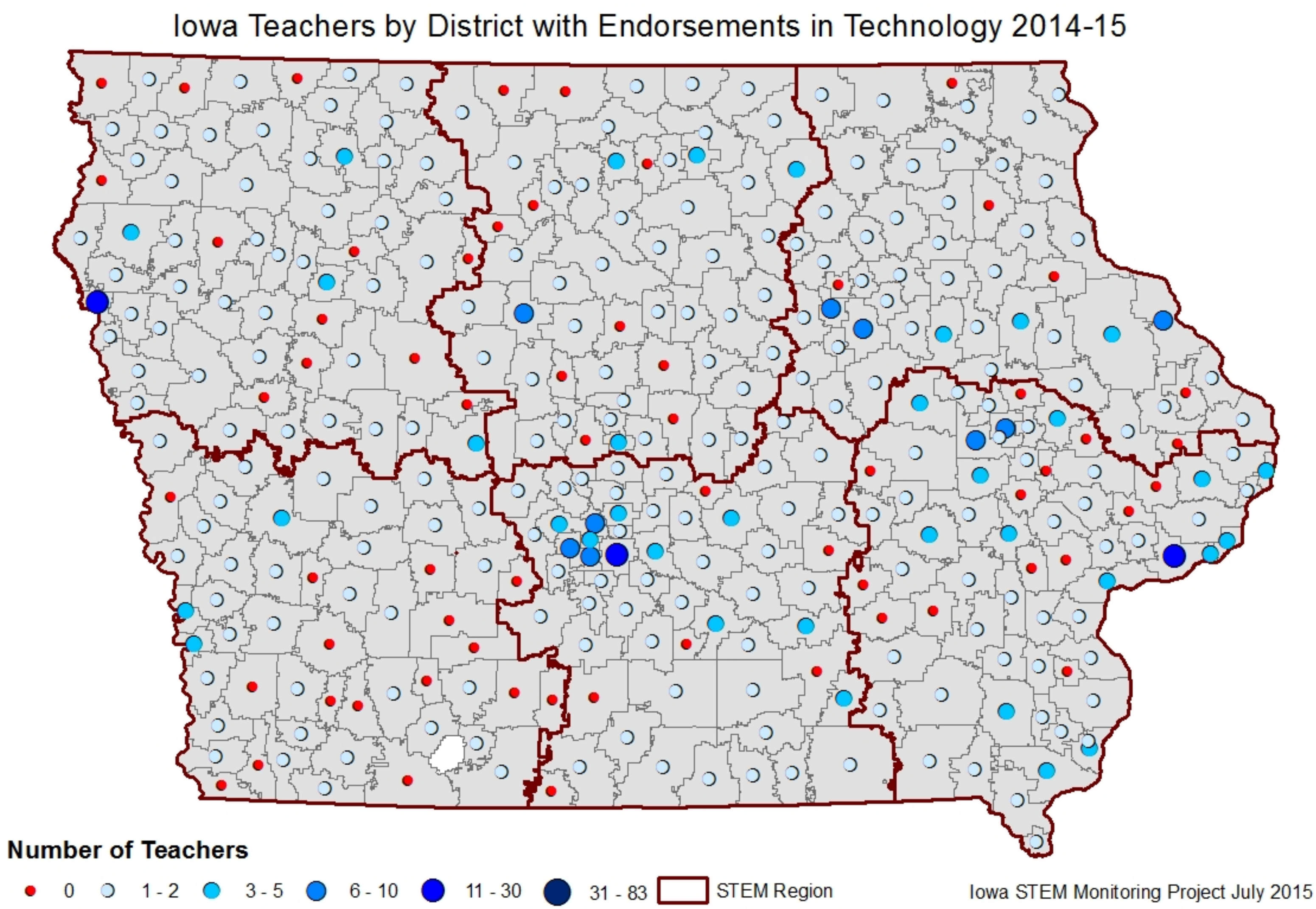


Figure 23. Iowa teachers by district with endorsements in technology, 2014-2015

Indicator 11: Number of beginning teachers recommended for licensure/endorsement in STEM-related subjects

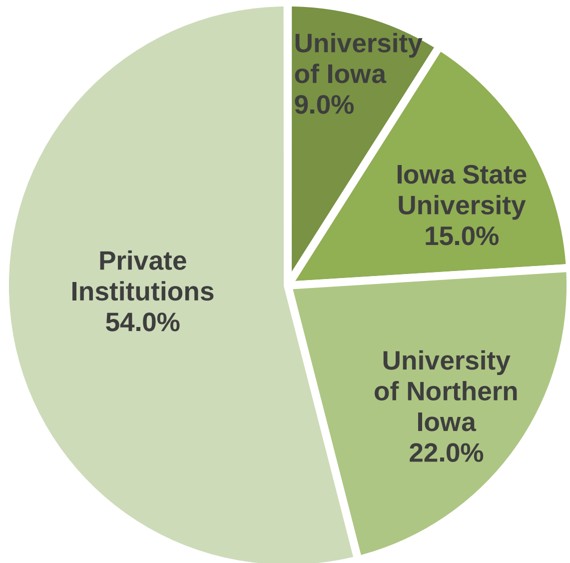
Data Source Iowa Board of Educational Examiners, July 2015

Indicator 11 explores the distribution of beginning teachers recommended for licensure by Iowa colleges and universities between 2008-2009 and 2014-2015. Note that data collection for 2014-2015 was still in progress at the time of this reporting; approximately 90% of the data are represented for 2014-2015. Data regarding the total number of teachers recommended for licensure annually by Iowa colleges and universities is provided in this section to contextualize the STEM-subject-endorsed teacher data.

Figure 24 and Figure 25 provide a visual distribution of the 32 colleges and universities in Iowa that recommend teachers for licensure, as well as the percentage of new teachers recommended by each Iowa college/university and the percentage of new teachers with STEM-subject related endorsements recommended by each Iowa college/university.

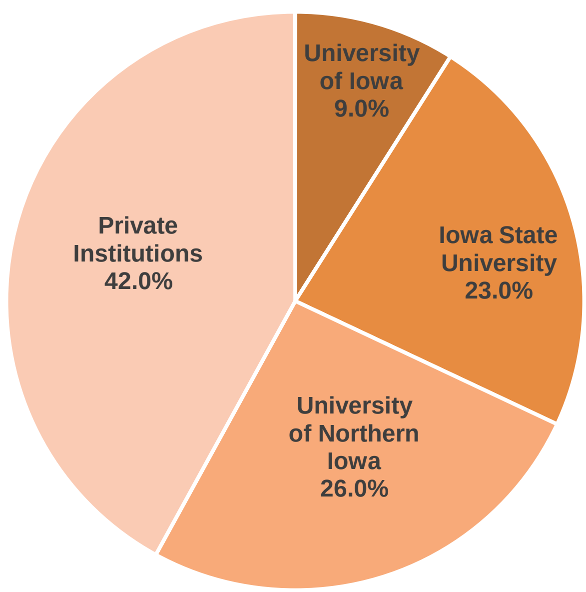
Key findings

- There was little change in the preparation of teachers, inclusive of STEM teachers in the state of Iowa between 2013-2014 and 2014-2015 (Table 18 and Table 19). The 29 private colleges and universities, collectively, continued to prepare slightly more than half (~54%) of all new teachers recommended for licensure while the three Regents institutions (University of Iowa, Iowa State University, and University of Northern Iowa) prepared the other 46% of all new teachers recommended for licensure in the state of Iowa. In contrast, the three Regents Institutions continued to prepare the majority of new teachers recommended for licensure with at least one endorsement in a STEM-related area (58%) with the other 42% of STEM teachers prepared by the private colleges and universities.
- There were slight changes within group for the preparation of new teachers and new STEM teachers at the three public Regents institutions between 2013-2014 and 2014-2015.
    - Iowa State University prepared a larger percentage of students overall as well as a larger percentage of STEM teachers recommended for licensure in 2014-2015. As such, University of Iowa and the University of Northern Iowa experienced slight decreases in the percentage of students they prepared for licensure at their respective institutions.
- Buena Vista University and Drake University continued to prepare the largest percentage of new teachers recommended for licensure and new STEM teachers recommended for licensure among private institutions of higher education at approximately 5% each.



Data Source: Board of Educational Examiners, July 2015

Figure 24. Distribution of all candidates recommended for licensure by Iowa colleges and universities, 2014-2015



Data Source: Board of Educational Examiners, July 2015

Figure 25. Distribution of candidates with a STEM-related endorsement recommended for licensure by Iowa colleges and universities, 2014-2015

Table 18. Number of candidates recommended for teacher licensure by Iowa colleges or universities

Program	Primary Location	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014[1]	2014-2015[2]
Ashford University	Clinton	18	18	17	22	25	30	19
Briar Cliff University	Sioux City	28	34	30	16	29	20	21
Buena Vista University	Storm Lake	122	146	136	140	157	118	129
Central College	Pella	46	40	42	57	53	45	64
Clarke College	Dubuque	41	43	49	43	36	40	23
Coe College	Cedar Rapids	30	37	50	30	37	28	28
Cornell College	Mt. Vernon	28	15	17	30	26	24	19
Dordt College	Sioux Center	50	59	61	55	59	52	57
Drake University	Des Moines	118	116	124	134	102	119	100
Emmaus Bible College	Dubuque	8	9	4	5	4	7	6
Faith Baptist Bible College	Ankeny	11	16	23	13	15	15	18
Graceland University	Lamoni	151	163	129	106	98	79	85
Grand View University	Des Moines	38	37	34	45	52	45	56
Grinnell College	Grinnell	8	6	9	6	6	4	7
Iowa State University	Ames	265	254	292	337	296	299	329
Iowa Wesleyan College	Mt. Pleasant	25	35	37	29	24	50	25
Kaplan University[3]	Davenport	10	22	28	9	0	8	2
Loras College	Dubuque	87	60	47	52	62	40	36
Luther College	Decorah	95	98	71	78	50	49	74
Maharishi Univ. of Management	Fairfield	1	1	3	3	0	2	2
Morningside College	Sioux City	53	57	65	59	49	49	55
Mount Mercy University	Cedar Rapids	35	37	31	40	43	27	38
Northwestern College	Orange City	56	63	45	53	60	59	43
Saint Ambrose University	Davenport	76	66	86	78	83	79	62
Simpson College	Indianola	71	55	91	77	74	79	51
University of Dubuque	Dubuque	34	31	41	34	33	21	22
University of Iowa	Iowa City	232	248	261	257	268	237	189
University of Northern Iowa	Cedar Falls	442	521	428	566	512	520	488
Upper Iowa University	Fayette	67	82	71	73	82	62	66
Waldorf College	Forest City	14	16	16	17	14	16	7
Wartburg College	Waverly	74	53	88	60	60	79	45
William Penn University	Oskaloosa	30	86	45	48	48	38	42
Total		**2,364**	**2,524**	**2,471**	**2,572**	**2,457**	**2,340**	**2,208**

Data Source: Iowa Board of Educational Examiners, July 2015

Note 1: Data collection for 2013-14 was still in progress at the time of reporting last year. The numbers have since been updated and are reflected in this table.

Note 2: Data collection for 2014-15 was still in progress at the time of reporting. Approximately 90% of the data are reported in this table.

Note 3: Kaplan University's program is graduate-only and delivered online. There is no central Kaplan University office in the state of Iowa; Davenport represents the first Kaplan site in the state.

Table 19. Number of candidates with a STEM-related endorsement recommended for teacher licensure by Iowa colleges or universities

Program	Primary Location	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014[1]	2014-2015[2]
Ashford University	Clinton	2	5	4	7	8	7	3
Briar Cliff College	Sioux City	0	5	3	5	4	8	2
Buena Vista University	Storm Lake	12	6	2	6	5	16	15
Central College	Pella	4	4	8	9	12	8	14
Clarke University	Dubuque	4	3	7	7	4	6	5
Coe College	Cedar Rapids	4	5	10	4	5	4	4
Cornell College	Mt. Vernon	3	2	2	3	7	2	5
Dordt College	Sioux Center	4	3	7	13	17	10	10
Drake University	Des Moines	25	13	16	17	17	25	23
Emmaus Bible College	Dubuque	-	-	-	-	-	-	1
Faith Baptist Bible College	Ankeny	-	-	-	-	-	-	-
Graceland University	Lamoni	4	8	9	2	4	8	10
Grand View University	Des Moines	3	7	5	7	7	12	12
Grinnell College	Grinnell	2	0	1	1	1	0	2
Iowa State University	Ames	64	54	78	80	86	85	116
Iowa Wesleyan College	Mt. Pleasant	3	2	6	1	2	6	-
Kaplan University[3]	Davenport	-	-	-	-	-	2	1
Loras College	Dubuque	10	7	5	3	10	9	8
Luther College	Decorah	2	7	5	4	7	9	13
Maharishi Univ of Management	Fairfield	2	0	0	0	0	0	0
Morningside College	Sioux City	10	8	9	12	8	13	16
Mount Mercy University	Cedar Rapids	4	3	0	8	7	6	6
Northwestern College	Orange City	4	8	4	12	10	9	10
Saint Ambrose College	Davenport	12	8	9	12	18	12	8
Simpson College	Indianola	17	8	7	17	12	15	6
University of Dubuque	Dubuque	5	3	2	8	4	4	7
University of Iowa	Iowa City	59	52	64	55	59	49	44
University of Northern Iowa	Cedar Falls	67	97	88	162	119	136	129
Upper Iowa University	Fayette	3	4	7	6	4	3	11
Waldorf College	Forest City	3	5	0	5	2	1	2
Wartburg College	Waverly	16	8	17	16	15	17	17
William Penn University	Oskaloosa	3	3	7	10	2	6	1
Total		**351**	**338**	**382**	**492**	**456**	**488**	**501**

Data Source: Iowa Board of Educational Examiners, July 2015

Note 1: Data for 2013-14 has been updated since last report and are reflected in this table.

Note 2: Data collection for 2014-15 was still in progress at time of reporting. Approximately 90% of the data are reported in this table.

Note 3: Kaplan University's program is graduate-only and delivered online.
There is no central Kaplan University office in the state of Iowa; Davenport represents the first Kaplan site in the state.

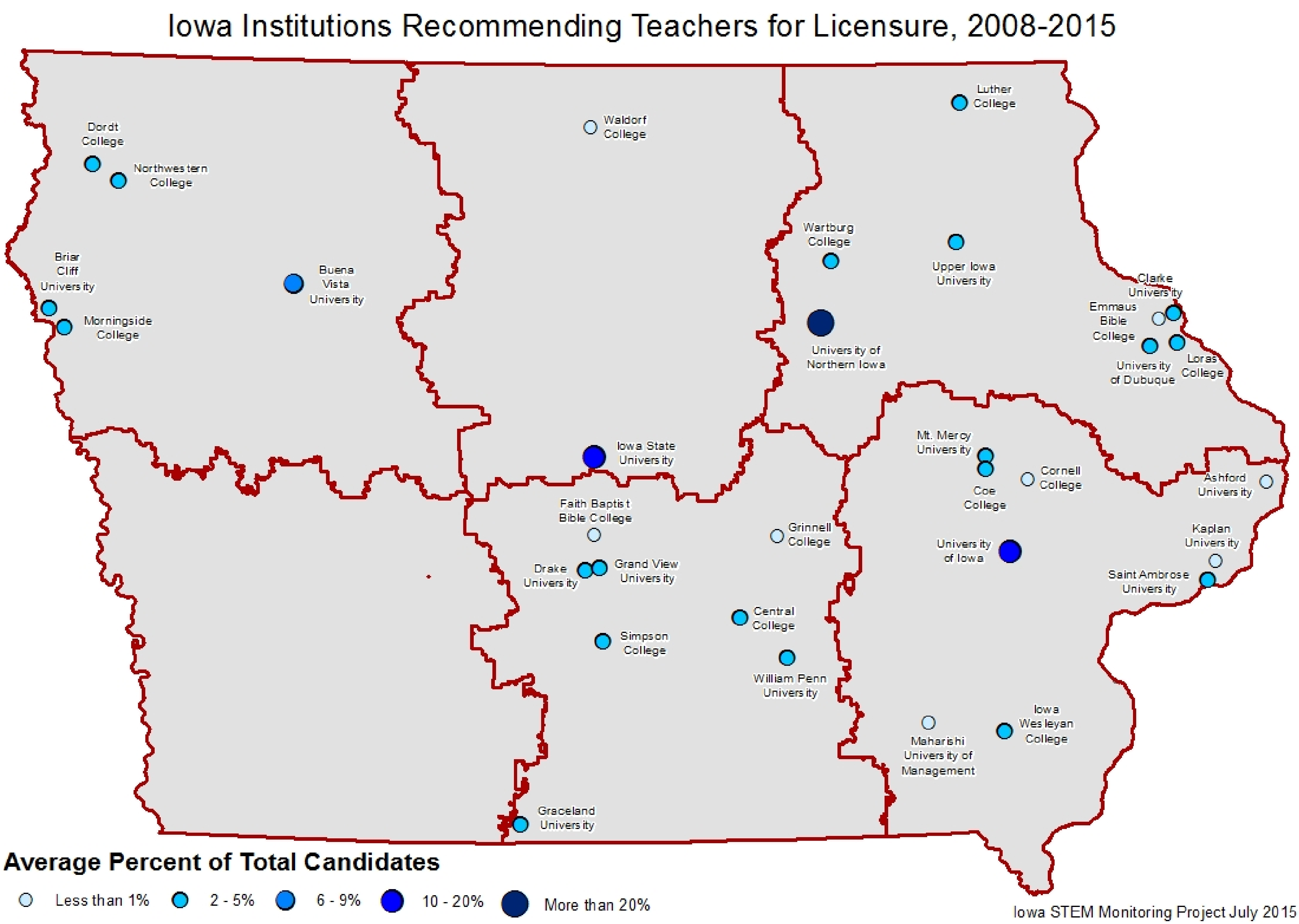


Figure 26. Iowa Institutions recommending teachers for licensure, 2008-2015

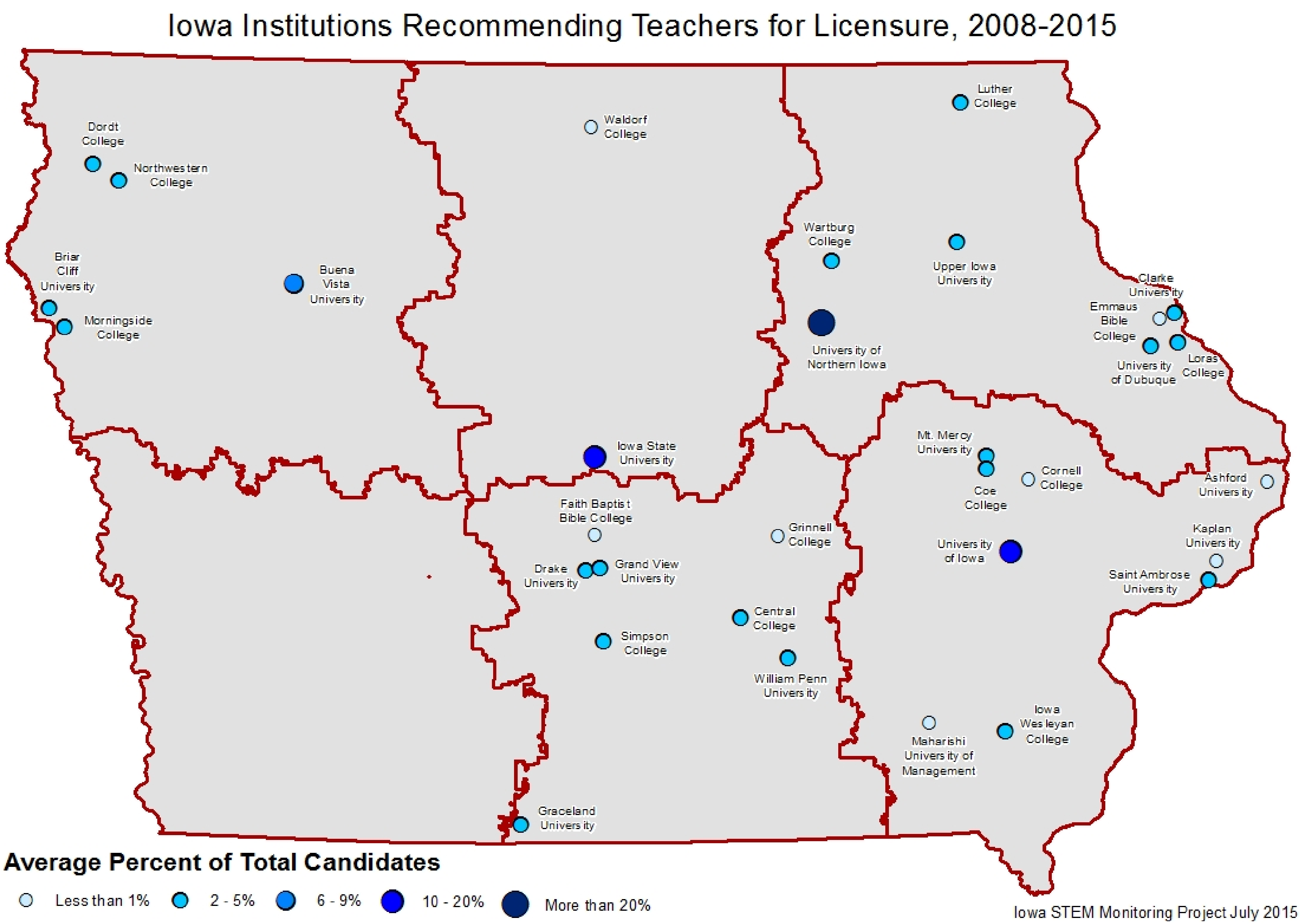


Figure 27. Iowa institutions recommending teachers with a STEM-related endorsement for licensure, 2008-2015

Indicator 12: Teacher retention in STEM-related subjects

Data source Basic Educational Data Survey (BEDS), Bureau of Information and Analysis Services Iowa Department of Education

Indicator 12 examines the retention of beginning teachers in Iowa who teach advanced high school STEM-related courses. As of 2014-2015, five cohorts of teachers have been examined: Cohort 1 began their employment in fall 2010; Cohort 2 began in fall 2011; Cohort 3 began in fall 2012; Cohort 4 began in fall 2013; Cohort 5 began in fall 2014. These cohorts will continue to be monitored each year with an additional cohort added each year, eventually producing a five-year retention rate of new STEM-related high school teachers.

Key findings

Table 20 shows the number of new Iowa high school STEM teachers in the initial year of employment, as well as the number of teachers retained in subsequent years.

- In 2010-2011, there were 73 new teachers hired to teach advanced high school STEM-subject courses. Four years later, approximately 40% of those teachers were still teaching advanced high school STEM-subject courses.
- Of the 66 new teachers hired to teach in 2011-2012, approximately 44% of the teachers had been retained as advanced STEM teachers for three years.
- In 2012-2013, there were 92 new teachers hired to teach advanced high school STEM-subject courses and 69 teachers returned for a second year.
- In 2013-2014, there were 59 new teachers hired to teach advanced high school STEM-subject courses. This was the smallest cohort of new teachers since we began monitoring new teacher retention. Yet, their one-year retention rate was on par (~76%) with the first-year retention rates of the previous cohorts of new teachers.

Table 20. Number of beginning high school STEM teachers retained by academic year

	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Cohort 1	73	57	47	36	29
Cohort 2		66	51	43	29
Cohort 3			92	69	55
Cohort 4				59	45
Cohort 5					85

Data source: Iowa Department of Education, Bureau of Information and Analysis Services,
Basic Educational Data Survey (BEDS)
Note 1: No data were reported for Lisbon Community School District for 2010-11, 2011-12, and 2012-13.
Note 2: No data were reported for Northeast Hamilton School District for 2013-14.

Table 21 shows the retention rate of beginning high school STEM-related teachers by cohort.

- Initial analysis of the current data shows that, across four cohorts, the average one-year retention rate of beginning high school STEM-related teachers in the state of Iowa is 77%. In other words, three quarters of beginning high school teachers charged with teaching advanced STEM-subject courses return for a second year of teaching advanced high school STEM-subject courses.
- With three cohorts now reporting a two-year retention rate, the average two-year retention rate of new teachers responsible for advanced high school STEM-subject courses is 62.6%.
- The average three-year retention rate, inclusive of cohort 1 and cohort 2, is 47%.

Table 21. Retention rates of beginning high school STEM teachers by cohort

	One-Year Retention	Two-Year Retention	Three-Year Retention	Four-Year Retention
Cohort 1 (2010-11)	78.1%	64.4%	49.3%	39.7%
Cohort 2 (2011-12)	77.2%	63.6%	43.9%	
Cohort 3 (2012-13)	75.0%	59.8%		
Cohort 4 (2013-14)	76.2%			

Data source: Iowa Department of Education, Bureau of Information and Analysis Services,
Basic Educational Data Survey (BEDS)
Note 1: No data were reported for Lisbon Community School District for 2010-11, 2011-12, and 2012-13.
Note 2: No data were reported for Northeast Hamilton School District for 2013-14.

It is important to note that of the teachers not retained each year, not all left the teaching profession completely. Approximately half of those teachers were still employed as public school teachers in Iowa but had either switched to teaching middle school or were no longer teaching advanced STEM-subject courses in high school. The data do not indicate why these teachers moved to new teaching assignments. It is possible that some shifted not because they specifically wished to stop teaching in STEM areas, but because they were assigned different courses by administrators.

Indicator 13: Enrollment in STEM-related courses in high school

Data source Iowa Department of Education, Bureau of Information and Analysis Services, 2015

Indicator 13 investigates the opportunities available for Iowa students to take basic and advanced level STEM courses in high school.

Key findings

Table 22 provides the number of high school students statewide enrolled in each STEM-related subject area over a five-year period.

- Student enrollments remained relatively stable in the areas of math, science, engineering and technology between 2013-2014 and 2014-2015. However, student enrollment in health courses decreased by 20% between 2013-2014 and 2014-2015.
- Annual change in student enrollment has occurred in each STEM-subject area over time.
  - Between 2009-2010 and 2011-2012, the first year of the Governor's STEM Advisory Council, the number of high school students enrolled in **science** courses increased slightly by 1%. Between 2011-2012 and 2014-2015, that number increased another 1%.
  - The number of students enrolled in **technology** courses has continued to decrease over time, first by 10% between 2009-2010 and 2011-2012 and then by another 7% between 2011-2012 and 2014-2015.
  - The most significant increase in student enrollment was in the area of **engineering** which has increased substantially every year since 2009-2010. Between 2009-2010 and 2011-2012, the number of students enrolled in high school engineering courses increased by 37%. Since 2011-2012, that number has increased by 23%.
  - Between 2009-2010 and 2011-2012, the number of high school students enrolled in **math** courses remained relatively stable. Conversely, between 2011-2012 and 2014-2015, the number of high school students enrolled in math increased by 7%.
  - The number of high school students enrolled in **health** courses increased by 19% between 2009-2010 and 2011-2012. However, since 2011-2012, that number has decreased by 14%.
- The gender composition has remained relatively stable in math and science courses, with males and females each comprising approximately half of the enrollment. However, consistent with national trends, technology and engineering continue to enroll a greater proportion of male students while health courses have a greater proportion of female students.

- Specifically, in 2014-2015, technology courses enrolled almost three times as many males as females, and engineering courses enrolled approximately 85% males and 15% females. Conversely, females compromised 75% of the enrollment in health courses.
- Of noted concern is the decrease in female students enrolled in technology courses. While the overall number of high school students enrolled in technology courses has decreased overtime, rate of participation between male and female students has also diverged overtime. Between 2009-2010 and 2011-2012, the number of female students enrolled in technology courses in the state of Iowa decreased by 13%. Between 2011-2012 and 2014-2015, that number decreased by 27% or 700 students.

Table 22. Student enrollment in high school STEM courses

	2009-10	2010-11	2011-12	% Change 2009/10 -2011/12	2012-13	2013-14	2014-15	% Change 2011/12 -2014/15
Science	**72,428**	**72,114**	**73,150**	**1%**	**73,633**	**73,996**	**74,178**	**1%**
Male	49.4%	49.8%	49.5%		49.6%	49.7%	49.4%	
Female	50.6%	50.2%	50.5%		50.4%	50.3%	50.6%	
Technology	**8,644**	**7,647**	**7,818**	**-10%**	**7,791**	**7,032**	**7,239**	**-7%**
Male	65.5%	64.2%	66.9%		69.2%	71.1%	73.9%	
Female	34.5%	35.8%	33.1%		30.8%	28.9%	26.1%	
Engineering	**5,327**	**6,386**	**7,303**	**37%**	**7,954**	**8,952**	**8,957**	**23%**
Male	84.9%	83.7%	84.1%		83.6%	83.5%	84.5%	
Female	15.1%	16.3%	15.9%		16.4%	16.5%	15.5%	
Math	**47,481**	**46,934**	**47,563**	**0%**	**49,602**	**51,210**	**50,894**	**7%**
Male	49.3%	49.1%	49.3%		49.5%	49.5%	49.4%	
Female	50.7%	50.9%	50.7%		50.5%	50.5%	50.6%	
Health	**289**	**278**	**343**	**19%**	**412**	**373**	**296**	**-14%**
Male	31.1%	25.2%	26.2%		31.3%	31.6%	24.7%	
Female	68.9%	74.8%	73.8%		68.7%	68.4%	75.3%	

Data Source: Iowa Department of Education, Bureau of Information and Analysis Services, 2015
Note1: Net change indicates the difference in the growth (+) or decline (-) in total student enrollment between 2008-09 and 2014-15

Further analysis was conducted regarding female enrollment in math and science courses by district for each academic year. The percentage of female enrollment in high school math and science courses in each district was compared to the percentage of overall high school female enrollment in each district (i.e., A score of 1 would suggest an enrollment in math and science courses that was perfectly representative of the overall high school female population in the district.) Means and standard deviations were then computed for each academic year creating a five point categorical scale to express course enrollment relative to population – *far fewer girls, fewer girls, balanced, more girls,* and *far more girls*. For more information regarding means and standard deviations, see Table 23.

Districts that fell in the balanced category were within one standard deviation of the mean. Districts labeled as having fewer girls were between one and two standard deviations *below* the mean while districts with far fewer girls were more than two standard deviations *below* the mean. Conversely, districts identified as having more girls were between one and two standard deviations *above* the mean while districts with far more girls were more than two standard deviations *above* the mean. Districts identified as having *No Females Enrolled/WGS* participated in whole grade sharing with another district and thus sent their high school students to a different school district for instruction.

Table 23. Female Enrollment in High School Math and Science Courses, Means and Standard Deviations

2014-2015	Mean	Standard Deviation
Math	1.0752	0.1445
Science	1.0734	0.1763

The female enrollment data are displayed in both tables and maps (Table 24 and Table 25) show the distribution of school districts across the five categories for both math and science for each of the six years. Figure 28 and Figure 29 display the data visually by school district, content area, and year.

- The majority of school districts in the state of Iowa that enroll female students in math and science courses, do so at a rate either relative to the district female population or higher and have done so since 2008-09.
    - **Science:** As of 2014-2015, approximately 70% of the school districts have a balanced enrollment of females in science courses relative to their district female population while another 16% of the school districts enroll more female students in science courses relative to their district female population
    - **Math:** As of 2014-2015, approximately 83% of the school districts currently have a balanced enrollment of females in math courses relative to their district female population with an additional 7% of the school districts enrolling more female students in math courses relative to their district female population. That means **90%** of the school districts in the state of Iowa enroll female students in math courses at a rate relative to or higher than their district female population.
- There are no geographic trends relative to the districts that enroll far fewer girls or far more girls in math and science courses. As the maps show, these districts are distributed throughout the state and across STEM regions.

Table 24. Distribution of Iowa school districts: High school female s*cience* enrollment relative to female population

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Far Fewer Girls[1]	7	6	6	7	4	5
Fewer Girls	29	36	31	33	28	38
Balanced	255	238	240	236	242	220
More Girls	27	33	30	26	30	42
Far More Girls	10	11	11	13	10	8
No Females Enrolled/WGS[2]	20	24	30	33	32	26

Data Source: Iowa Department of Education, Bureau of Information and Analysis Services, 2015

1. Means and standard deviations were computed for each academic year creating a five point categorical scale to express course enrollment relative to population:

   Far fewer girls - Districts with more than two standard deviations *below* the mean

   Fewer girls - Districts between one and two standard deviations *below* the mean

   Balanced - Districts that fell within one standard deviation of the mean

   More girls - Districts between one and two standard deviations *above* the mean

   Far more girls - Districts with more than two standard deviations *above* the mean

2. Districts identified as having No Females Enrolled/WGS participated in whole grade sharing with another district and thus sent their high school students to a different school district for instruction.

Table 25. Distribution of Iowa school districts: High school female *math* enrollment relative to female population

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Far Fewer Girls[1]	3	11	9	2	7	4
Fewer Girls	34	30	24	27	19	26
Balanced	249	241	246	251	248	257
More Girls	34	36	29	27	28	20
Far More Girls	8	8	10	8	11	3
No Females Enrolled/WGS[2]	20	22	30	33	33	29

Data Source: Iowa Department of Education, Bureau of Information and Analysis Services, 2015

1. Means and standard deviations were computed for each academic year creating a five point categorical scale to express course enrollment relative to population:

   Far fewer girls - Districts with more than two standard deviations *below* the mean

   Fewer girls - Districts between one and two standard deviations *below* the mean

   Balanced - Districts that fell within one standard deviation of the mean

   More girls - Districts between one and two standard deviations *above* the mean

   Far more girls - Districts with more than two standard deviations *above* the mean

2. Districts identified as having No Females Enrolled/WGS participated in whole grade sharing with another district and thus sent their high school students to a different school district for instruction.

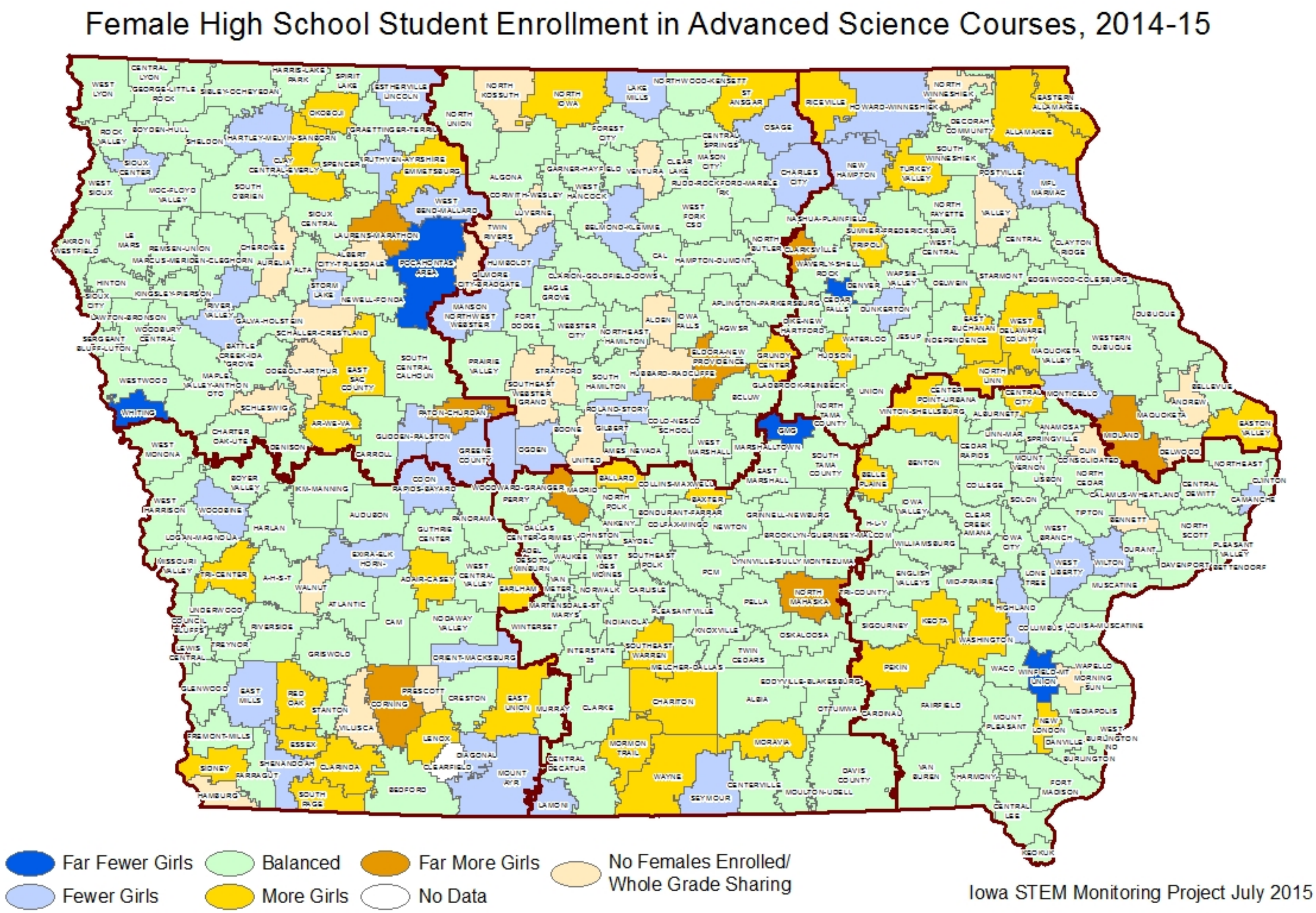


Figure 28. Female high school student enrollment in advanced science courses, 2014-15

Female High School Student Enrollment in Advanced Math Courses, 2014-15

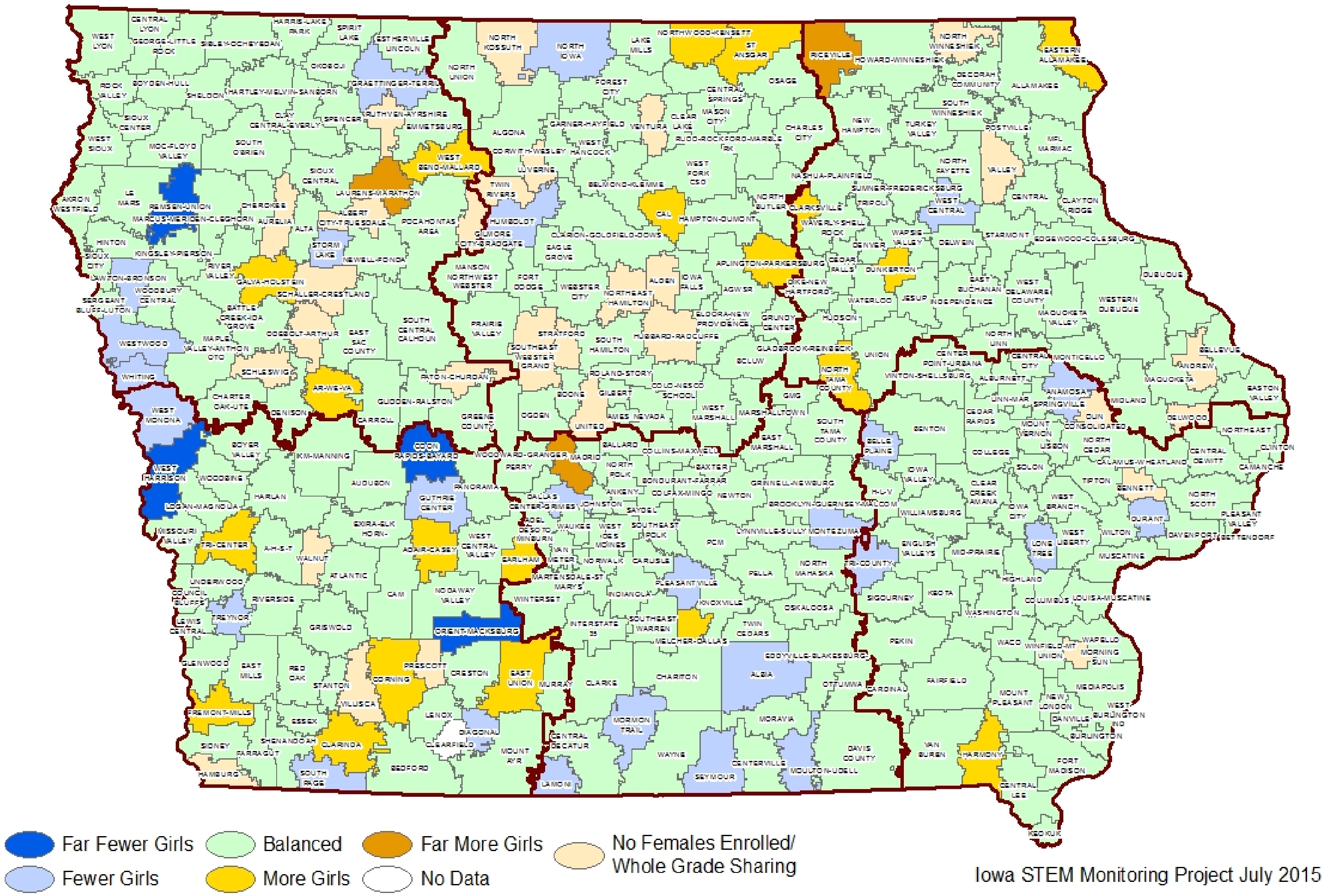


Figure 29. Female high school student enrollment in advanced math courses, 2014-15

Indicator 14: Community college awards in STEM fields

Data source Iowa Department of Education, Division of Community Colleges

Awards include diplomas, certificates, Associate's degrees, and "other" awards as identified and classified by the Iowa Department of Education Division of Community Colleges. The Iowa Department of Education classifies career and technical education programs into occupational "career clusters," following the National Career Clusters Framework. For the current annual report, four of these (architecture and construction, health sciences, information technology, and STEM) are tracked for the purposes of indicator 14. This is a small modification from previous reports which tracked three career clusters (health sciences, information technology, and STEM).

Note there are differences in operational definitions of STEM awards/degrees depending on the data source. In addition, defining "STEM degrees" is a moving target, and may be more broad or narrow depending on the data source. Indicator 15 also includes information on STEM degrees from Iowa's community colleges using Classification of Instructional Programs (CIP) codes compared to awards as reported by career cluster here. STEM awards by career cluster will be more broad in definition. STEM degrees defined by CIP codes will be more specific.

Key findings

- Over 5,500 awards in STEM-related fields were awarded by Iowa's community colleges in 2014 (Table 27).
- Overall, there were small fluctuations in the percent change of awards from Iowa's community colleges between 2010 and 2014, with overall awards decreasing by 1%, awards among males increasing by 8%, and awards among females decreasing by 2%. Notably, awards to minority graduates increased by 69% in 2014 compared to 2010 (Figure 30).

Table 26. Community college enrollment by career cluster[1]

	2010	2011	2012	2013	2014	% Change 2011-2014
Architecture and Construction	2,682	2,599	2,422	2,082	2,018	-25%
Information Technology	2,863	2,853	2,726	2,607	2,444	-15%
Science, Technology, Engineering, and Mathematics	956	882	495	245	221	-77%
Health Science	19,577	20,260	18,833	17,600	15,943	-19%
TOTAL	**26,078**	**26,594**	**24,476**	**22,534**	**20,626**	**-21%**

Source: Iowa Department of Education, Division of Community Colleges. (2015). *The annual condition of Iowa's community colleges: 2014*.

Retrieved from https://www.educateiowa.gov/document-type/condition-community-colleges

1. Definitions of Career Clusters can be obtained from http://www.careerclusters.org/

Table 27. Community college awards by career cluster[1,2]

	2010	2011	2012	2013	2014	% Change 2010-2014
Architecture and Construction						
Total	640	792	679	566	625	-2%
Male[3]	605	752	652	521	537	-11%
Female	28	40	27	32	52	86%
White	509	534	479	326	528	4%
Minority	43	48	42	79	71	65%
Information Technology						
Total	329	405	551	490	409	24%
Male	265	316	418	374	308	16%
Female	63	89	133	113	101	60%
White	265	316	367	330	331	25%
Minority	28	26	34	61	51	82%
Science, Technology, Engineering, and Mathematics						
Total	98	107	88	78	56	-43%
Male	73	67	43	45	36	-51%
Female	20	40	45	22	20	0%
White	58	74	49	53	39	-33%
Minority	18	9	21	8	9	-50%
Health Science						
Total	4,563	4,696	4,920	4,173	4,477	-2%
Male	381	574	545	561	547	44%
Female	4,097	4,122	4,375	3,584	3,930	-4%
White	3,731	3,806	3,932	3,336	3,798	2%
Minority	275	324	379	706	484	76%
TOTAL[4]	**5,630**	**6,000**	**6,238**	**5,307**	**5,567**	-1%
Male	**1,324**	**1,709**	**1,658**	**1,501**	**1,428**	8%
Female	**4,208**	**4,291**	**4,580**	**3,751**	**4,103**	-2%
White	**4,563**	**4,730**	**4,827**	**4,045**	**4,696**	3%
Minority	**364**	**407**	**476**	**854**	**615**	69%

Source: Iowa Department of Education, Division of Community Colleges. (2015). *The annual condition of Iowa's community colleges: 2014*. Retrieved from https://www.educateiowa.gov/document-type/condition-community-colleges

1. Awards include diplomas, certificates, Associate's degrees, and "other" awards as identified and classified by the Iowa Department of Education Division of Community Colleges. The Iowa Department of Education classifies career and technical education programs into occupational "career clusters," following the National Career Clusters Framework. Three of these (health sciences, information technology, and STEM) are tracked for the purposes of the Indicators.

2. Definitions of Career Clusters can be obtained from http://www.careerclusters.org/

3. Subgroup totals do not include students with unknown/unreported gender or race. Sums of subgroup data not equal to the total are due to missing data.

4. Methods revised in 2015 to include architecture and construction as a career cluster, in addition to the three career clusters (health sciences, information technology, and STEM) tracked in Year 1 and Year 2 annual reports.

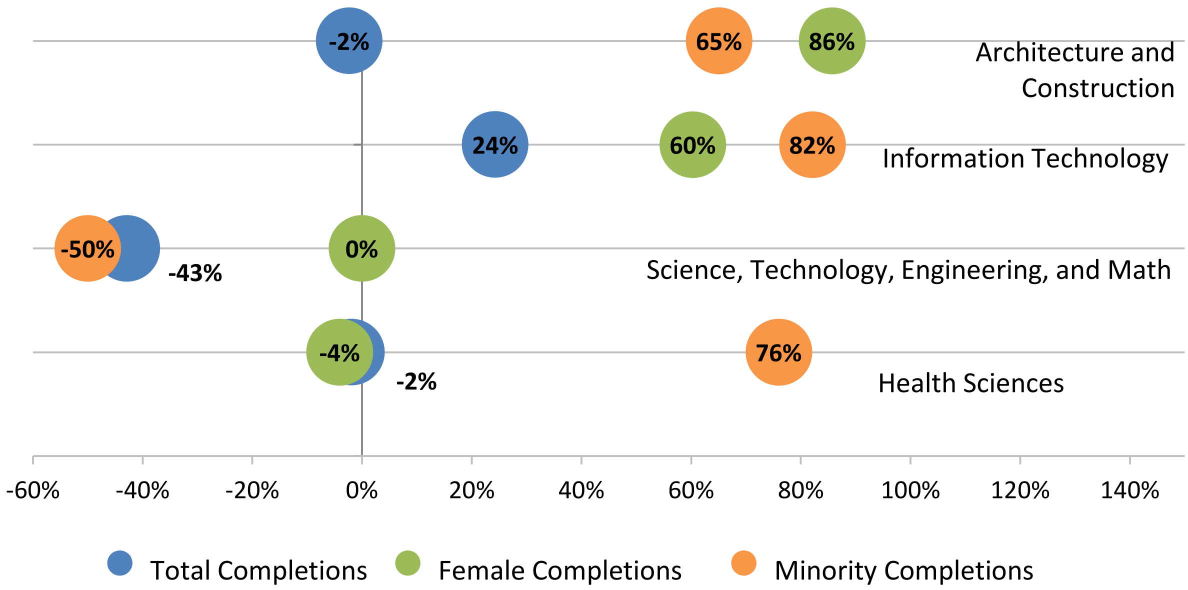


Figure 30. Percentage change in number of awards in STEM-related career clusters at community colleges, 2010-2014

Indicator 15: College and university enrollment and degrees in STEM fields

Data source Integrated Postsecondary Education Data System (IPEDS)

This indicator includes information on enrollment, bachelor's degrees, master's degrees, and doctoral degrees conferred by 4-year public universities, private non-profit colleges, and private for-profit colleges. Information on associate's degrees from Iowa's 2-year community colleges is also included here applying the same operational definition of STEM degrees and using the same data set as used to determine STEM degrees from Iowa's 4-year colleges and universities. This allows for better proportional comparisons by college type.

Note that the definition of what constitutes a "STEM degree" has evolved in the past five to ten years nationwide. The methods for the current annual report have been modified slightly from Year 1 and Year 2 annual reports which results in some number fluctuations from what was previously reported. The same database (i.e. IPEDS) is used with a more precise definition of STEM degrees. The tables below utilize a basic analysis of IPEDS database using a composite of primary 2-digit Classification of Instructional Programs (CIP) code categories that reflect STEM, STEM-related, and health science degrees. This is a slight modification of a more specific, 6-digit, CIP code definition of STEM degrees that was developed to correspond with the standard occupational classification (SOC) codes used in tracking STEM workforce developed by the Standard Occupational Classification Policy Committee (SOCPC) for the Office of Management and Budget. Additional documentation on the STEM classification process and recommendations can be found at www.bls.gov/soc

Key findings

- From 2010-2011 to 2012-2013, there has been a 1% increase in STEM awards at Iowa's 2-year community colleges, a 12% increase at 4-year public, and an 11% increase at 4-year private colleges and universities, respectively (Table 29).
- During the same time period, health science degrees have increased 2% at Iowa's public and private non-profit colleges and universities (Table 30).

Table 28. Four-year institutions' fall enrollment. 2010 and 2012

STEM & STEM-Related (excludes Health Sciences)		2010	2012	Percent change from 2010 to 2012
4-year public universities				
	Undergraduate	11,183	13,294	19%
	Graduate/Professional	3,375	3,145	-7%
	Subtotal	14,558	16,439	13%
Private, 4-year, not-for-profit				
	Undergraduate	4,357	4,308	-1%
	Graduate/Professional	11	13	18%
	Subtotal	4,368	4,321	-1%
	Total, non-profit	18,926	20,760	10%
Private, 4-year, for-profit				
	Undergraduate	267	211	-21%
	Graduate/Professional	0	0	-
	Subtotal	267	211	-21%
	Grand total	19,193	20,971	9%

Health Science Degrees		2010	2012	Percent change from 2010 to 2012
4-year public universities				
	Total	960	962	0%
Private, 4-year, not-for-profit				
	Total	0	0	
Private, 4-year, for-profit				
	Total	0	0	

Source: National Center for Education Statistics, IPEDS Data Center

STEM & STEM related degrees include (2-digit CIP): Engineering (14), Biological Sciences/Life Sciences (26), Mathematics (27), Physical Sciences (40).

Health Science degrees include (6-digit CIP): Dentistry (51.0401), Medicine (51.1201).

Table 29. Number of STEM and STEM-related degrees awarded by Iowa's 2-year and 4-year colleges and universities

STEM & STEM-Related (excludes Health Sciences)		2010-2011	2011-2012	2012-2013	Percent change, 2010-2011 to 2012-2013
2-year community colleges					
	Associate's degree	1,165	1,218	1,175	1%
	Subtotal	1,165	1,218	1,175	1%
4-year public universities					
	Bachelor's degree	2,782	2,987	3,235	16%
	Graduate/Professional	1,030	1,134	1,025	0%
	Subtotal	3,812	4,121	4,260	12%
Private, 4-year, not-for-profit					
	Associate's degree	14	9	5	-64%
	Bachelor's degree	1,233	1,366	1,357	10%
	Graduate/Professional	151	155	188	25%
	Subtotal	1,398	1,530	1,550	11%
	Total, non-profit	6,375	6,869	6,985	10%
Private, 4-year, for-profit					
	Associate's degree	637	621	496	-22%
	Bachelor's degree	658	750	724	10%
	Graduate/Professional	53	190	202	281%
	Subtotal	1,348	1,561	1,422	5%
	Grand total	7,723	8,430	8,407	9%

Source: National Center for Education Statistics, IPEDS Data Center
STEM & STEM related degrees include (2-digit CIP): Agriculture (01), Natural Resources (03), Architecture (04), Computer and Information Sciences (11), Engineering (14), Engineering Technologies (15), Biological Sciences (26), Mathematics and Statistics (27), and Physical Sciences (40).

Table 30. Number of health science degrees awarded by Iowa's 2-year and 4-year colleges and universities

Health Science Degrees		**2010-2011**	**2011-2012**	**2012-2013**	**Percent change, 2010-2011 to 2012-2013**
2-year community colleges					
	Associate's degree	2,060	2,126	2,133	4%
	Subtotal	2,060	2,126	2,133	4%
4-year public universities					
	Bachelor's degree	552	432	435	-21%
	Graduate/Professional	901	934	949	5%
	Subtotal	1,453	1,366	1,384	-5%
Private, 4-year, not-for-profit					
	Associate's degree	269	291	324	20%
	Bachelor's degree	861	991	1,070	24%
	Graduate/Professional	1,658	1,607	1,532	-8%
	Subtotal	2,788	2,889	2,926	5%
	Total, non-profit	6,301	6,381	6,443	2%
Private, 4-year, for-profit					
	Associate's degree	1,238	1,313	989	-20%
	Bachelor's	1,269	2,349	2,753	117%
	Graduate/Professional	214	576	740	246%
	Total, for-profit	2,721	4,238	4,482	65%
	Grand total	9,022	10,619	10,925	21%

Source: National Center for Education Statistics, IPEDS Data Center
Degrees include (2-digit CIP): Health Science (51).

Indicator 16: Percentage of Iowans in workforce employed in STEM occupations

Data source Iowa Workforce Development

Key findings

Projected growth rates in employment are calculated for a variety of occupational areas over ten-year periods.

- Approximately 15% of Iowa's occupations are in STEM fields (Table 31).
- From 2012 to 2022, Iowa's STEM occupations are expected to grow 1.6% annually, compared to a 1.3% annual growth rate across all occupations (Table 31).
- On average in 2014, individuals in STEM occupations earned $26.12 in mean wages and $54,300 in mean salaries, compared to all occupations overall earning $19.35 in mean wages and $40,200 in mean salaries, respectively (Table 31).
- By gender, a larger proportion of females than males are employed in the STEM-related fields of life/physical/social science and healthcare occupations (Table 32).

Table 31. Percentage of Iowans in workforce employed in STEM occupations

Time period	Total STEM employment	Total employment (all occupations)	%STEM of all occupations
2008-2018	358,960	1,762,260	20%
2010-2020	267,765	1,717,020	16%
2012-2022	257,230	1,758,205	15%

Table 32. Iowa estimated employment in STEM fields: Projections, growth, and salaries, 2012-2022[1]

	2012 Estimated employment	2022 Projected employment	Annual growth rate	2014 Mean Wage($)	2014 Mean Salary($)
Management	14,655	16,940	1.6%	46.59	96,914
Business & Financial Operations	23,980	28,025	1.7%	31.47	65,450
Computer & Mathematical	31,125	37,865	2.2%	34.42	71,588
Architecture & Engineering	10,600	11,600	0.9%	31.96	66,482
Life, Physical, & Social Science	8,075	9,015	1.2%	25.58	53,211
Healthcare Practitioners & Technical	75,750	89,925	1.9%	33.68	70,049
Healthcare Support	11,985	14,340	2.0%	16.80	34,951
Installation, Maintenance, & Repair	24,895	27,535	1.1%	21.33	44,362
Production	16,945	18,815	1.1%	21.02	43,724
Other[2]	39,220	16575	1.6	21.49	44,707
Total STEM Occupations	**257,230**	**299,615**	**1.6%**	**26.12**	**54,332**
Total All Occupations	**1,758,205**	**1,955,480**	**1.1%**	**19.35**	**40,241**

Source: Communications and Labor Market Information Division, Iowa Workforce Development

1. The acronym STEM, as used in this table, is a combined occupational group made-up of occupations from existing and/or established occupational groups adopted from the Office of Management and Budget's (OMB) Standard Occupational Classification (SOC) Manual. These occupations have a preponderance of tools and skills from Science, Technology, Engineering, and/or Mathematics. STEM occupations were defined using criteria by Iowa Workforce Development (IWD) and/or recommended by the SOC Policy Committee for OMB.
2. Other includes first-line supervisors of food preparation/servers, institutional/cafeteria cooks, graphic designers, postsecondary business/biological science/nursing teachers, animal breeders, first-line supervisors of farming/fishing/forestry workers, electricians, plumbers/pipefitters/steamfitters, and fire fighters.

Table 33. Distribution of males and females in STEM occupations, 2015

STEM Occupational Category[1]	% Male	% Female
Management	46%	54%
Business & Financial Operations	23%	77%
Computer & mathematical	62%	38%
Architecture & engineering	88%	12%
Life, Physical, Social Science	47%	53%
Healthcare practitioners & technical	13%	87%
Healthcare support	9%	91%
Installation, maintenance, & repair	97%	3%
Production	94%	6%
Other STEM[2]	60%	40%
TOTAL[3]	**40%**	**60%**

Source: 2015 Iowa Workforce Development Statewide Laborshed Survey, Communications and Labor Market Information Division, Iowa Workforce Development

1. STEM occupations as used in this table are a combined occupational group using the Standard Occupational Classification Policy Committee (SOCPC) definition and additional criteria defined by Iowa Workforce Development. The Census STEM and STEM-related occupation code list is based on the recommendations of the SOC Policy Committee for the Office of Management and Budget (OMB). Additional documentation on the STEM classification process and recommendations can be found at www.bls.gov/soc.
2. Other includes sales engineers, first-line supervisors of food preparation/servers, institutional/cafeteria cooks, graphic designers, postsecondary business/biological science/nursing teachers, animal breeders, first-line supervisors of farming/fishing/forestry workers, electricians, plumbers/pipefitters/steamfitters, and fire fighters.
3. The larger proportion of females in total in STEM occupations is largely driven by including healthcare occupations as a STEM field.

Indicator 17: Job vacancy rates in STEM occupational areas

Data source Iowa Workforce Assessment Survey, Iowa Workforce Development

The Workforce Needs Assessment Survey is conducted each year with employers in the state by Iowa Workforce Development to assess the demand and skills required for jobs in several sectors of the workforce. The Workforce Needs Assessment is expected to be released later in 2015.

Key findings

- From 2014-2015, there were an estimated 8,744 vacancies in STEM jobs statewide. (Table 34).

Table 34. Estimated job vacancy rates in STEM occupational areas[1]

	2011-2012		2012-2013		2014-2015	
Occupational Categories[2]	**Vacancy Rate**	**Est. Vacancy**	**Vacancy Rate**	**Est. Vacancy**	**Vacancy Rate**	**Est. Vacancy**
Architecture and Engineering	5%	815	3%	593	6%	1,047
Community and Social Science	3%	699	2%	355	3%	720
Computer and Mathematical science	3%	810	3%	752	6%	1,887
Farming, Fishing, and Forestry	11%	588	3%	148	12%	683
Healthcare Practitioner and Technical	4%	2,738	2%	1,837	3%	2,847
Healthcare Support	8%	3,953	4%	1,678	3%	1,205
Life, Physical, and Social Science	6%	659	1%	116	3%	355
Total Estimated Vacancies		**10,262**		**5,479**		**8,744**

Source: Iowa Workforce Needs Assessment, Iowa Workforce Development, 2015

Retrieved from: www.iowaworkforcedevelopment.gov/sites/search.iowaworkforcedevelopment.gov/files/statewide_wna_2013.pdf

1. Vacancy data derived from the Iowa Workforce Development job bank, and reported in the Workforce Needs Assessment report for each respective year. Data may be limited for making longitudinal comparisons due to the changing number of employer websites that are indexed on the job bank in any given year. Numbers are also subject to changes in employers' job posting strategies. For example, over the course of three years, an employer may change their job-posting strategy and become more aggressive about posting and re-posting jobs, which would result in a big jump in the number of openings over the course of time.
2. Occupational Categories not included in this table are: Arts, Design, Entertainment, Sports, & Related; Building & Grounds Cleaning & Maintenance; Business & Financial Ops; Construction & Extraction; Education, Training, & Library; Food Preparation & Serving Related; Installation, Maintenance, & Repair; Legal; Management; Office & Administrative Support; Personal Care & Service; Production; Protective Service; Sales & Related; and Transportation & Material Moving.

Indicator 18: STEM workforce readiness

Data source ACT, Inc. and Iowa Workforce Development

Key findings

- The number of individuals taking the National Career Readiness Certificate (NCRC) *online* has increased from approximately 6,000 in 2012 to nearly 25,000 in 2014, but the total number has decreased from 179,000 test-takers in 2010 to 101,000 in 2014 (Table 35).
- The percent of individuals deemed workforce-ready based on the results of the NCRC assessment remained relatively constant at around one-half of test-takers each year from 2010 to 2014. The percent deemed workforce-ready increased from 51% in 2010 to 55% in 2014.

Table 35. Percentage of Iowa test takers who are workforce ready in applied mathematics on the National Career Readiness Certificate[1]

		2010	2011	2012	2013	2014
Test-takers						
	Online[2]	3,645	4,808	6,344	20,589	24,719
	Paper and pencil	175,332	151,056	121,357	94,325	76,588
Scored 5+						
	Online	2,404	3,300	4,281	13,672	14,658
	Paper and pencil	89,499	77,014	64,958	49,979	41,388
% Workforce-ready[3]						
	Overall	51%	52%	54%	55%	55%

1. STEM workforce readiness was estimated using results from the ACT National Career Readiness Certificate (NCRC). This assessment examines employability skills in three domains: applied mathematics, locating information, and reading for information. Here, the proportion of NCRC test takers receiving a 5 or better score on the Applied Mathematics component is used as a proxy for STEM workforce readiness. Subsequent years are linked to calculate a percentage on the basis that test takers from previous years are accumulating in the workforce.
2. Online counts reported in Year 1 and Year 2. Results from paper-and-pencil for all years added in Year 3. In addition, 2010-2012 online counts were updated from Year 1 report based on data provided by Iowa Workforce Development, June 2014.
3. The proportion considered STEM workforce-ready was updated in Year 3, and calculated considering both online and paper-and-pencil test-takers (Percent reported for online only in previous annual reports).

Indicator 19 (Addendum): Iowa STEM Initiative: Professional Network Analysis and Geographic Visualization of Key Decision Makers (2011-2012 through 2014-2015)

Data Source: Iowa STEM Education Evaluation (NSF DRL-1238211)

Indicator 19 is a special addendum to the 2015 report, and features some of the work going on the Iowa STEM Education Evaluation (I-SEE) project -- a 3-year project funded by the National Science Foundation (NSF DRL-1238211).

Examining the professional network of the Iowa STEM Initiative allows for a rich understanding of who is developing and conducting intervention activities, who does and does not have access to network resources, and the overall strengths and weaknesses of the network.

The professional network is used to examine the structure and content of initiative members' personal networks and their relationship to the more structured networks of the overall initiative, as well as the networks that exist within regions, among STEM and non-STEM initiative participants, and across the various professional affiliations involved in STEM work. It shows the interrelations between these networks and their effect on the resources that are available to expand and sustain a healthy statewide network of STEM professionals.

Seven different groups were instrumental to the development of the Iowa STEM Initiative since its inception in July 2011. These entities include the Governor's Advisory Council (including the Executive Committee), Regional Managers, Regional Advisory Boards, Working Groups, Implementation Teams, Higher Education STEM Champions Network, and Teacher Think Tank. Within these seven entities, a total of 391 Iowans were considered to have a primary role in developing and implementing the Iowa STEM Initiative during the first four years of the initiative.

Geographic Information System (GIS) analysis was used to provide a descriptive visualization of the key decision makers across the state of Iowa. Figure 31 displays the location of all 391 Iowans who have served as key decision makers since the creation of the initiative in July 2011.

- The Iowa STEM Initiative key decision-makers represented the state of Iowa well.
- They reside in 126 different zip codes across the state of Iowa, although approximately 25% of them reside in five specific zip codes in the metropolitan areas of the state.

Within the professional network analysis, we know that stakeholders throughout the network on average have 31 connections. The highest degree of separation for stakeholders in the Iowa STEM network is four, while the average network player only has two degrees of separation. Last, large networks tend to have a high density of social cliques that limit the flow of information across the network. Low clique scores are more desirable, and networks of this size tend to have a clique score from 7 to 15. Iowa's STEM professional network has an overall clique score of 0.12 – meaning that Iowa's STEM network is very healthy. Figure 32 shows the growth of the Iowa STEM network from the planning years (2007-2011) through each of the last four years. During the planning years of 2007-2011, 96 stakeholders reported around 1200 network ties. By 2014-2015, 259 current stakeholders report over 12,000 network ties.

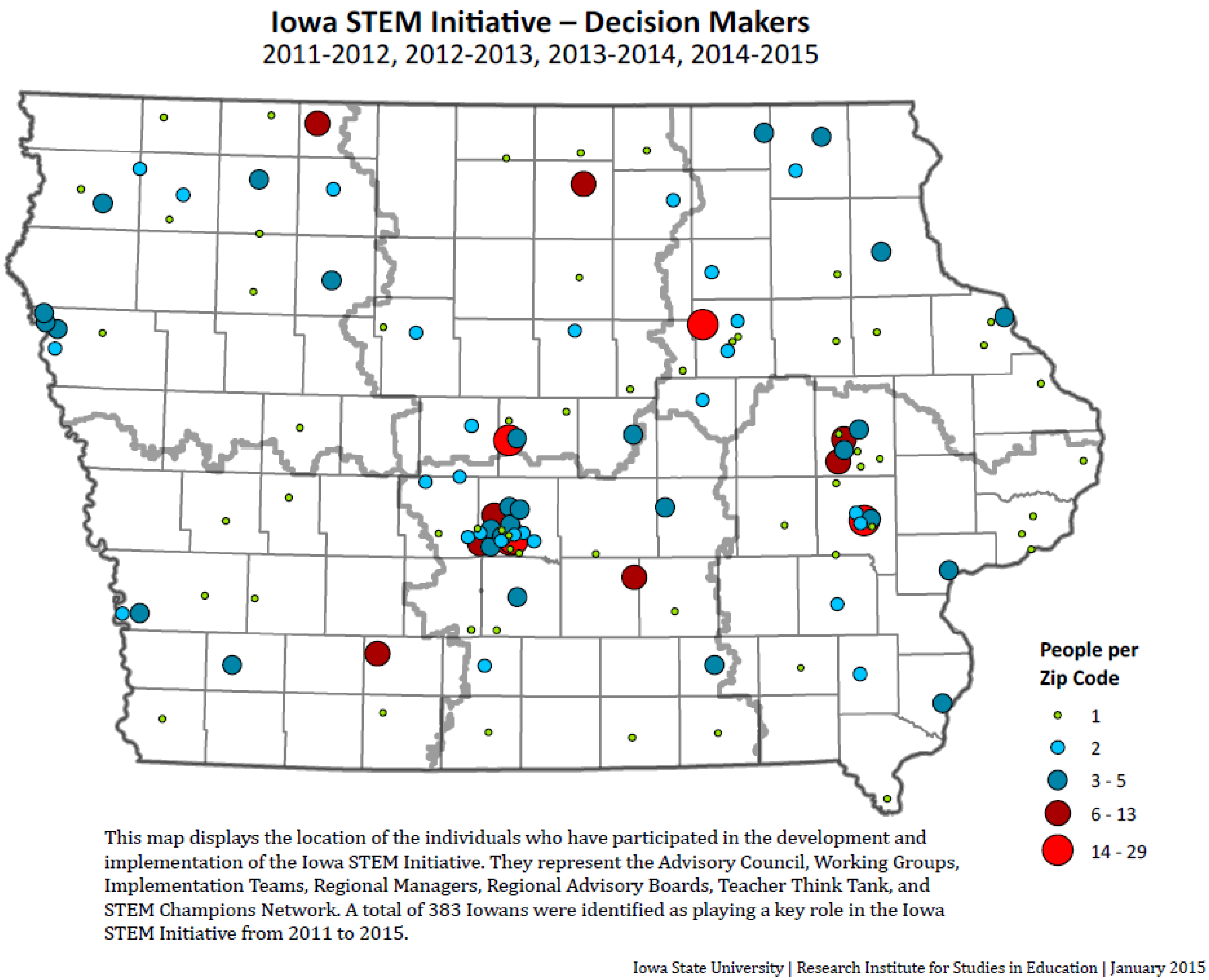


Figure 31. Location of the Iowa STEM Initiative Decision Makers from 2011-2015

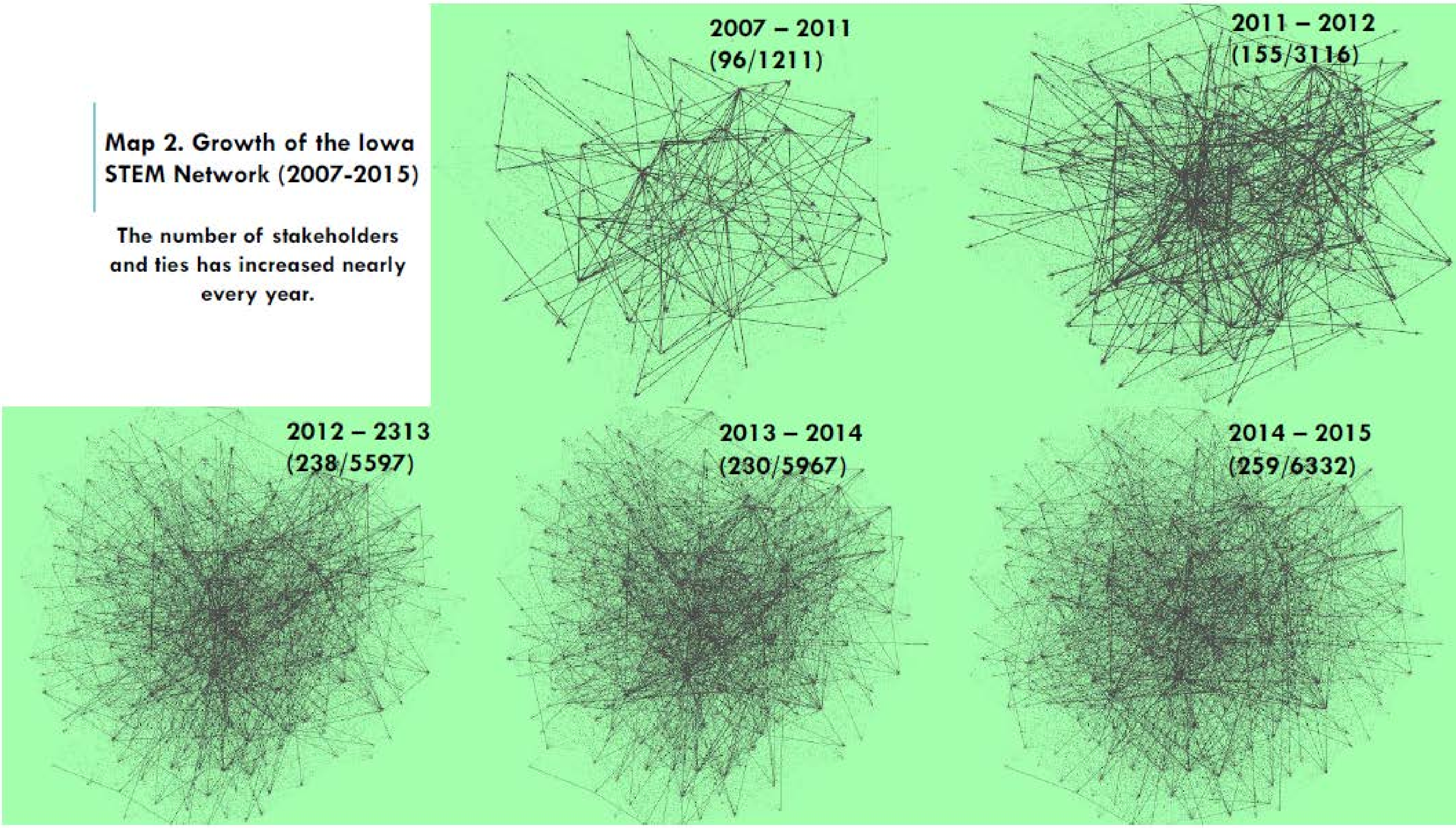


Figure 32. Growth of the Iowa STEM Network (2007-2015)

Section 2. Statewide Survey of Public Attitudes Toward STEM

Data source Iowa Statewide Survey of Public Attitudes Toward STEM (UNI Center for Social and Behavioral Research, 2014)

To measure public awareness of and attitudes toward STEM in Iowa, the UNI Center for Social and Behavioral Research has conducted an annual statewide public survey of adult Iowans since 2012. The survey was funded by the Iowa Governor's STEM Advisory Council and the National Science Foundation (Award No. DRL-1238211). The survey was developed in 2012, and reviewed and revised slightly for 2013 and 2014. Survey topics included:

1. STEM awareness and exposure
2. Attitudes toward STEM and the role of STEM in Iowa
3. Perceptions and attitudes about STEM education
4. Perceptions about strategies to improve STEM education
5. Parent perceptions of STEM education
6. Demographics

The complete survey instrument used for 2014 data collection can be found in Appendix D.

Population & Sampling Design The 2014 Survey of Adult Attitudes toward STEM used a dual-frame random digit dial (DF-RDD) sample design that included both landline and cell phones. In addition, a targeted (landline list-assisted) oversample of three groups was included (parents, African-American adults and Hispanic adults). All samples were obtained from Marketing Systems Group (MSG). A modified Kish protocol was used for within-household selection for landline calls. Respondents were Iowans who were at least 18 years of age or older at the time of the interview. Interviews were completed from June 2, 2014 through August 7, 2014, and averaged 26 minutes in length. Interviews were conducted in both English and Spanish.

A total of 1,916 interviews were completed. This included 444 (23%) landline and 615 (32%) cell phone interviews with an additional targeted oversample of 396 (21%) parents, 355 (18%) Hispanic and African American adults, and 106 (6%) Spanish-speaking interviews. Note that sample counts are based on the number of completed interviews generated from each respective sampling frame: 1) landline telephone numbers, 2) cell phone telephone numbers, 3) listed landline numbers from the targeted oversample of likely households of parents of 4-19 year old children, or 4) listed landline numbers from the targeted oversample of likely households of Hispanic or African American adults. In addition, working telephone numbers that were transferred to a Spanish-speaking interviewer were tracked and counted separately. These counts may differ from the self-reported demographic characteristics of participants described in the report.

Response rates were calculated using the American Association for Public Opinion Research (AAPOR) RR3 calculation.[1] The overall response rate was 24%. The response rates for both the landline RDD and the cell phone samples were each 27%. The average response rate of the targeted oversamples was 20% (Parents: 18%, African American & Hispanic: 21% and Spanish-speaking: 20%). The overall cooperation rate (AAPOR CR3) was 64%. The cooperation rate for interviews completed via cell phone (78%) was higher than for landline (58%) and was 64% (parents), 56% (African American & Hispanic) and 60% (Spanish-speaking) for the oversamples.

Weighting & Precision of Estimates This report focuses on findings from the 2014 statewide survey, but also includes some key comparisons to findings from 2012 and 2013.

The data from all years were weighted in order to obtain point estimates that are representative of all adult Iowans (age, gender, education, etc.).[2] The post-stratification weights were computed with SAS (see www.sas.com) statistical software. Descriptive statistics, including frequencies and distributions were calculated for the total sample and for population subgroups including gender, education, parent status, and place of residence for select questions in the survey. Margin of sampling error taking into account the design effect is ±3.2% for the overall sample and as high as ±12.2% for the analyses using the smallest subgroups (Race subgroup: All other, including oversampling). IBM SPSS Statistics (V22.0) was used for initial data management and descriptive analysis, and SUDAAN software (see www.rti.org/sudaan) was used to estimate population estimates of attitudes toward STEM. Analyses conducted in SUDAAN have been adjusted for the design effect[3] due to differential probabilities of selection, clustering and weighting. SUDAAN was also used for logistic regression to model some of the main findings of this study. Further explanation of this multivariate analysis (RLOGIST command in SUDAAN) can be found at www.rti.org/sudaan.

The significance level was set at a p-value of 0.05 (or 5%) for all analyses. Unless otherwise noted, the term “percent” refers to the “weighted percent” of survey respondents.

---

[1] See Appendix E for the complete response rate which followed the AAPOR Standard Definitions guidelines for calculation.
[2] See Appendix E. Weighting Methodology Report for the 2014 data.
[3] The Design Effect (DEFF) is a measure of estimated ratio between variances between cluster versus simple random sampling design in a weighted data analysis. See more information at www.rti.org/sudaan.

2014 Survey Results

A total of 1,916 completed interviews were conducted. Demographic characteristics of the survey sample can be found in Table 36. Approximately 51% of respondents were female compared to 49% male. By age group, 45% of respondents were 18-44 years old, 37% were 45-64 years old, and 17% were 65 years or older, respectively. The mean age of respondents was 47 years (range: 18-94 years) By race and ethnicity, the majority of the sample was White (89%). Approximately 3% of respondents were Black/African American and 4% Hispanic, Latino, or Spanish origin. Overall, the sample reflected comparable distributions by gender, age group, and race/ethnicity to the population of adult Iowans (51% female versus 49% male; 45% 18-44 years, 34% 45-65 years, and 20% 65+ years; and 90% non-Hispanic White, 3% non-Hispanic Black, and 4% Hispanic or Latino, respectively) (U.S. Census Bureau, 2014).

An estimated 30% of respondents reported four or more years of college, 33% at least some college, and 38% were high school graduates or less. By place of residence, approximately 42% reported living in a rural area or small town of less than 5,000 population compared to 29% from a large town of 5,000 to less than 50,000 population, and 29% from urban locations of greater than 50,000 population. Finally, 28% of respondents were a parent of at least one child, 3-19 years old.

Table 36. Demographic characteristics of respondents, 2014

	Sample size (n)	Population Estimate	Estimated % after weighting
Total Sample	**1,916**	**2,350,676**	**--**
Gender			
Men	783	1,143,583	48.6%
Women	1,133	1,207,093	51.4%
Age Group			
18-44	676	1,067,233	45.4%
45-64	771	879,645	37.4%
65 and older	469	403,798	17.2%
Race			
White	1,542	2,080,402	89.0%
Black / African American	116	64,108	2.7%
Other	244	194,020	8.3%
Ethnicity			
Hispanic, Latino, or Spanish origin	219	102,471	4.4%
Non-Hispanic	1,697	2,248,205	95.6%
Education			
High school graduate/GED or less	579	880,959	37.6%
Some college or technical school (1-3 yrs, AA)	626	772,129	32.9%
4-year undergraduate or graduate degree	704	691,043	29.5%
Employment			
Employed for wages	999	1,237,205	52.7%
Self-employed	173	225,719	9.6%
Out of work / Unable to work	118	182,407	7.8%
Student	61	141,833	6.0%
Homemaker	115	116,766	5.0%
Retired	444	442,282	18.9%
Income			
Less than $25,000	304	375,600	18.9%
$25,000 to $49,999	426	527,540	26.5%
$50,000 to $74,999	307	363,436	18.3%
$75,000 to $99,999	248	286,961	14.4%
$100,000 or More	377	436,129	21.9%
Place of residence			
Rural / Small town (<5,000 pop.)	802	959,017	41.8%
Large town (5,000-<50,000 pop.)	545	668,940	29.1%
Urban (50,000+ pop.)	524	667,503	29.1%
Parent			
Not a parent of a school aged child	1,113	1,695,984	72.1%
Parent of 3-11 year old	352	311,014	13.2%
Parent of 12-19 year old	451	343,678	14.6%

Note. Sums less than 1,916 due to respondents who answered ‘Don’t know’ or ‘Refused’.

STEM awareness

Prior to defining STEM and asking structured questions about STEM education in the telephone interview, respondents were asked an uncued, open-ended question to explore basic awareness and understanding of STEM when used as a stand-alone acronym. Responses were coded across common themes, and aggregated into five overall categories (Figure 33).

One in five (20%) responses was an exact or close definition of STEM, and 2% of responses described STEM as having something to do with education in general. Stem cells or stem cell research was specifically referenced in 14% of responses. Over half (54%) of responses were 'I don't know' or 'nothing' comes to mind regarding the acronym STEM.

UNCUED RECALL AND UNDERSTANDING OF STEM

One in five respondents could describe an exact or close definition of STEM.

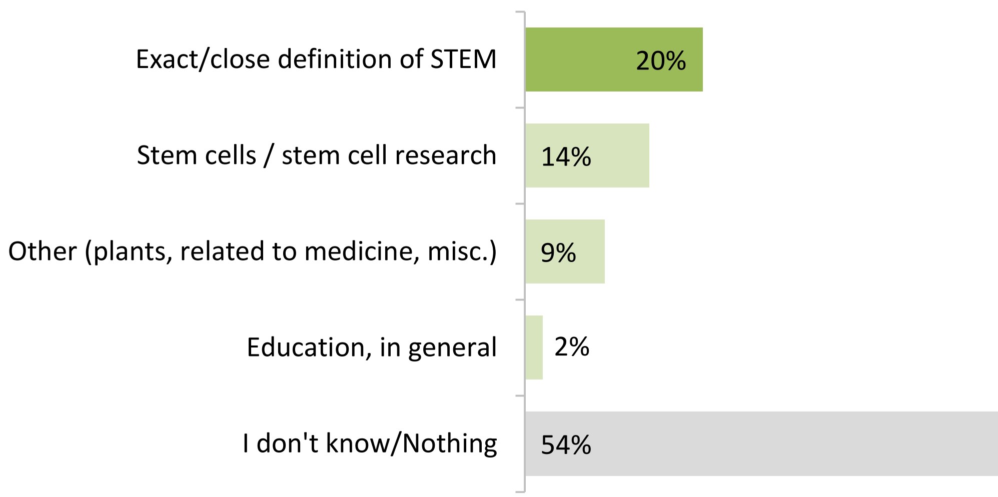


Figure 33. You may have heard about STEM education or STEM careers lately. What, if anything, comes to mind when you hear the letters S-T-E-M, or the word STEM?

Awareness of STEM was also assessed in a cued question referencing ‘improving math, technology, science, and engineering education.’ In addition, awareness of statewide efforts to improve STEM education was assessed by asking respondents if they have read, seen, or heard anything about groups or events promoting STEM education and careers in Iowa or the phrase “Greatness STEMs from Iowans.”

In 2014, a majority of Iowans (74%) had heard something in the past month about K-12 education in general, and 61% reported that they had heard something about ‘improving math, science, technology, and engineering education’ (Figure 34). When asked specifically about STEM, 41% of Iowans had read, seen, or heard of STEM.

Statewide Awareness of STEM

61% of Iowans have heard about ‘improving math, technology, science, and engineering education,’ and 41% have heard of STEM when used as a stand-alone acronym.

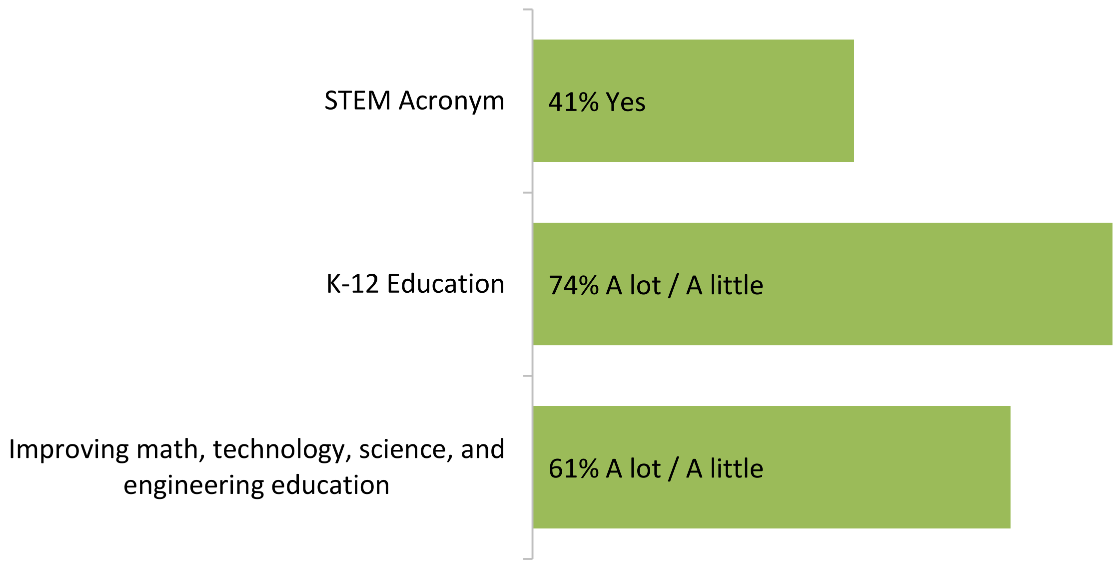


Figure 34. Percentage of Iowans with awareness of STEM

In follow-up, respondents who answered ‘yes’ (n=860) to having an awareness of STEM were asked to describe what they have read, seen, or heard about STEM. The following comments reflect some of the overall themes across responses:

> *What I've gathered is that there is an increased effort to focus more on these branches of education. From what I understand is that the children of this country are lacking in these areas. I have noticed a difference of skills of the children in these areas recently.*
>
> *Trying to encourage more kids especially girls to get into those fields.*

Our local newspaper has had articles about the local high school and community college students who have been involved in programs and statewide competitions.

A statewide initiative.

I can't remember. / Well not much. / Just general information. / Heard a little about it, not a lot.

Read about it in the paper, they are looking into the economics and improvements on STEM and keeping Iowa ahead of the game. I think Iowa used to be thought of as more advanced in these topics than we are today, in terms of perception.

The need for more funding, qualified teachers, reaching students at an earlier age, and having them academically prepared.

It encourages kids to pursue their education in STEM areas so they can grow in the future. There are lots of programs that encourage kids to get involved with STEM areas.

Respondents who answered 'yes' (n=860) to having an awareness of STEM, were asked about specific sources of information where they may have read, seen, or heard about STEM education in the past 30 days (Figure 35). Overall, nearly half (46%) reported seeing information in the newspaper. More respondents with no children or no school-aged child had seen information on STEM education in the newspaper compared to parents of school-aged children ($p<.01$). In contrast, a greater proportion of parents of a school-aged child had seen information on STEM education on the Internet or from a school or teacher compared to non-parents ($p<.01$).

Sources of Information on STEM Education

Among Iowans who reported an awareness of STEM, 46% had read about STEM education in the newspaper in the past 30 days.

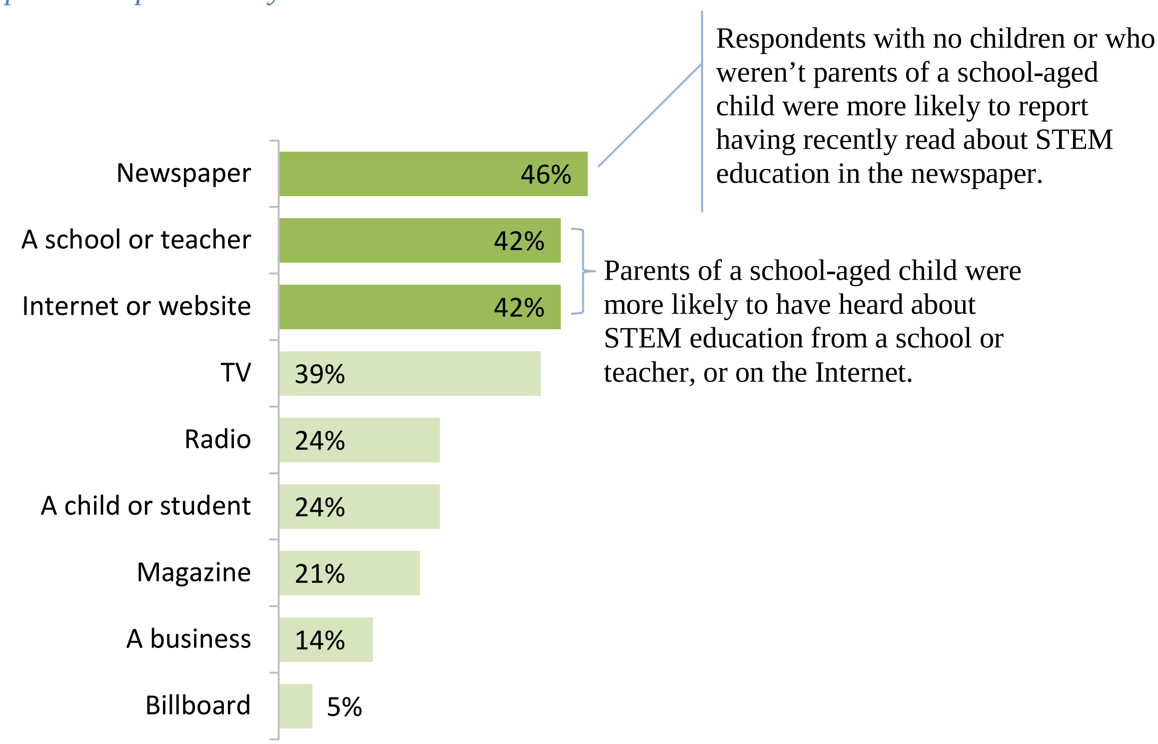


Figure 35. In the past 30 days, have you read, seen, or heard anything about STEM education from any of the following sources of information? (% Yes. Categories not mutually exclusive.)

In the 2014 survey, 14% of Iowans recognized the slogan *Greatness STEMs from Iowans.*

Finally, respondents were asked about groups and events promoting STEM education and careers, as well as awareness of the slogan *Greatness STEMs from Iowans*. An estimated 25% of Iowans reported awareness of the Governor's STEM Advisory Council, and from 10-17% reported an awareness of a specific event (e.g. STEM Summit, STEM Festival) (Figure 36). A greater proportion of respondents with four or more years of college reported having heard of the Governor's STEM Advisory County or a specific event compared to respondents with a high school education or less (p<.01 for all). In December 2013, the Iowa Governor's STEM Advisory Council launched a public awareness campaign, *Greatness STEMs from Iowans*. Approximately six months later, an estimated 14% of Iowans reported having heard the slogan *Greatness STEMs from Iowans.*

AWARENESS OF GROUPS AND EVENTS PROMOTING STEM EDUCATION AND CAREERS

One in four Iowans reported having heard about the Iowa Governor's STEM Advisory Council in the past year.

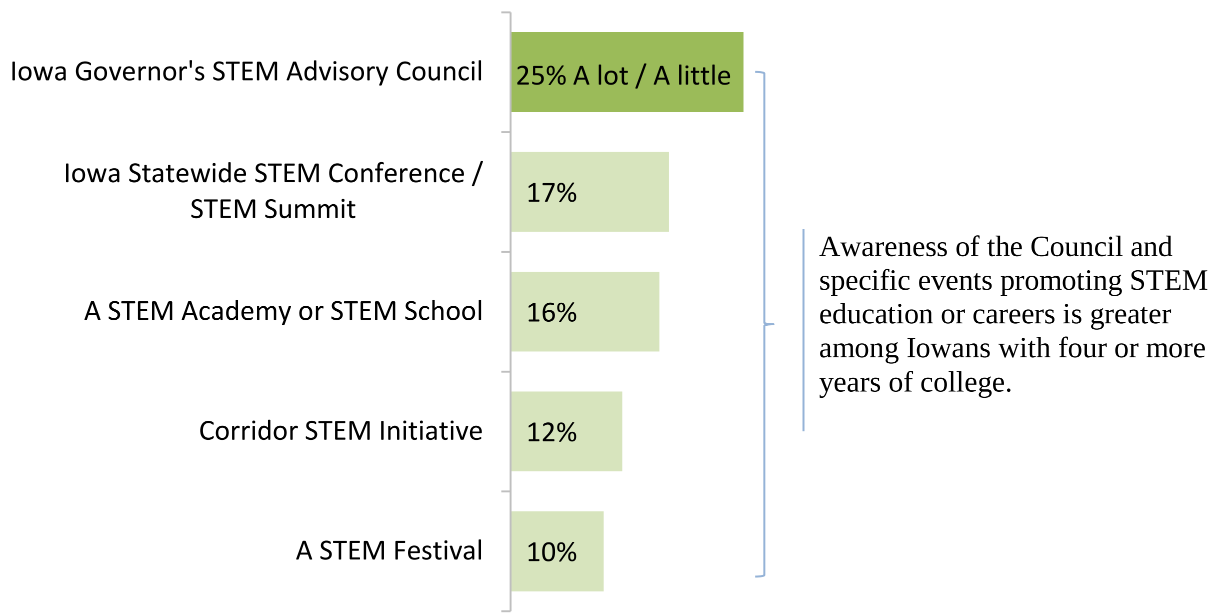


Figure 36. I'm going to read a short list of some groups promoting STEM education and careers. Please tell me how much you have heard, if anything, about each one in the past year. (% A lot/A little. Categories not mutually exclusive.)

Bivariate analysis of awareness of STEM

Bivariate analyses were used to compare awareness of STEM across select demographic variables. A summary of findings regarding awareness of STEM by gender, education, parent status, and place of residence is presented in Table 37. Overall, higher education was associated with more awareness of K-12 education in general; having heard of improving STEM education, or the acronym STEM (Figure 37). In addition, more Iowans who live in a large city of greater than 50,000 population report awareness of the STEM acronym and having heard about improvements in STEM education in the past month compared to Iowans from rural places of residence.

Awareness of STEM by Demographic Characteristics

Iowans with some college education or who live in urban areas have more awareness of STEM as an acronym and having heard of improving STEM education.

Iowans who are parents of a 12-19 year old child have more awareness of efforts to improve STEM education compared to parents of younger children and non-parents.

Table 37. Awareness of STEM by demographic characteristics

	K-12 education	Improving math, technology, science, and engineering education	STEM acronym
Gender	Females more likely than males to have heard 'a lot' about K-12 education in general.**	No significant differences	No significant differences
Education	Iowans with four or more years of college are more likely to have heard about K-12 education in general.**	Iowans with four or more years of college are more likely to have heard about improving STEM education.**	Iowans with at least some college have more awareness of STEM compared to those who have never attended college.**
Parent status	Parents of a child 12-19 are more likely to have heard about K-12 education in general.**	Parents of a child 12-19 are more likely to have heard about improving STEM education.*	No significant differences
Place of residence	No significant differences	Iowans who live in a large city (>50K population) are more likely to have heard about improving STEM education.*	Iowans who live in a large city (>50,000 population) have more awareness of STEM compared to those who live in towns of less than 5,000 or in a rural area.**

*p<.05; **p<.01

Awareness of STEM acronym by demographic characteristics

Awareness of STEM is greater among Iowans with some college education or more, and among Iowans who live in urban areas.

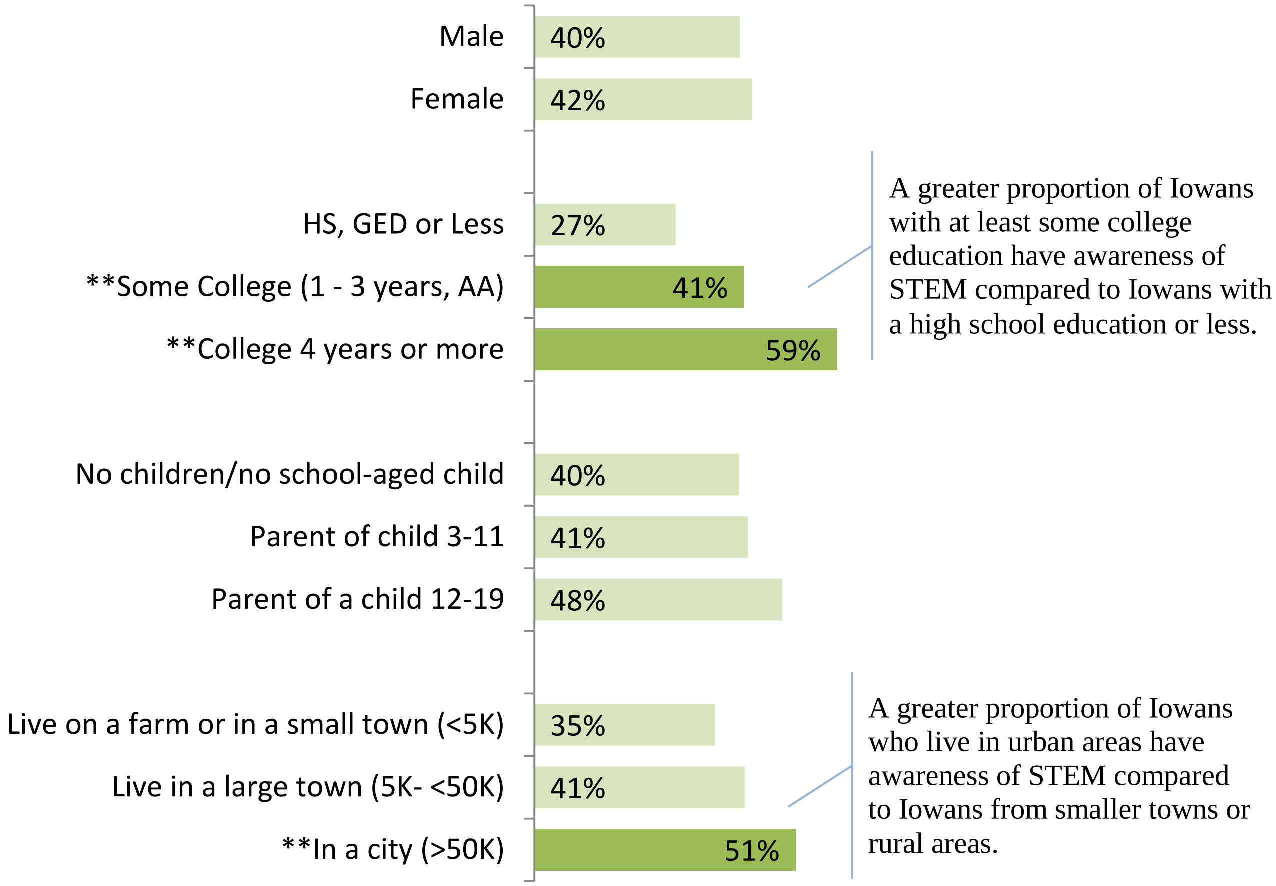


Figure 37. STEM stands for 'science, technology, engineering, and mathematics.' Have you heard of this before? (% Yes) **p<.01

Awareness of STEM education was assessed by asking how much have you heard about ‘Improving math, technology, science, and engineering education,’ if anything, in the past month. Respondents were asked to respond using a 3-point scale of ‘A lot’, ‘A little’, or ‘Nothing.’ Iowans who have a college degree or more, or live in a city of greater than 50,000 population are more likely to have heard about ‘improving math, technology, science, and engineering education’ in the past month (Figure 38).

AWARENESS OF STEM EDUCATION BY DEMOGRAPHIC CHARACTERISTICS

Awareness of ‘improving math, technology, science, and engineering education’ is greater among Iowans with four or more years of college, and among Iowans who live in urban areas.

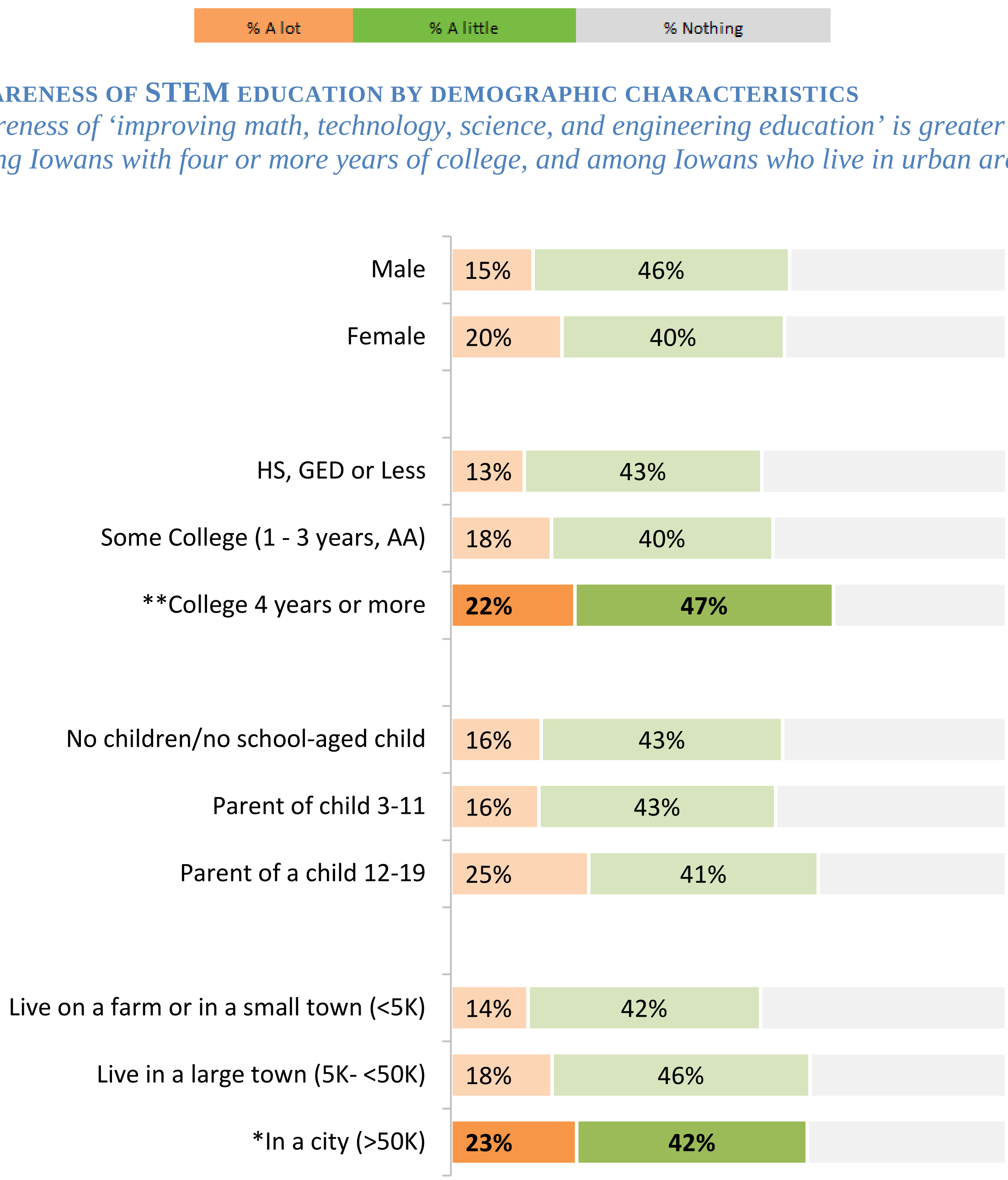


Figure 38. Please tell me how much you have heard about ‘Improving math, technology, science, and engineering education,’ if anything, in the past month. (% A lot/A little/Nothing) *p<.05; **p<.01

Multivariate analysis of awareness of STEM

Finally, multivariable logistic regression analysis was conducted on the main variable of awareness of STEM. The purpose of this analysis was to determine the strongest predictor of awareness of STEM when all potential predictors are considered simultaneously. Predictors included in the model were gender, age, education, race, household income, place of residence, and parent status.

The logistic regression model focused on respondents who reported having an awareness of STEM (an estimated 41% of adult Iowans). The overall model was significant at $p<.001$.

After controlling for other factors, Iowans with some college education ($p=.03$) or college degree ($p<.001$), an annual gross income of $75,000 to less than $100,000 ($p=.04$), and/or who live in a large city of greater than 50,000 population ($p=.02$) were significantly more likely to have awareness of STEM. Specifically,

- The odds ratio for Iowans with some college was 1.55 [CI: 1.04-2.31]. Among Iowans with four or more years of college, the odds ratio was 3.06 [CI: 2.01, 4.65].
- The odds ratio for those with an annual gross income of $75,000 to less than $100,000 was 1.87 [CI: 1.03, 3.40].
- Finally, the odds ratio for those living in a large city of greater than 50,000 population was 1.51 [CI: 1.06, 2.16].

Iowans with four or more years of college are 3 times more likely
to have awareness of STEM compared to those without any college education.

These findings suggest that Iowans with a college education are significantly more likely to have awareness of STEM compared to those without any college education. This is especially true for those with four or more years of college, who are 3 times more likely to have awareness of STEM compared to those without any college education. In addition, Iowans with an upper-middle income level of $75K to less than $100,000 are nearly twice as likely to have awareness of STEM compared to those with income less than $25,000. Last, Iowans who live in a large city are 1.5 times more likely to have awareness of STEM compared to those from small towns or rural areas, respectively.

Schools, libraries, zoos, and museums are all educational settings where exposure to STEM topics, STEM education, and STEM-related activities may occur. Nearly two-thirds of Iowans reported having visited a public library in the past year, and over one-half had visited a K-12 school (Figure 39). Iowans with higher education were more likely to report having visited all out-of-school settings compared to Iowans with a high school education or less ($p<.01$ for all). Compared to Iowans from small towns, Iowans living in a large city of greater than 50,000 population were more likely to have visited a museum, zoo/aquarium, science/technology center, or arboretum/botanical center in the past year ($p<.01$ for all). Notably, however, there was no difference in the proportion of Iowans who had visited a public library in the past year by place of residence. That is, regardless of where they live, approximately 6 out of 10 residents have visited a public library in the past year.

VISITS TO OUT-OF-SCHOOL EDUCATIONAL SETTINGS

Six out of ten Iowans report having visited a public library in the past year.

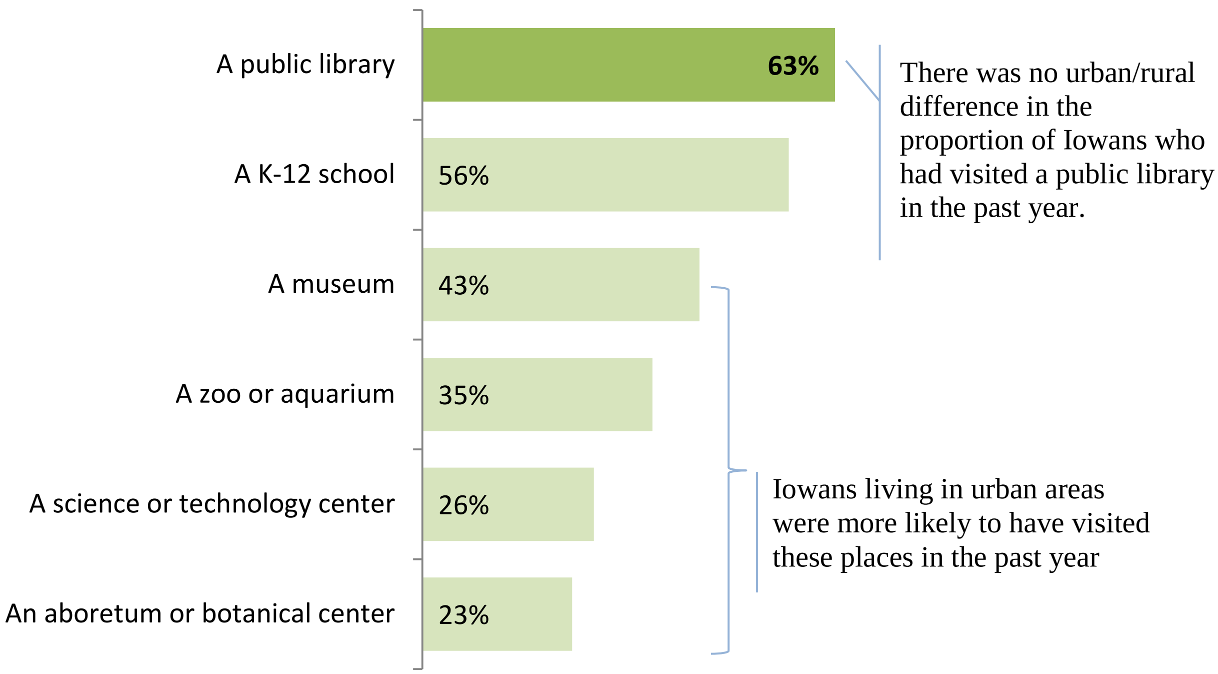


Figure 39. Percentage of Iowans who have visited educational settings where STEM learning may occur

Attitudes toward STEM and the role of STEM in Iowa

Public attitudes toward STEM and views about the role of STEM in Iowa were assessed with a series of statements. The statements reflected attitudes about the importance of STEM, STEM's role in economic development, broadening participation in STEM, and barriers to public support of STEM (Figure 40, Figure 41, and Figure 42). Respondents were asked to respond using a 5-point Likert scale of 'strongly disagree', 'disagree', 'neither disagree or agree', 'agree', or 'strongly agree.'

Attitudes on the importance of STEM

The majority of Iowans agrees that STEM fields provide more opportunities for the next generation (57% agree/ 40% strongly agree), and that science and technology are making our lives better (61% agree/ 35% strongly agree).

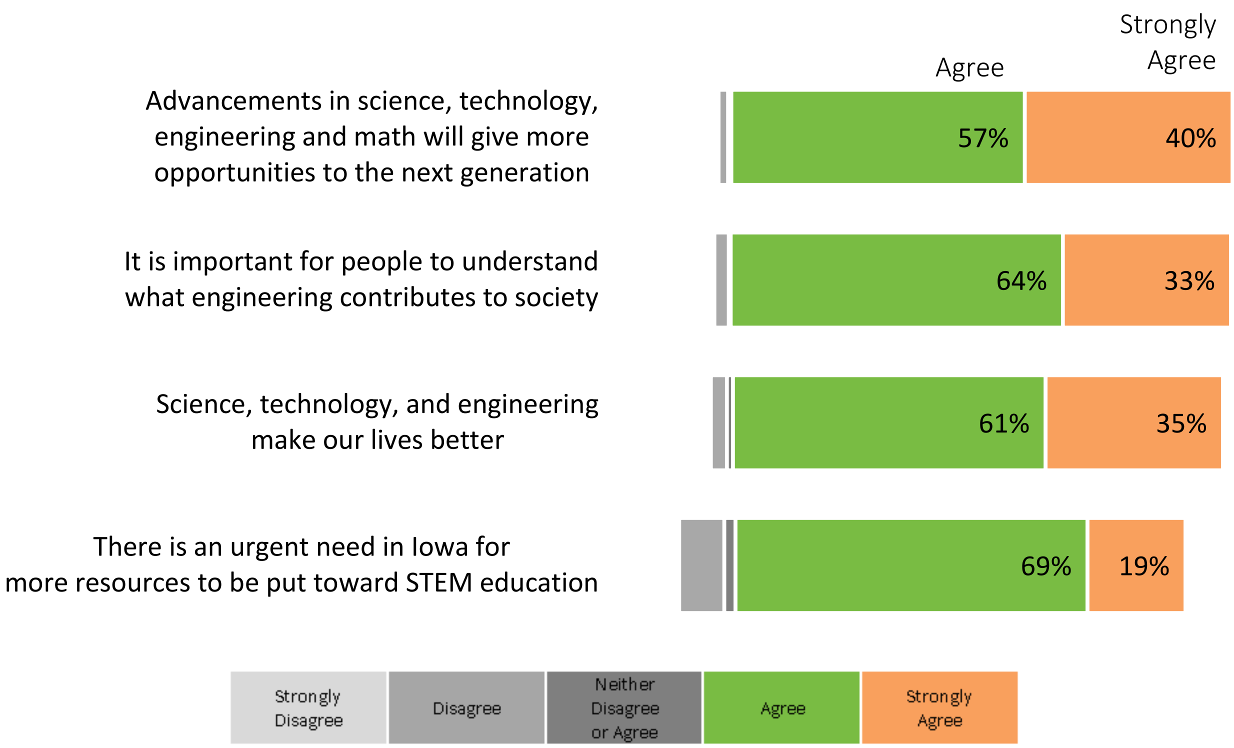


Figure 40. Public attitudes about the importance of STEM

The majority of Iowans agrees or strongly agrees with statements that reflect the role of STEM in Iowa's economic and workforce development (Figure 41). This includes support for broadening participation in STEM for rural Iowans (73% agree / 18% strongly agree), and increasing participation among women (60% agree / 28% strongly agree) and underrepresented minorities (59% agree / 14% strongly agree). Despite support for efforts to increase STEM jobs, 82% of Iowans think there are not enough skilled workers to fill STEM jobs in the state, compared to 13% of Iowans who feel there is just the right number of skill workers to fill STEM jobs.

ATTITUDES TOWARD STEM'S ROLE IN ECONOMIC AND WORKFORCE DEVELOPMENT

Among Iowans, 67% agree and 22% strongly agree that focus on STEM education will improve the state's economy.

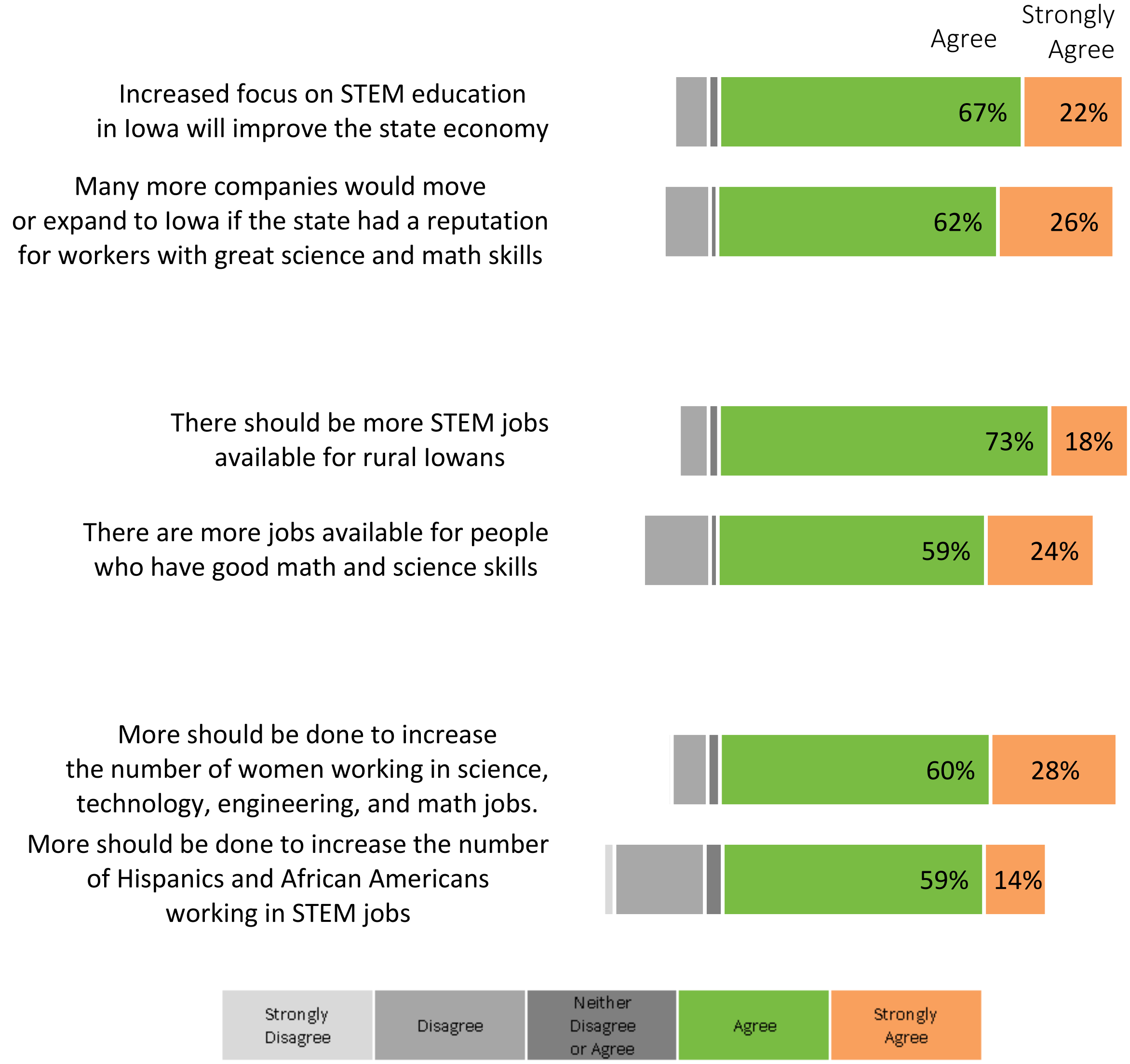


Figure 41. Attitudes toward STEM, the economy, and workforce development

Perceptions about STEM being "too specialized" or as an area that "develops too fast" may be a barrier for support (or lack thereof) for STEM for some Iowans. Changing perceptions about the perceived effort or skills needed to accomplish and understand STEM may lead more people to choose STEM careers.

PERCEPTIONS THAT MAY HINDER SUPPORT FOR STEM

Over half of Iowans disagree (>50% disagree/strongly disagree) that STEM is "too specialized" or "develops too fast", but these perceptions may still be barriers for 4 out of 10 residents in the state.

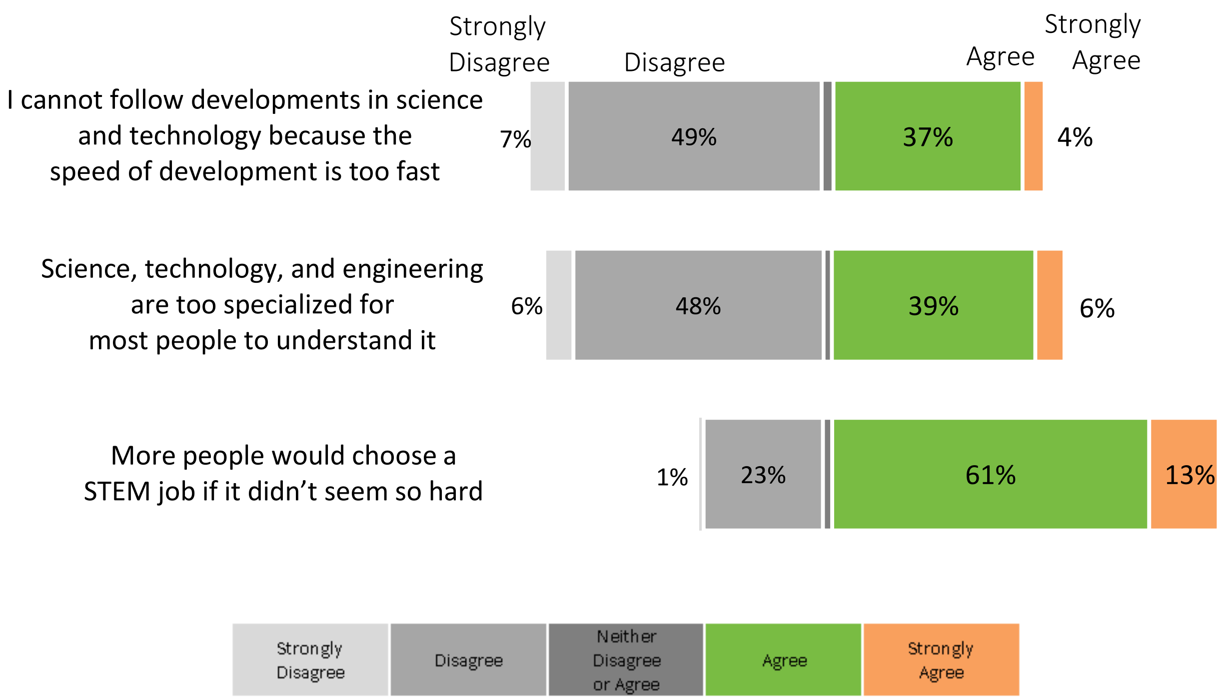


Figure 42. Perceptions among Iowans that may hinder support for STEM

Perceptions about STEM education

The statewide survey also assessed public awareness and attitudes toward STEM education in Iowa. This was achieved by asking questions about the quality of education in STEM subjects in schools in their community, the importance of STEM education, and strategies to improve STEM education. The survey also explored perceived barriers to STEM education.

Perceptions of Quality of Education

Over half of Iowans rate the quality of science, technology, and math education in their community as 'Excellent' or 'Good,' while only 37% of Iowans rate the quality of engineering education in their community that way.

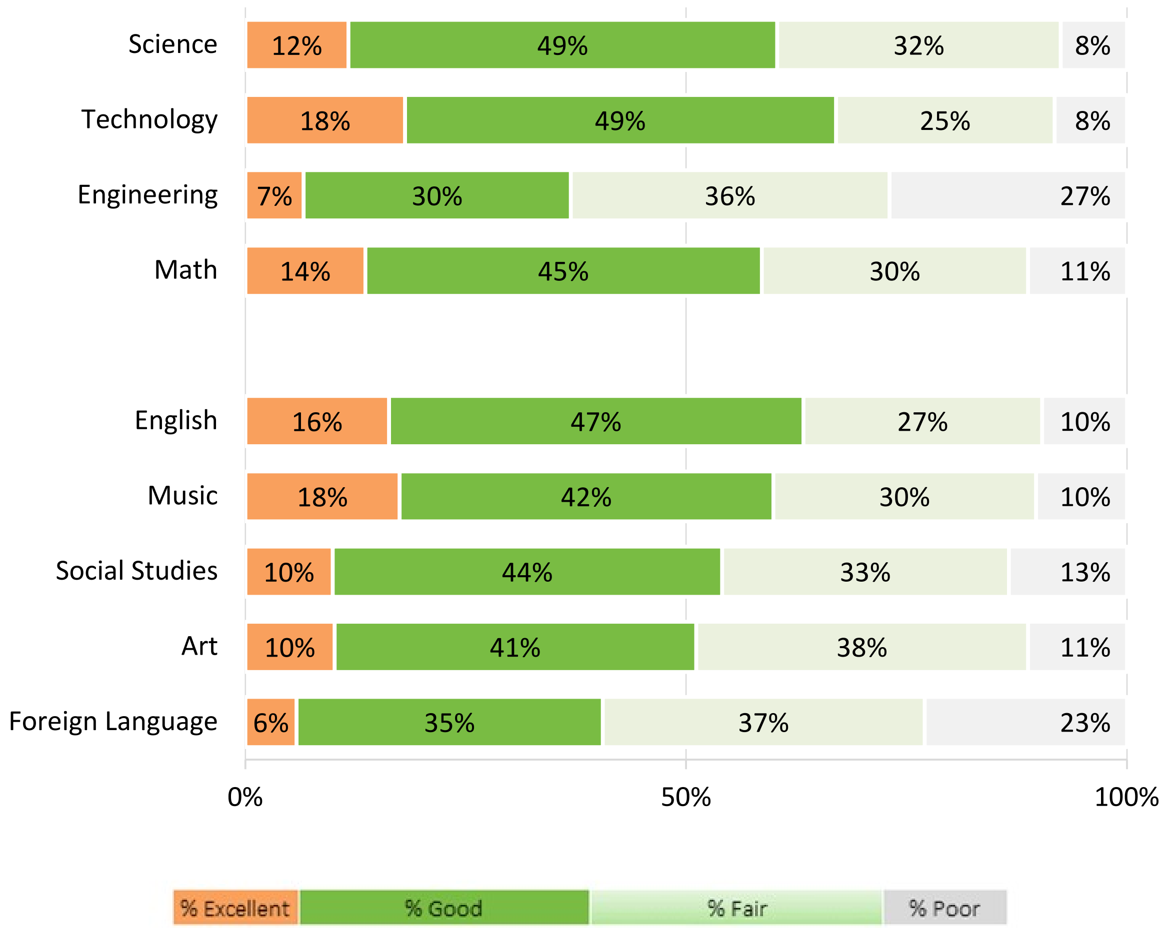


Figure 43. How well do you think the schools in your community are teaching each of the following subjects?

Attitudes about STEM education were assessed in a series of statements on the importance of STEM education, teacher and student preparation, and broadening participation among students in STEM. Respondents were asked to respond using a 5-point Likert scale of ‘strongly disagree’, ‘disagree’, ‘neither disagree or agree’, ‘agree’, or ‘strongly agree.’

Attitudes about STEM education

Most Iowans agree (61%) or strongly agree (34%) that math and science courses teach important critical thinking skills.

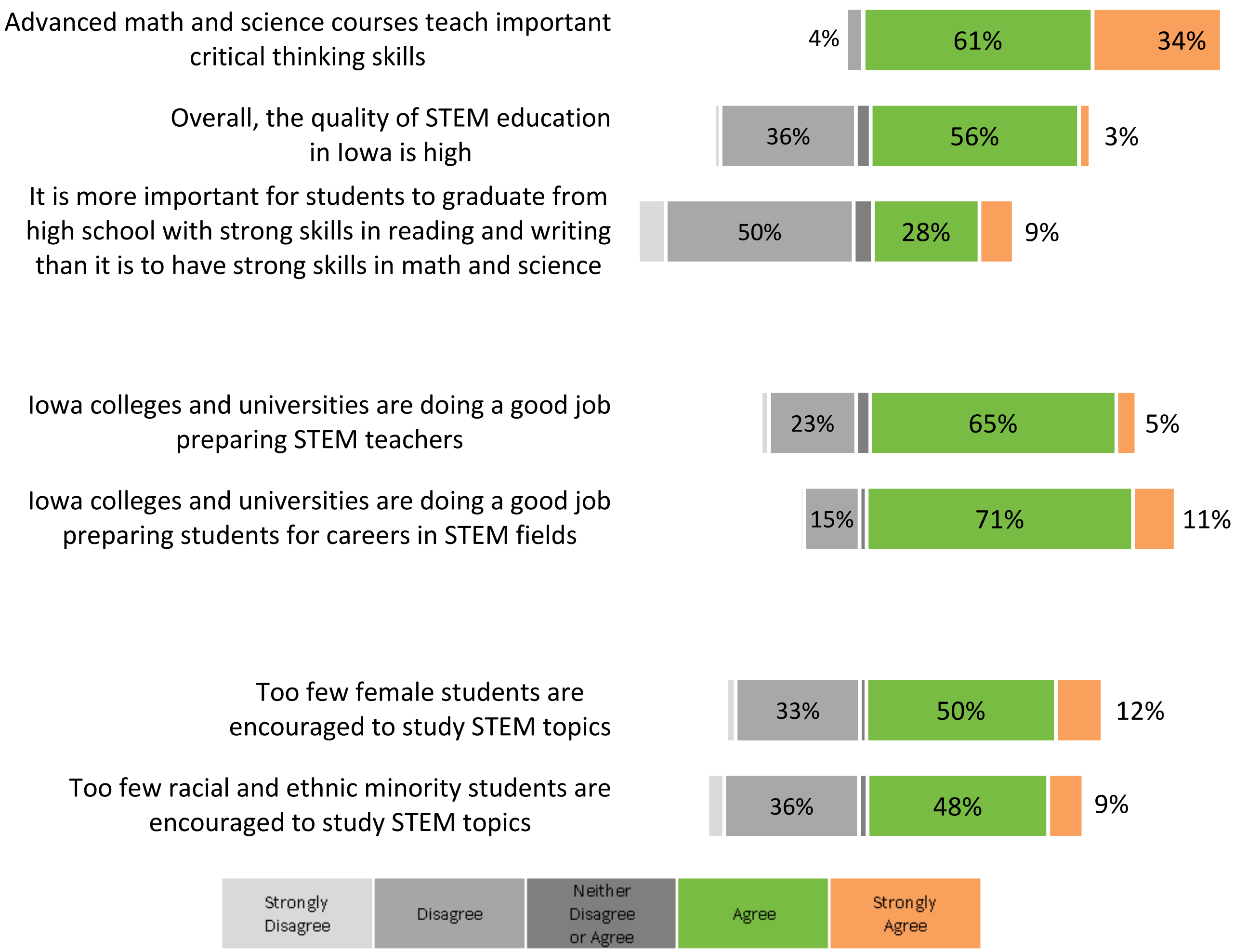


Figure 44. Attitudes about STEM education

SUPPORT FOR RESOURCES DEVOTED TO STEM EDUCATION

The majority of Iowans support state efforts to devote resources and develop initiatives to promote STEM education in Iowa (44% Very supportive, 43% Somewhat supportive).

In addition, respondents were asked about a list of strategies that might impact math and science education by responding if they thought it would *improve* or *not improve* STEM education. The strategies are presented in Figure 45. A greater proportion of Iowans support increasing access and providing hands-on STEM experiences, rather than strategies that focus on taking different approaches for fast versus slow learners or students who are struggling with math or science. Among respondents who endorsed applied-learning strategies as a way to improve math and science education, 71% said student internships with businesses and 75% said hands-on science and technology activities for elementary students' would make a *major* improvement to math and science education.

PERCEPTIONS ABOUT STRATEGIES TO IMPROVE STEM EDUCATION

Nine out of ten Iowans think hands-on experiences (in elementary classrooms, with businesses, or in a lab) and increasing access to a full range of math and science courses would improve math and science education in Iowa.

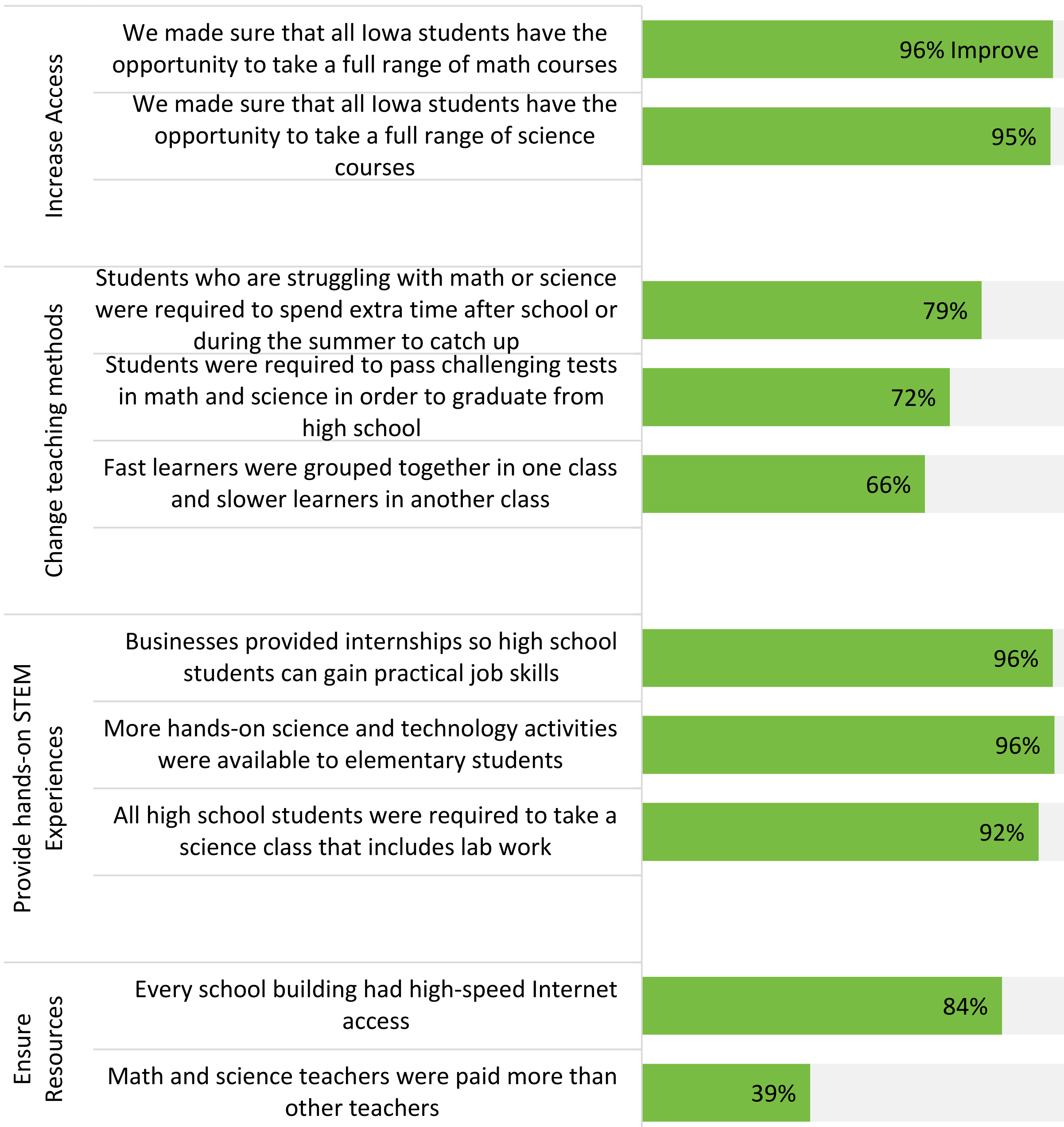


Figure 45. Perceptions about strategies to improve math and science education in Iowa (Response options: Improve / Not improve)

To explore perceived barriers to STEM education, an open-ended, uncued question asked respondents "What do you think are the primary barriers to STEM education?" The responses were grouped by common themes. The themes that emerged centered on five over-arching topic areas including: 1) Not enough access/availability of resources, 2) "STEM is not for me", 3) Lack of interest or indifference by students or parents, 4) Lack of awareness or understanding of STEM , and 5) Not prioritized in K-12 education or within government/politics (Table 38).

WHAT ARE THE PRIMARY BARRIERS TO STEM EDUCATION?

Among Iowans, the two most commonly cited barriers to STEM education were not enough access to or availability of resources for STEM, and personally held perceptions that suggest "STEM is not for me."

Table 38. What are the primary barriers to STEM education?

Theme	Description of comments
Not enough access to or availability of resources (818 comments)	Any statement that reflects a resource limitation, such as not enough qualified teachers, or "lack of" or "not enough" resources of any kind (e.g. teachers, time, money, supplies/materials, technology, rural Internet access, mentors).
STEM is not for me (429 comments)	Statements that reflect personal feelings, perceptions, or bias against STEM, such as it is "too hard", "not interesting", or "not relevant," or any perceived gender/racial or "only for nerds" bias.
Lack of interest or indifference by students or their parents (249 comments)	Comments on the perceived culture of "students these days" or their parents attitudes toward math and science, such as lack of desire or motivation to learn STEM, lack of encouragement from their parents to do so, or the prevalence of too much other distractions (e.g. social media, personal electronics).
Lack of awareness or understanding of STEM (213 comments)	Responses that reflect lack of awareness, knowledge, information, exposure, understanding about STEM or the opportunities to learn about it.
Not prioritized in K-12 education or within government/politics (73 comments)	Comments that reflect the lack of prioritization of STEM in educational settings or within government/politics. This also includes any reference to STEM relative to other educational or political priorities such as, the Common Core, No Child Left behind, or class size.

The following comments reflect some of the overall themes across all responses on barriers to STEM education:

<u>Not enough access to or availability of resources (818 comments)</u>

> *Rural settings do not get as much STEM exposure or knowledge compared to bigger cities; without that exposure students cannot get the hands-on experience that they need and teachers do not have the experience to teach students what they need to know.*
>
> *[Not] Having mentors available to stir drive in lower ages, lack of rural internet access followed by [lack of] funding and focus from local to state, and parents.*
>
> *[Not enough] Money and good teachers, I don't know that we have a lot of good teachers, and regarding money, money makes a difference because good folks might avoid teaching because of the amount of money they could earn, some teachers are not the strongest students who might have otherwise considered teaching.*
>
> *I would just like to see it better funded and I would like to see more opportunities available at the early elementary level. And more equal accessibility for lower social/economic status households.*
>
> *Sometimes camps are too expensive, sometimes the times are not doable for working parents.*

<u>STEM is not for me (429 comments)</u>

> *A stigma in science that it is too difficult, also not seen as super-fun to many kids, and there is the impression that if you are not smart enough that it will be too hard.*
>
> *Poverty, learning disabilities, gender can be an issue…discrimination.*
>
> *Racism, teaching the wrong, incorrect, incomplete history, affects all other areas of study. Need a lot of help.*
>
> *Kids don’t feel smart enough to overcome math and science and they need to be encouraged. STEM is for EVERYONE!*
>
> *There is still the concept of women don't do science or math.*

Lack of interest or indifference by students or their parents (249 comments)

Kids in this culture have so many distractions, too much pull on their time; they aren't focused on their academic achievement. They are often too pulled by the media into social aspects that don't encourage them to think about their future/needs of society, too immersed in entertainment....

Too many kids that just don't care, teachers are doing a good job but kids don't want to do better, not encourage enough from parents.

Trying to get the kids just to settle down and learn what they need to learn. To get them to do what they need to do to get through life. And that's a job in itself. Most of them have too much technology at home. I can't get no work out of them because they want to play computer games and not do anything.

Family breakdown, depends on community, multiple varying problems, the social issues are enormous, teachers weak - underfunded.

[Competition with] Extracurricular activities and kids schedules, not a high enough priority put on [STEM] by families. The general public isn't always educated in areas we have resources in our community. Sports keep lots of people busy.

Lack of awareness or understanding of STEM (213 comments)

Keeping the public informed about STEM education. Not enough advertisement about STEM events/keeping local communities informed.

Lack of understanding from parents. I didn't realize what STEM meant.

Making people aware of the possibilities and informing them about what they need to do, at a younger age, in order to move toward a STEM field or career.

Knowing what careers are possible with different degrees. The importance of knowing how to be prepared for a degree.

Most people don't understand it and more people would be interested if they knew what it was.

Not prioritized in K-12 education or within Government/politics (73 comments)

Comprehension, compared to the common core subjects- don't give the tools to work out some problems. A lot of strategies are not there.

School districts adherence to the common core, consistency of method of teaching across all grades.

I think there is so much emphasis on moving children forward and staying positive, or not giving them bad grades or holding them back when needed, there is such a push to keep them moving. Too much on standardized testing. Teachers are too controlled in how they teach and they are limited.

Teachers seem to spend more time trying to make themselves look good for No Child Left Behind and don't do a good job teaching... seems to try to find a way around having to teach kids.

The school is very political controlled, as in groups of people that control, and [I] don't think the schools are giving a good education.

Parent perceptions of STEM education

In addition to the topics listed above, parents of pre-kindergarten through 12th grade students received questions about the following topics: attitudes toward Iowa K-12 Schools (e.g. time spent on STEM topics, quality of instruction in STEM topics), importance of STEM skills, their child's educational progress/goals (e.g. plans after graduation, perceived child interest/achievement in STEM topics and STEM careers), and STEM exposure in out-of-school settings.

Among respondents who were parents of a school-aged child, 79% reported their child attended public school, 6% attended a private school, 4% homeschooled, and less than 1% attend a charter school. The remaining 11% reported their child had graduated from high school or had their GED, which is likely an artifact of summer data collection and recruiting parents of children 3-19 years old.

Importance of STEM education among Parents

Among parents of a child 3-11 years old, 72% said it is very important that their child does well in math, 63% said this about technology, and 59% about science. Fewer (45%) parents of an elementary aged child placed as much importance on exposure to engineering concepts

About half of parents of a child 12-19 years old said it is very important for their child to have advanced math, science, or technology skills (52%, 47%, and 47%, respectively). Fewer parents (35%) placed the same importance on advanced engineering concepts.

Table 39. Importance of STEM skills among parents with a school-aged child

Parents of 3-11 year olds: How important is it that your child…	% Very	% Somewhat	Parents of 12-19 year olds: How important is it that your child…	% Very	% Somewhat
Does well in math	72%	27%	Has some advanced math skills	52%	30%
Does well in science	59%	35%	Has some advanced science skills	47%	31%
Has some good computer and technology skills	63%	31%	Has some advanced technology skills	47%	33%
Has some exposure to engineering concepts	45%	38%	Has some exposure to advanced engineering concepts	35%	30%

Response options: Very important, somewhat important, not very important, not important at all

Perceived Interest & Achievement in STEM

On a scale of one to five, where one is definitely does not enjoy and five is definitely enjoys, 67% of parents of a young child, and 52% of parents of an older child said their child definitely enjoys playing computer games.

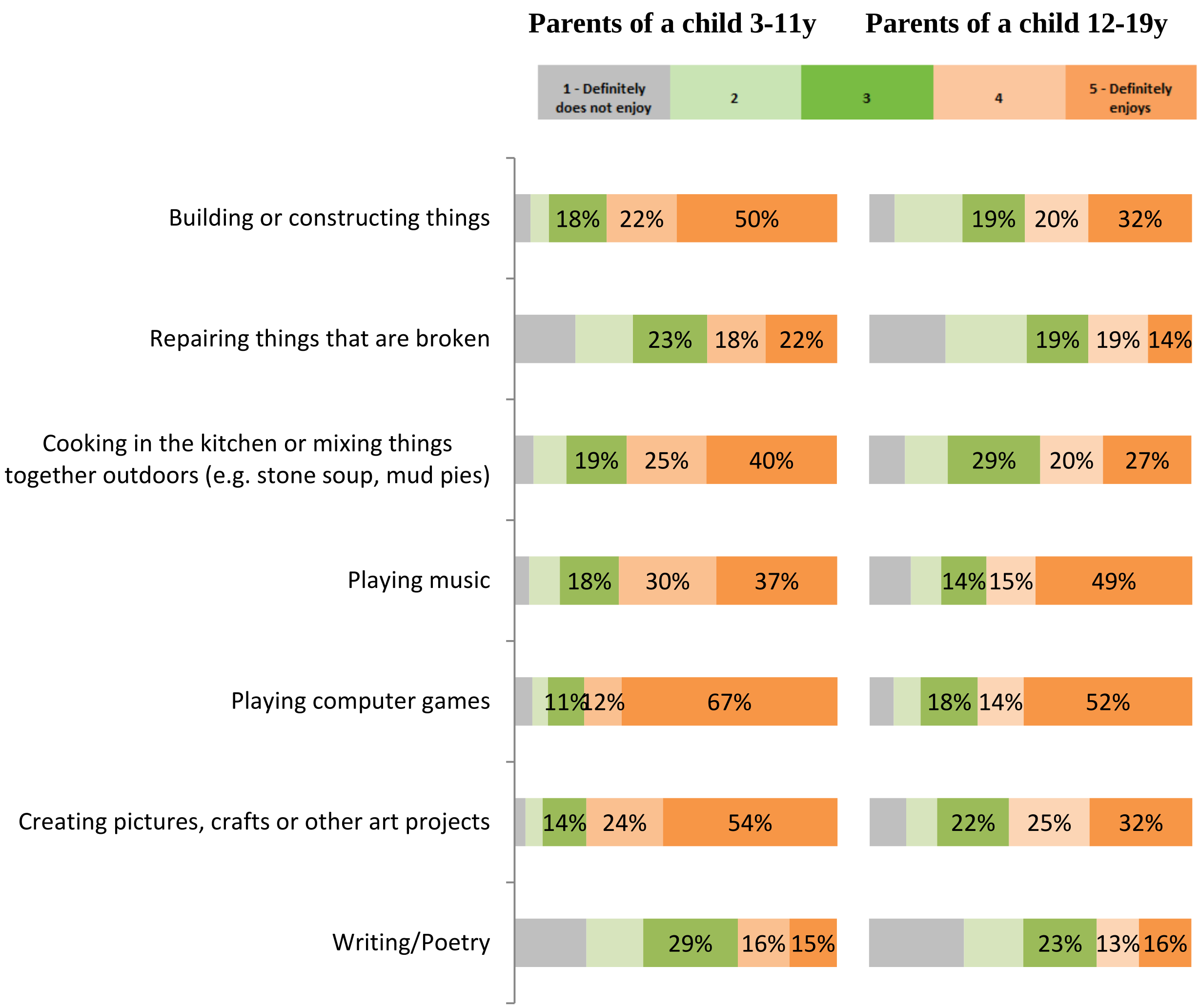


Figure 46. Parent perceptions of their child's interest in STEM-related activities

Regardless of the age of the child, parents report similar levels of interest across individual STEM subjects.

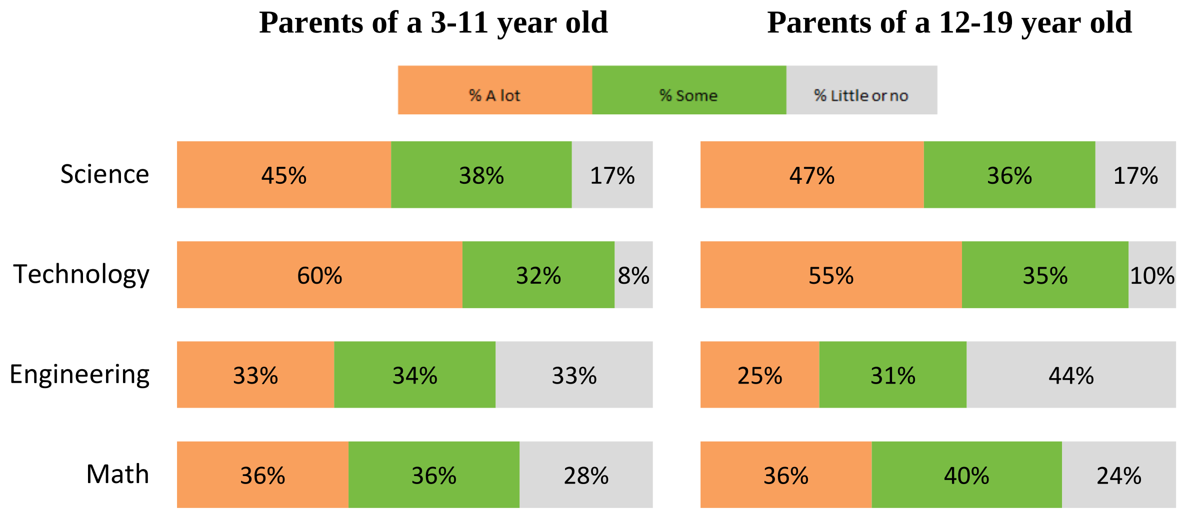


Figure 47. Parent perceptions of their child's interest in STEM

Most parents indicate their child is doing 'very well' or 'ok' in science, technology, or math; but fewer parents say this about "designing, creating, and building machines and devices, also called engineering."

When asked how well their child is doing across individual STEM subjects, more parents of an elementary-aged child respond "does not apply" compared to parents of a middle or high school aged child. It is unclear whether parents perceive their child is not receiving education in STEM subjects, or are unaware of STEM-related learning that may be happening.

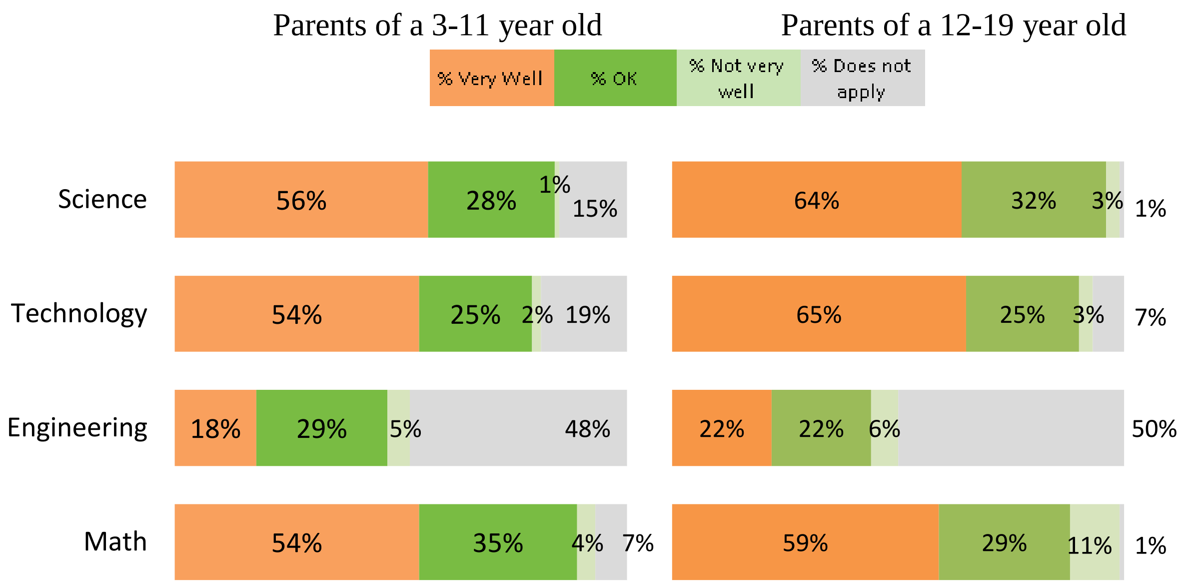


Figure 48. Parent perceptions of their child's achievement in STEM

About six in ten (61%) parents of a child 3-11 years reported they or their child has used the internet or a smartphone to help complete homework or a school assignments, compared to 95% of parents of older children (p<.001). In addition, 40% of parents of older children said their child has a school-issued iPad, table, or laptop compared to 14% of parents of younger children (p<.001).

EXPOSURE TO STEM

Approximately one-third of parents reported that their child had ever taken classes or attended camps in an out-of-school setting.

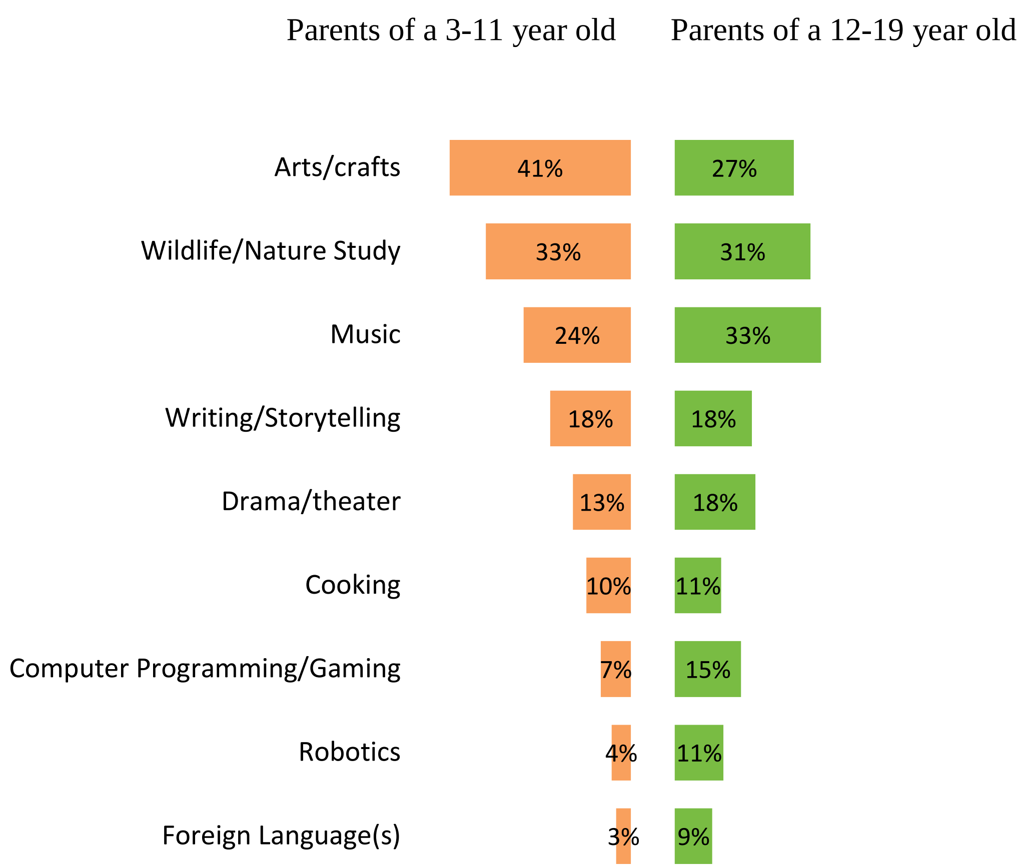


Figure 49. Parent report of child's participation in classes or camps in informal settings

Parents also reported some exposure for their child to STEM in out-of-school settings in the past school year.

Parent report of child participation in informal settings

Among parents of a child 3-11 years old, approximately one in five (19%) report participation in boy or girl scouts. Lower proportions of parents of a child 12-19 years old report their child's participation in STEM in any informal settings.

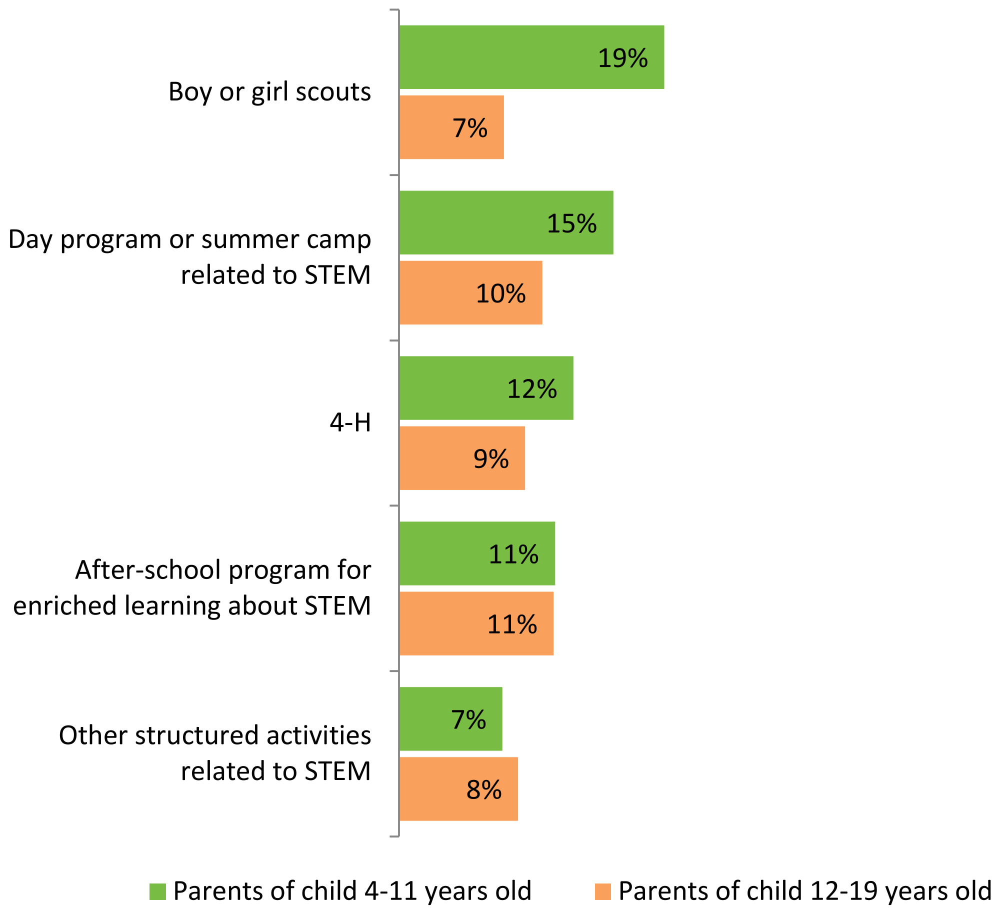


Figure 50. Participation in STEM-related activities in out-of-school settings

Educational aspirations Parents of a child 12-19 years old were asked about their child's educational aspirations following high school, and whether they think their child will pursue a career in a STEM field. Nearly two-thirds (64%) said their child is likely to attend a 4-year college or university, and 20% said their child would likely attend a 2-year community college. Approximately 37% of parents think their child is 'very likely', and another 31% their child is 'somewhat likely' pursue a career in a STEM-related field.

Changes from 2012 to 2014

From 2012 to 2014, awareness of the STEM acronym increased from 26% to 41%, respectively (Table 40). However, compared to previous years, fewer Iowans reported having heard of K-12 education; or improving math, technology, science, and engineering education in the past month.

Table 40. Population estimates of awareness of STEM in Iowa

	Year	Pop Est	%Yes	
STEM Acronym (% Yes)	2012	602,007	26%	
	2014	963,078	41%	
	Year	Pop Est	% A lot	% A little
K-12 Education (% A lot/A little)	2012	1,804,852	28%	51%
	2014	1,725,477	25%	29%
Improving math, technology, science, and engineering education (% A lot/A little)	2012	1,508,753	23%	43%
	2014	1,421,472	18%	43%
Iowa Governor's STEM Advisory Council (% A lot/A little)	2013*	731,338	4%	28%
	2014	587,356	3%	22%

*Awareness of the Governor's STEM Advisory Council was not asked in 2012.

Q4b. STEM stands for 'science, technology, engineering, and mathematics.' Have you heard of this before? (Yes/No)

Q1. I'm going to read a short list of topics. Please tell how much you have heard about [K-12 education], if anything, in the past month. Have you heard a lot, a little, or nothing in the past month? (A lot/a little/nothing)

Q2. I'm going to read a list of topics about education in Iowa. Please tell how much you have heard about [Improving math, technology, science, and engineering education], if anything, in the past month. Have you heard a lot, a little, or nothing in the past month? (A lot/a little/nothing)

Increased awareness and support for STEM

The 2014 Survey of Iowans showed increased awareness of STEM and increases in support for STEM compared to the 2012 survey. In 2014, 41% of Iowans had heard of the acronym STEM. In contrast, only 26% of Iowans had heard of the acronym in 2012 (Figure 51)

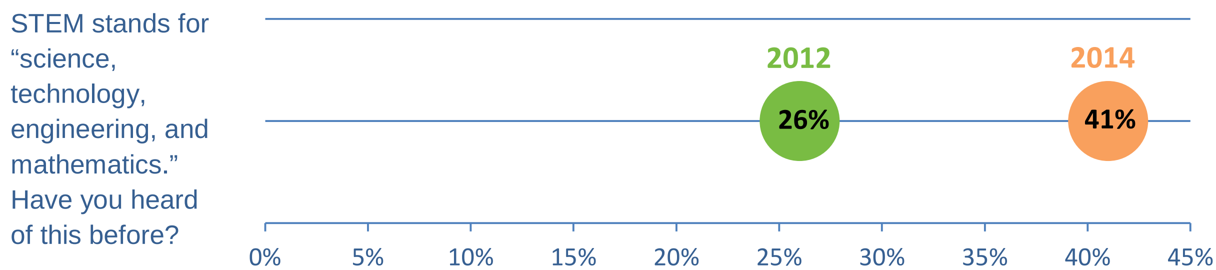
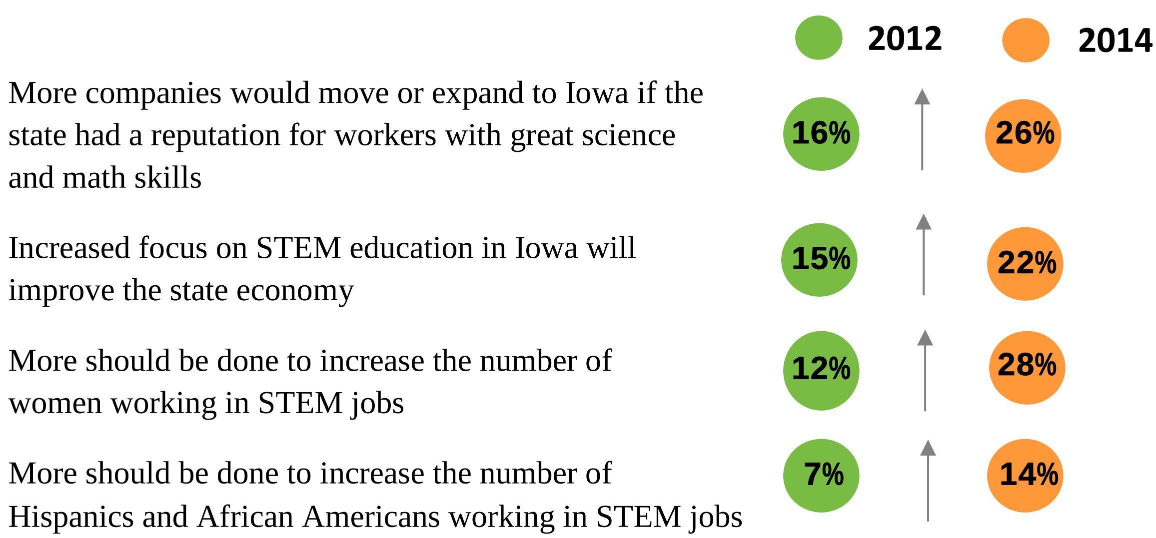


Figure 51. Increase in STEM awareness, 2012 to 2014

Awareness and attitudes toward STEM increased significantly between 2012 and 2014, especially in the areas of economic contributions and broadening STEM participation (Figure 52). From 2012 to 2014, significantly* more Iowans *strongly agree* that…



***All differences reported here are statistically significant at p<0.001.*

Figure 52. Increases in attitudes toward STEM, 2012 to 2014

Perceptions of value for STEM investments

Over one-third of Iowans see the value that STEM brings to their lives and in the opportunities and jobs available for the next generation. From 2012 to 2014, the proportion of Iowans who *strongly agree* that science and technology make our lives better has decreased from 40% to 35%, but the proportion of Iowans who believe in its value for the next generation has increased from 28% to 40%.

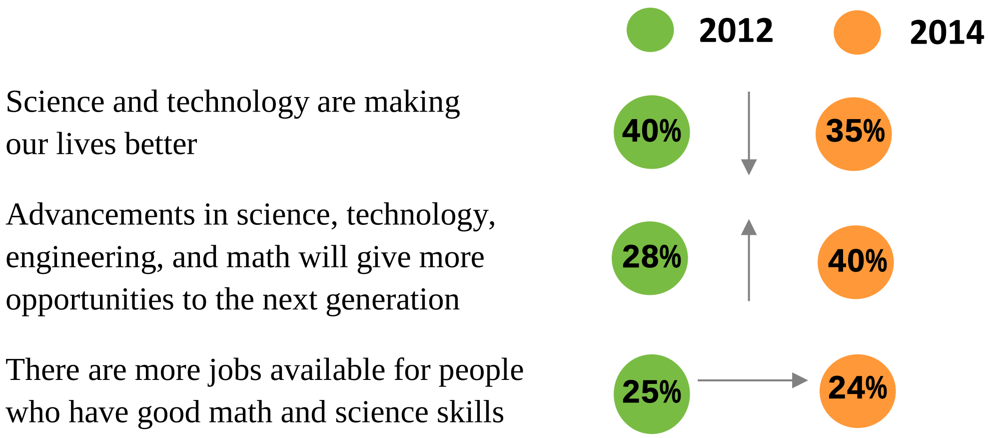


Figure 53. Perceptions of value for STEM investments

Change in perceptions about STEM education

There were some decreases in public assessment of STEM education in 2014 compared to the survey in 2012. Overall, most adults agree schools do well in teaching STEM topics; however, awareness may lead some to more keenly assess the quality of STEM education.

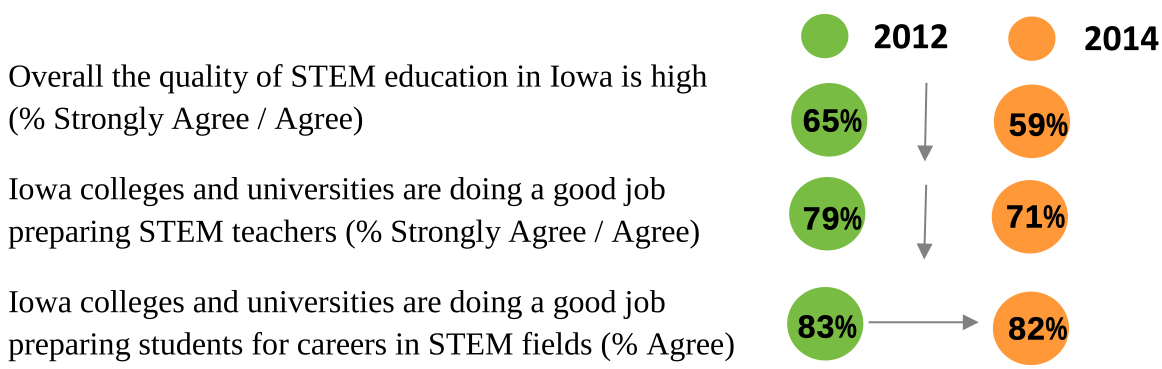


Figure 54. Change in perceptions about STEM education

Summary of statewide survey findings

When asked an uncued, open-ended question about STEM, only one in five respondents could describe an exact or close definition of STEM. However, in 2014, a majority of Iowans (74%) had heard something in the past month about K-12 education in general, and 61% had heard something about ‘improving math, science, technology, and engineering education.” Compared to Year 1 (2012) when only 26% of Iowans had heard of the acronym STEM, 41% of Iowans had read, seen, or heard of STEM.

Among Iowans who reported an awareness of STEM, 46% had read about STEM education in the newspaper in the past 30 days. Respondents with no children or who were not parents of a school-aged child were more likely to report having recently read about STEM education in the newspaper. This contrasts, not unexpectedly, with parents of a school-aged child who were more likely to have heard about STEM education from a school or teacher, or on the Internet. In a question that explored visits to out-of-school settings where exposure to STEM may occur, 63% of Iowans had visited a public library in the past year. Notably, this did not vary by urban or rural place of residence, which suggests that libraries may be a setting where future STEM programs should be held to reach a statewide audience.

Respondents were also asked about groups and events promoting STEM education and careers, as well as awareness of the slogan *Greatness STEMs from Iowans*. An estimated 25% of Iowans reported awareness of the Governor’s STEM Advisory Council, and from 10-17% reported an awareness of a specific event (e.g. STEM Summit, STEM Festival). In December 2013, the Iowa Governor’s STEM Advisory Council launched a public awareness campaign, *Greatness STEMs from Iowans*. Approximately six months later in the 2014 statewide awareness survey, an estimated 14% of Iowans reported having heard the slogan *Greatness STEMs from Iowans.* As the campaign continues to reach across the state, the 2015 statewide surveys will continue to gauge the statewide recognition of the campaign and its purpose.

Finally, multi-variable logistic regression analysis was used to determine the best predictors of awareness of STEM. After controlling for other factors, Iowans with some college education ($p=.03$) or college degree ($p<.001$), an annual gross income of $75,000 to less than $100,000 ($p=.04$), and/or who live in a large city of greater than 50K population ($p=.02$) were significantly more likely to have awareness of STEM.

Over half of Iowans rate the quality of science, technology, and math education in their community as ‘Excellent’ or ‘Good.’ Most Iowans agree (61%) or strongly agree (34%) that math and science courses teach important critical thinking skills. Among Iowans, the two most commonly cited barriers to STEM education were not enough access to or availability of resources for STEM, and personally held perceptions that suggest “STEM is not for me.”

The majority of Iowans support state efforts to devote resources and develop initiatives to promote STEM education in Iowa (44% Very supportive, 43% Somewhat supportive).

Among respondents who said applied-learning strategies would improve math and science education, 71% said student internships with businesses and 75% said hands-on science and technology activities for elementary students' would make a major improvement to math and science education. This opinion aligns with what Scale-Up programs offer and other efforts by the Governor's STEM Advisory Council to provide these opportunities.

Awareness and attitudes toward STEM increased significantly between 2012 and 2014, especially in the areas of economic contributions and broadening STEM participation. However, perceptions of the value of STEM investments has increased in some areas, but decreased in others. From 2012 to 2014, the proportion of Iowans who *strongly agree* that science and technology make our lives better has decreased from 40% to 35%, but the proportion of Iowans who believe in its value for the next generation has increased from 28% to 40%. In addition, there were some decreases in public assessment of STEM education in 2014 compared to the survey in 2012 (from 65% to 59%, respectively). Overall, most adults agree schools do well in teaching STEM topics; however, awareness may lead some to more keenly assess the quality of STEM education. Perceptions about STEM teacher preparation decreased by eight percentage points from 79% in 2012 to 71% in 2014. Perceptions of student preparation for careers in STEM fields decreased one percentage point from 83% to 82%.

It takes time to gauge changes in awareness, attitudes, and perceptions in a large population. The benefit of an annual statewide survey is in providing benchmarks in order to assess whether differences either large or small hold over time. The annual statewide survey of attitudes toward STEM has revealed increases in some areas and decreases in others. These findings will be used to inform the questions asked in the 2015 survey and measure whether these trends continued in 2014-2015.

Section 3. Statewide Student Interest Inventory

Data source Iowa Assessments, Iowa Testing Programs, The University of Iowa

Methods Iowa Assessments are standardized tests taken annually by nearly every student in grades 3 through 11 in the state of Iowa. For the past three years, an 8-item interest inventory has been added to the Iowa Assessments. Schools have the option to administer the inventory to their students. The Interest Inventory was developed in part to serve as a data source for both the Iowa STEM Indicators System (See Indicator 8), and a way to compare students who participate in Scale-Up Programs with all students statewide (See Section 4.2 Report of Participant Information).

Two versions of the inventory were created with variations in question wording and response options to accommodate different grade levels (Table 41). For 2014-2015, among the 346,914 students in Iowa who took the Iowa Assessments, 215,134 also completed the Interest Inventory (62% match rate). Item frequencies for each of the interest inventory questions can be found in Appendix H.

Table 41. Statewide Student Interest Inventory

Grades 3rd-5th	Grades 6th-12th
Response options: • I like it a lot • It's okay • I don't like it very much	Response options: • Very interested • Somewhat interested • Not very interested
1. How much do you like to create and build things?	1. How interested are you in designing, creating, and building machines and devices (also called engineering)?
2. How much do you like math?	2. How interested are you in math?
3. How much do you like science?	3. How interested are you in science?
4. How much do you like art?	4. How interested are you in art?
5. How much do you like reading?	5. How interested are you in English and language arts?
6. How much do you like using computers and technology?	6. How interested are you in computers and technology?
7. How much do you like social studies?	7. How interested are you in social studies (such as history, American studies, or government)?
8. When you grow up, how much would you like to have a job where you use science, computers, or math?	8. As an adult, how interested would you be in having a job that uses skills in science, technology, math, or engineering?

Key findings

- While these small changes should be interpreted carefully, the proportion of all students statewide who said they were "very interested" in individual STEM topics or in pursuing STEM careers has increased by a few tenths in every STEM category from 2012-2013 to 2014-2015.

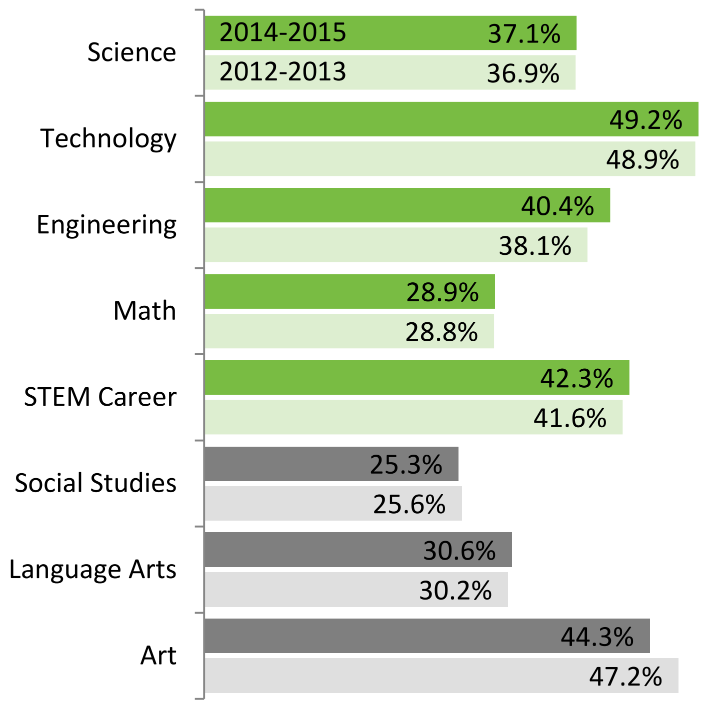


Figure 55. Statewide Student Interest Inventory for all students statewide, 2012-2013 (n=241,957) versus 2014-2015 (n=215,134)

Key findings (cont'd)

- Among all students statewide who took the Iowa Assessments in 2014-2015, interest in individual STEM subjects is highest among elementary students, followed by middle school and high school students, respectively (Figure 56).
- While interest in all subjects decreases as students' progress through school, the proportion of students who are "very interested" in pursuing a STEM career remains close across grade groups, from 44% among grades 3rd through 5th, 43% among grades 6th through eighth, and 38% among grades 9th through 12th.

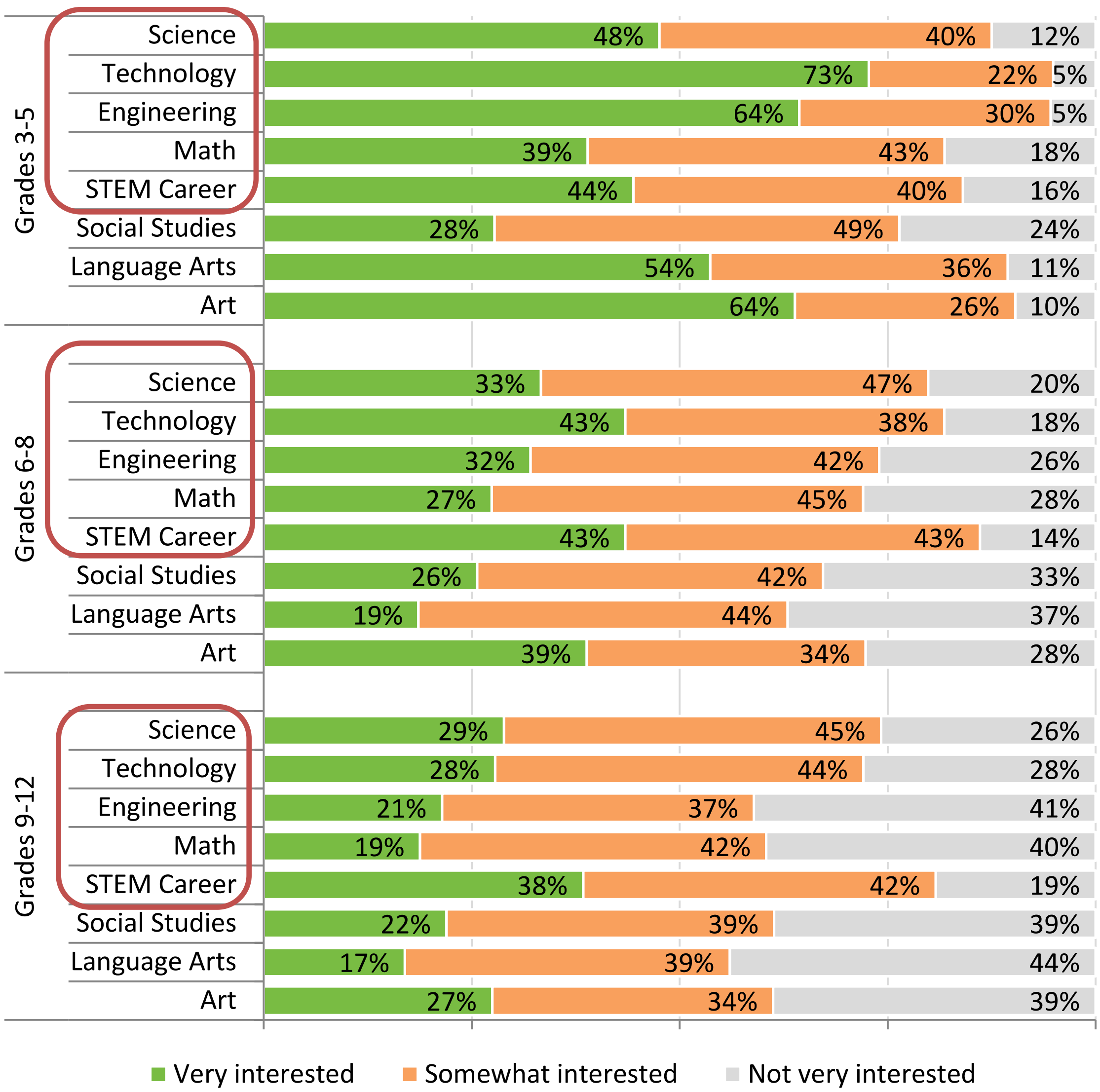
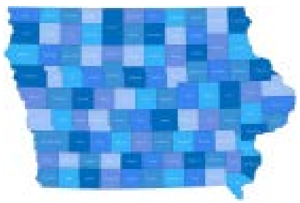


Figure 56. Statewide Student Interest Inventory for all students statewide by grade group, 2014-2015 (n=215,134)

Section 4.
Regional Scale-Up Program Monitoring



The Iowa STEM Regional Scale-Up Program was launched as a way to meet the Governor's STEM Advisory Council's top priority: to increase student interest and achievement in STEM across the state. In 2014-2015, ten Scale-Up programs were selected by an expert review panel which recommended and approved programs based on demonstrated success in increasing student interest and achievement in STEM, while offering the flexibility to be implemented in any size school or organization. The programs were administered through Iowa's six STEM Regional Hubs, and awarded to formal and informal local education agencies (LEA). An LEA is any school (public, private or home school association), a Boy/Girl Scout troop, a 4H Club, library, a childcare organization or any organization (e.g. Iowa State University Extension and Outreach, museums, science centers) that works with youth-formally or informally.

Methods As part of the Iowa STEM Monitoring Project, three submissions were expected from all schools or organization implementing a Scale-Up Program: 1) a teacher/leader survey, 2) a student participant list, and 3) student surveys. Taken together, the three submissions inform the ISMP by providing the project partners with consistent information across all Scale-Up programs.

The Teacher/Leader Survey is an online report that is submitted by a teacher or leader from a school or organization who implemented a Scale-Up program. The purpose of the Teacher/Leader Survey is to gather information about Scale-Up Program implementation and outcomes from teacher/leaders of all Scale-Up programs implemented in Iowa. All teacher/leaders implementing a Scale-Up program are asked to complete an online questionnaire via a web link. The questionnaire is developed by and data are submitted directly to the Research Institute for Studies in Education at Iowa State University. (See Appendix I for Teacher/Leader Survey instrument)

In addition, all schools or organizations implementing a Scale-Up program working directly with students in grades K-12 or working with teachers who have a class of K-12 students were asked to submit a student participant list to Iowa Testing Programs. The purpose of the student participant list was to provide information about each Scale-Up participant (or students impacted by a Scale-Up program) for Iowa Testing Programs to match Scale-Up participants to their records within the statewide dataset of students who have taken the Iowa Assessments. To protect the confidentiality of Scale-Up participants, the information used to match Scale-Up participants was submitted directly from the school or organization receiving the Scale-Up program award to Iowa Testing Programs using a password-protected, secure web-based interface. The student participant lists were not shared with anybody from the STEM Advisory Council, STEM regional managers, or any ISMP evaluation staff. Iowa Testing Programs provided de-identified and aggregated interest and achievement scores of Scale-Up program participants across programs to enable comparisons between Scale-Up participants and other students in the state.

Additionally, a short student questionnaire was created for completion by all students who participated in or were impacted by their teacher's participation in a Scale-Up program. These Scale-Up programs include those that either directly served K-12 students or served K-12 teachers via professional development with the goal of indirectly impacting student interest in STEM. The purpose of the student survey was to assess student interest in individual STEM topics and in pursuing a STEM career after participating in a Scale-Up program.

The post-program student survey was coordinated by the Center for Social and Behavioral Research at the University of Northern Iowa, and administered by teachers and program leaders using a seven-item questionnaire (Appendix L – Student Survey instruments). Teachers and program leaders were provided with an information letter to send home for parents, a script to read to students before administering the survey, and the student questionnaire. Three versions of the questionnaire were provided to accommodate different grade levels. Students were asked to report their age, gender, and any change in interest in individual STEM subjects and in pursuing a STEM career after participating in the program.

Interest was measured on a 3-point scale using variations of response options reflecting "more interested," "just as interested," or "less interested" (Table 42). In addition, the lower elementary questionnaire included response options paired with smiley, neutral, or sad faces.

Analysis Data were analyzed using descriptive statistics. For the student survey only, T-tests or analyses of variance (ANOVAs) were used to test for statistically significant differences between male and female students, and across grade levels (elementary, middle, high school). Statistical significance is reported when $p<.05$ or less. Tests to determine statistically significant differences on the Interest Inventory or achievement on the Iowa Assessments between Scale-Up student participants and students statewide were not conducted due to large differences in sample sizes (n=10,907 versus n=215,134, respectively, in 2014-2015) (Table 42).

Table 42. Interest Inventory participation summary

	2012-2013		2013-2014		2014-2015	
	n	Match rate	n	Match rate	n	Match rate
Total statewide participation in the Iowa Assessments	342,494		346,774		346,914	
Total statewide Interest Inventory participation[1]	241,957	70.6%	174,184	50.2%	215,134	62.0%
Number of students on student participant list submissions	7,771		26,238		23,779	
Scale-Up students matched to Iowa Assessments scores	6,225	80.1%	19,497	74.3%	15,905	66.9%
Scale-Up students matched to Iowa Assessments scores *and* STEM Interest Inventory	4,647	59.8%	9,352	35.6%	10,907	45.9%

1. Schools have the option to administer the STEM Interest Inventory at the same time students take the Iowa Assessments.

Important considerations The post-test only design (no baseline survey of student participants was completed) limits the ability to see differences in student interest before and after Scale-Up program participation. In addition, results represent only those students or teacher/leaders who completed a questionnaire; nonresponse bias may impact the findings. Finally, response bias may impact the findings as students who are interested in STEM may be more likely to participate in some STEM programs.

Results Results from the three monitoring activities for Regional Scale-Up Programs are presented in their respective sections that follow.

Table 43. Student survey interest measures

Lower Elementary	Upper Elementary	Middle/High School
Response options: I like it more now I like it the same now I like it less now	Response options: • I am more interested now • I am just as interested now • I am less interested now	Response options: • More interested now than before • Just as interested now as before • Less interested now than before
Think about how much you liked math in the fall. Do you like math more now, about the same, or less now?	Think about how interested you were in math in the fall. Are you more interested in math now, just as interested in math now, or less interested in math now?	Compared to the beginning of the (semester/program/etc.), are you more interested, just as interested, or less interested now in each of the following? • Math • Science • Computers and Technology
Think about how much you liked science in the fall. Do you like science more now, about the same, or less now?	Think about how interested you were in science in the fall. Are you more interested in science now, just as interested in science now, or less interested in science now?	
Think about how much you liked using computers in the fall. Do you like using computers more now, about the same, or less now?	Think about how interested you were in using computers in the fall. Are you more interested in using computers now, just as interested in using computers now, or less interested in using computers now?	
Do you like to design and build things more now, about the same, or less now than you did in the fall?	Think about how interested you were in designing, creating, and building things in the fall. Are you more interested in creating things now, just as interested in creating things now, or less interested in creating things now?	Compared to the beginning of the (semester/program/etc.), are you more interested, just as interested, or less interested in designing, creating, and building machines and devices (also called engineering)?
Are you more interested now, about the same, or less interested in having a job that uses science, math, and computer skills?	Are you more interested now, just as interested, or less interested in having a job that uses science, math, and computer skills?	Compared to the beginning of the (semester/program/etc.), are you more interested, just as interested, or less interested in someday having a job that uses skills in science, technology, math, or engineering?

Section 4.1 Teacher/Leader Survey

Data source Teacher/Leader Survey, Iowa STEM Monitoring Project
Provided by Research Institute for Studies in Education, Iowa State University

Key findings

The summary of findings of the Teacher/Leader Survey for 2014-2015 includes data collected across all six STEM regions of the state and ten Scale-Up programs. See Appendix J for a description of the 2014-2015 Scale-Up programs. Data were collected for the following Scale-Up programs:

- A World in Motion (AWIM)
- CASE—The Curriculum for Agricultural Science Education
- Defined STEM
- Engineering is Elementary in Iowa (EiE)
- FIRST Tech Challenge
- HyperStream and VREP
- KidWind: Wind Power and Renewable Energy *
- SCI Pint Size Science*
- Project Lead the Way (PLTW) Engineering*
- Project Lead the Way (PLTW) Gateway

[New programs in 2014-2015 are noted by *.]

One thousand two hundred thirty-five (n=1,235) Iowa schools and organizations were awarded Scale-Up programs in 2014-2015 (Table 44). This represents an increase of 407 schools and organizations from the previous year. See Appendix K for locations of the Scale-Up programs.

Table 44. Number of schools or organizations awarded 2014-2015 Scale-Up programs by STEM region

Scale-Up Program	Total n	Number by STEM Region NW	NC	NE	SW	SC	SC
Total	**1,235**	**265**	**266**	**165**	**218**	**133**	**188**
A World in Motion	261	53	100	22	40	21	25
CASE	54	5	13	9	12	7	8
Defined STEM	110	44	47	3	6	6	4
Engineering is Elementary	218	63	25	8	63	22	37
First Tech Challenge	98	14	8	18	5	19	34
Hyperstream	60	11	10	7	8	16	8
KidWind	79	18	15	12	16	6	12
Pint Size Science	294	52	45	73	60	21	43
PLTW—Engineering	28	2	2	8	6	6	4
PLTW—Gateway	33	3	1	5	2	9	13

Source: Iowa Governor's STEM Advisory Council, Office of the Executive Director (as of August, 2014)

A total of 821 surveys were completed and returned, representing 228 Iowa school districts and 40 organizations such as 4-H and extension and outreach, community centers and libraries, United Way, and community colleges. Over three-fourths of the respondents were female. Seventeen percent of the responses came from the Northwest region, 20% from the North Central region, 20% from the Northeast region, 13% from the Southwest region, 16% from the South Central region, and 14% from the Southeast region. Each of the Scale-Up programs was well represented in the responses. It is important to note that responding teachers reported teaching a variety of subjects, not just STEM-related subjects. Many were elementary classroom teachers and others taught multiple subjects. Teachers and leaders of all grade levels (Pre-Kindergarten through 12th grade) were represented in the Teacher/Leader survey as well.

Program Participation

Eight-hundred twenty-one (821) individual Scale-Up programs were represented in the sample, representing 43,730 participants in six different categories: 1) pre-school students; 2) grades K-5 students; 3) grades 6-8 students; 4) grades 9-12 students; 5) parents; and 6) others (Table 45). Participants grouped into the *other* category included community members/partners, engineers, corporate volunteers and business mentors, college students, family members, school administrators, and other K-12 students from different grades.

All Scale-Up programs involved K-12 students. Although only about two percent of the programs included parents and four percent included other participants, this was approximately three times the number of parents and others that participated in 2014-2015 than in 2013-2014.

Table 45. Teacher/leader report of Scale-Up program participation

	Number of Programs Reporting	Percentage of Programs	Number of Participants
Students (pre-school)	159	19.4%	4,042
Students (K-5)	343	41.8%	17,223
Students (6-8)	178	21.7%	14,416
Students (9-12)	205	25.0%	4,607
Parents	20	2.4%	623
Others	36	4.4%	2,814

Program Implementation

Teacher/leaders reported on six aspects of program implementation: 1) whether programs were implemented as intended or were modified; 2) experiences with service providers and challenges or barriers faced in working with service providers; 3) collaboration with local groups; 4) local involvement; 5) challenges in implementing the Scale-Up program; and 6) recommendations to others implementing a Scale-Up program. Summaries of open-ended responses follow.

Implementation Two-thirds of the respondents (68%) reported implementing their Scale-Up programs as intended. About one-fourth (26%) implemented the program with minor changes, and 5% implemented it with major changes. Nine respondents (1%) did not implement the program at all. Reasons given for deviations to timelines and plans included setbacks due to time constraints, late arrival of materials, other lessons that interfered with STEM programming, and lack of mentors. Additionally, many teacher/leaders customized their Scale-Up programs in order to serve unique local needs. Some of the customizations included adjusting lessons to fit grade level (including vocabulary), adjusting or eliminating lessons due to time constraints, offering the program outside of the classroom in after-school or summer programs, and utilizing different materials than those provided in the kits.

Experiences with service providers Teacher/leaders reported to what extent they experienced the following with service providers: adequate contact, timeliness of receipt of materials and resources, responsiveness to questions and needs, and overall expectations of partnership (Figure 57). Over 80% of the teacher/leaders reported having positive experiences with their service providers all or most of the time. They reported that they had adequate contact with the service provider, they received materials and resources in a timely manner, the service provider was responsive to questions and needs, and the partnership met overall expectations.

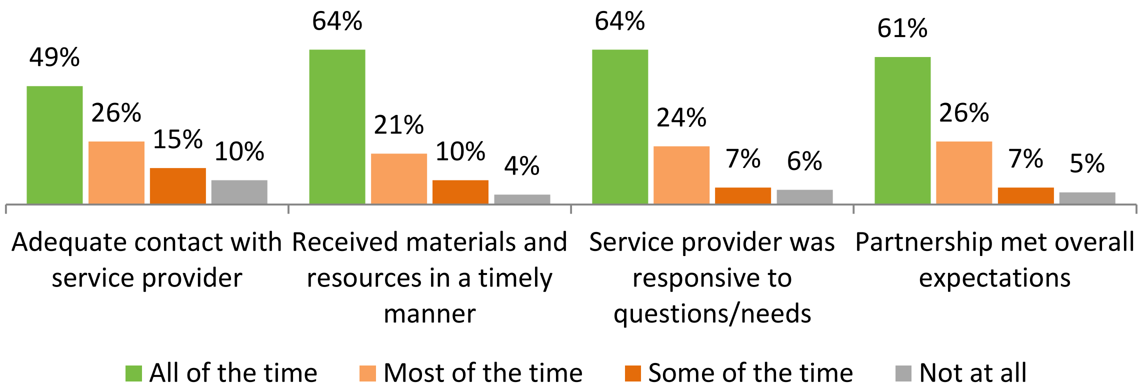


Figure 57. Teacher/Leader experiences with service providers

The percentage of teacher/leaders that responded "not at all" to any of the categories ranged from 4% to 10% and comments were generally related to receiving materials late or receiving incomplete or damaged materials, poor communication (i.e., unanswered emails, phone calls, voicemails), inadequate training to use the materials, unfamiliarity with who their service providers were or having no contact at all with a service provider, issues related to reimbursement of expenses, or non-specific general frustration.

Collaboration Teacher/leaders also reported on collaboration(s) between their specific Scale-Up program and various entities, including in-school groups, out-of-school groups, community groups, volunteer groups, and "other" groups (Table 46). About 55% reported collaborations with in-school groups, and 19% of Scale-Up programs collaborated with out-of-school groups. Approximately 15% of Scale-Up programs collaborated with community or volunteer groups as well.

Table 46. Collaborations between Scale-Up programs and local groups

	Number of Scale-Up Programs that Collaborated With…	Percentage of Scale-Up Programs that Collaborated With…
In-School Groups	448	54.6%
Out-of-School Groups	153	18.6%
Community Groups	140	17.1%
Volunteer Groups	112	13.6%
Other Groups	48	5.8%

Teacher/leaders described collaborating specifically with other teachers from a variety of different grade levels and subjects, professional learning communities and school-based clubs, school administrators and staff, experts and pre-service students from local colleges and universities, other K-12 students, and parent volunteers. Teacher/leaders also collaborated with

Iowa State extension offices, 4-H programs, local businesses, after school programs, community college and university staff, the Science Center of Iowa, and other local and regional teams in the area.

Local involvement At the local level, approximately one-fourth of teacher/leaders reported receiving media coverage, and about half reported a local interest in continuing STEM programming (Figure 58). Other sources of local involvement included support from business and industry and receiving additional funding or resources.

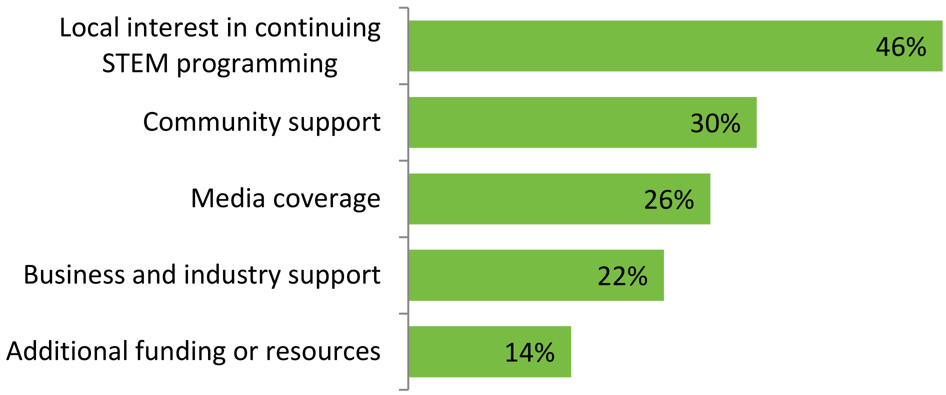


Figure 58. Teacher-descriptions of local level support provided to Scale-Up programs

Challenges, barriers, and recommendations to others In an open-ended question, respondents described challenges and barriers they faced during Scale-Up implementation. Many teachers and leaders reported no challenges and thought their programs were very successful. For some teachers and leaders, challenges and barriers hindered implementation. Some of the challenges and barriers reported included:

- lack of time to implement program; too much information to cover in the time available;
- time it takes to prepare the lessons for implementation;
- need for better training; need for help in implementing with multiple-grade levels within the daily curriculum; finding volunteers; unaware of the commitment required to complete the program and lack of familiarity with the program;
- lack of materials for all the students; materials received late; storing materials;
- changes in school or organizational administration or in teachers who would implement the programs; lack of support from administrators;
- class sizes too big for the quantity of materials provided;
- difficulty in maintaining continuity of student attendance; scheduling out of school programs around other activities; accessing students who have very full schedules;
- students not having enough background knowledge; and/or
- program materials that were too advanced for students (particularly for elementary students).

Respondents also shared recommendations regarding things they found helpful during the implementation of their program. Many mentioned building a network of fellow teachers, school administrative support, engineers, industry volunteers, other regional and state teams, and local colleges and universities that helped smooth the implementation process. Respondents recommended participating in program training and professional development, taking advantage of resources (e.g., handouts, the teachers' manual, email support, websites, mentors, and service providers) provided by the program, and preparing for implementation by practicing the experiments ahead of time. Many of the respondents found the materials to be complete and helpful in implementing the programs.

Program Outcomes

Teacher/leaders were asked to report gains in their skills and confidence in teaching STEM-related content; whether they used or developed school-business partnerships in implementing their programs, the number of school-business partnerships, and a description of the most used relationships; and observed outcomes resulting from the program.

Teacher/Leader gains in knowledge, skills, and confidence Teacher/leaders reported that they gained skills and confidence in teaching STEM topics as a result of their participation (Table 47). The majority of teacher/leaders agreed or strongly agreed that they now have more confidence to teach STEM content (81%), have increased their knowledge of STEM topics (86%), are better prepared to answer students' STEM-related questions (79%), and have learned effective methods for teaching in STEM-content areas (76%).

Table 47. Teacher/leader gains in knowledge, skills, and confidence in STEM topics as a result of participating in Scale-Up programs

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
I have more confidence to teach STEM topics.	38.3%	42.9%	14.6%	1.2%	0.6%	2.4%
I have increased my knowledge of STEM topics.	43.8%	42.0%	10.2%	0.9%	0.8%	2.4%
I am better prepared to answer students' questions about STEM topics.	35.8%	43.5%	15.2%	2.2%	0.9%	2.4%
I have learned effective methods for teaching STEM topics.	34.9%	40.8%	17.1%	3.3%	1.3%	2.6%

School-business partnerships The Scale-Up programs often incorporated business partnerships to give students enhanced opportunities to learn about STEM topics. Two hundred sixty-two teacher/leaders reported that they used one or more previously established school-business partnership in their area, and 166 teacher/leaders indicated that they developed one or more new partnerships to implement their Scale-Up programs. Seventy-five indicated that they were unable to find either a new or existing school-based partnership to use with their Scale-Up programs. Finally, they reported that 477 programs did not require a school-business partnership.

In total, educators reported working with an estimated 1,162 existing business partnerships and establishing 376 new school-business partnerships during 2014-2015. Some of the larger schools reported having more than 50 existing partnerships, while others had only one or two. Among teacher/leaders who reported new partnerships, most had established only one new partnership, although some developed ten or more.

In an open-ended question, the teacher/leaders described the nature of the school-business partnerships they used most in implementing their Scale-Up programs. Many businesses provided guest speakers who described their jobs and their organizations to the students, and industry-based volunteers served as mentors. Some provided funding for STEM projects, equipment, marketing materials, space for meetings and practice, and transportation and snacks for students. Others helped implement Scale-Up activities or sponsored on-site field trips. A broad variety of school-business partnerships were accessed. They included industry, hotels, agriculture companies and research farms, veterinary clinics, hardware stores and lumberyards, pharmacies, U.S. Army Corp of Engineers and conservationists, Iowa State Extension, energy companies, and city services to name a few. Teachers also were creative in developing the partnerships, sometimes enlisting parents and family members to serve as guest speakers or provide an entry into a business. [Note: In previous years, many teacher/leaders reported difficulties in establishing partnerships. In 2014-2015, there was only minimal mention of this.] See below for examples of teacher/leader comments.

> *A local business is family owned and several students have parents who work for this business. We invited them to work on this project with us. Instead of the business sending us one engineer, they sent us five. We split up the class into smaller sections, so that they could have more time to ask questions. It was great!*

> *We held an open house and invited representatives from a wide range of businesses. What resulted was multiple offers for financial support, invitations to visit robotics in use in several of the businesses in attendance, and an increased interest in the accomplishments of the work being done by our students.*

> *[Our partner] gave us funds that will keep our entire programming functional for the next year.*

Because of previous experience with our Scale-Up program at the Extension Office, we were able to get help condensing the material and actually presenting it to the students.

Expectations Teacher/leaders reported observing positive outcomes as a result of the Scale-Up programs, with 88% of them responding that the outcomes they observed met or exceeded their expectations. Less than 6% of the teacher/leaders reported that the outcomes did not meet their expectations. When expectations were not met, teacher/leaders reported several factors, including: lack of student motivation or excitement; time constraints, particularly when materials arrived later than expected or needed; and content that was either too difficult for the students or did not contribute enough new information.

Observed outcomes From a list of specific outcomes, over 80% of the teacher/leaders reported observing an increase in both awareness and interest in STEM topics, while over 50% self-reported observing an increase in awareness in STEM careers and increased student achievement in STEM topics (Figure 59). Approximately 46% of teacher/leaders observed increased interest in STEM careers, and about a third reported increased interest in post-secondary STEM opportunities. A few respondents also noted other observable student outcomes, including increased engagement, increased enthusiasm for STEM and science content, increased self-confidence, and learning to work in teams. Several teachers indicated that they would look for better, alternative, or unique ways to measure achievement. Also, some respondents said public and parental awareness was also an observable outcome of the programs.

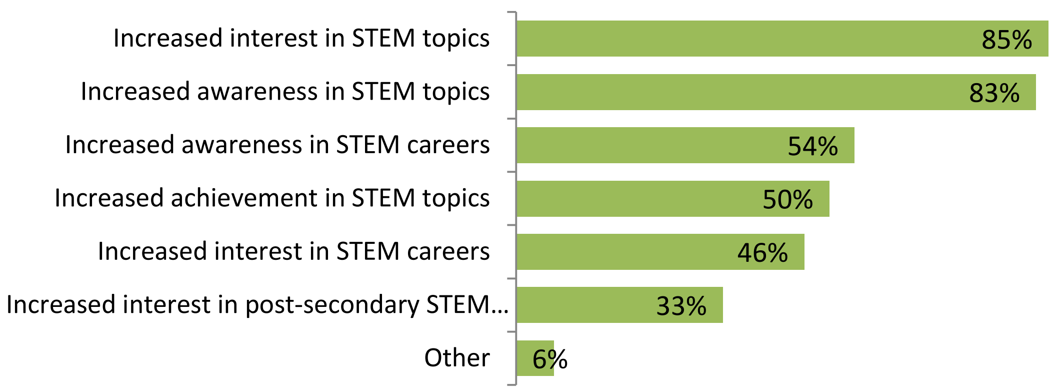


Figure 59. Observed outcomes of the Scale-Up programs

Impact of the Scale-Up programs Respondents also provided examples of the perceived impact the program had on teachers and students. In written comments, many respondents reported that students experienced an apparent increase in motivation, engagement, and interest in STEM content areas as well as in STEM careers. They also thought that students' critical thinking, problem solving, and teamwork skills were developed or showed improvement throughout the program. The hands-on activities allowed students to explore their ideas and teachers said they observed their students thinking more like scientists and engineers. Teachers also reported seeing their students apply their knowledge of math, science, and technology to real-world problems which had a positive impact on students in that students were eager to do science every day. Some teachers said they saw an improvement in test scores. Teachers reported that the program allowed students to explore hands-on learning, which encouraged students to continue to work on projects even after programming had ended. See below for list of representative comments related to the impact of the Scale-Up programs.

<u>*Engagement*</u>

> *Children left our camp program excited and engaged in STEM. They learned that STEM is all around us and every job is connected to STEM in some way. We taught the Liquids & Solids. The kids asked if we could teach it again this summer!*
>
> *The preschoolers all consider themselves to be scientists now. They are eager to learn.*
>
> *Student enthusiasm went through the roof! They were eager to share what they were learning with their parents at conferences. They came to realize that they learned a lot from each other! Collaboration was excellent among the kids. It was a truly engaging and exciting activity to build the straw rockets. They felt so important to when I referred to them as the design team for the Earth Toy Designs Company!*
>
> *Several of our students have gained a great deal of self-confidence and overcome the intimidation of some technological projects. A ninth grader jumped in just two weeks before competition to help our multimedia team - a normally shy and quiet young man really stepped up and became a vital contributory part of the team.*
>
> *We have several students that have found a safe place in the robotics team and a place to go after school to connect with other students and work towards a goal. We have been able to recruit six girls to our group that are involved in everything from marketing to building and programming. The exposure to other teams and the public at competitions has also been a boost to some of our student's self-esteem. One student, who was afraid to talk to others during our first league match, was making friends and scouting by the time that we reached state competitions and has been very active in our search for sponsors for the next season.*
>
> *Students believed they were chemical engineers, thinking like scientists and asking great inquiry-based questions. They were actively engaged and excited to participate.*

I have one participant who does not like school. S/he would rather not be in school, but never missed a practice or meet. This person will go into the engineering or manufacturing field.

As soon as I put my lab coat on, the students were engaged. They loved the experiments and hands-on activities. I think that the program has made my students see science as an exciting way to learn and they want to figure out how and why things happen.

I have heard comments from parents that their children are telling them about the STEM activities and using the scientific terms at home.

I feel like my students are more comfortable and confident now with taking on complex challenges. Their collaboration skills are more developed. I also see positive growth in problem solving skills. I believe these are results of working with the engineering and design principles established by the program.

We now have scientists everywhere in our classroom. Many more questions are being asked and many more answers are being discovered by our students.

[redacted] is the Alternative High School in the [redacted]. All of our students have been identified as at-risk of dropping out of high school. To date every student that has been an active participant of FTC Robotics has either graduated or continues to pursue their high school diploma. Our buildings average attendance rate is 60%. [The] Robotics class and extracurricular activity boast an 85% attendance rate.

My students were very engaged in the topics and each day we did a new experiment the students would call it "The Best Day Ever."

Careers in STEM

My students have made wonderful connections to STEM careers. On our many field trips this year they asked great questions that were relevant and informed.

Participants after taking our STEM courses now realize that STEM careers are a possibility for them and that there are STEM career opportunities within our community.

I have had several of the participants go on in STEM fields post-graduation. One of which is competing in Robotics at the collegiate level.

Many students are seeking STEM paths for college. Many students have secured internships for the summer and senior year in STEM fields. Nine young women were recognized by NCWIT and two were national finalists.

One of our students became very interested in coding after writing the code for our robot that she is now looking at a career in computer program/engineering.

Students have been made aware of the types of jobs that are available in STEM fields. I think that the girls have more awareness of their opportunities in STEM careers.

Achievement

[These programs have] helped students achieve higher results in other classes too.

Pre-test average score was 41%, with only two students scoring above 60%. Post-test average score was 76%, with 20 students scoring above 60%. Students completed a survey and 75% indicated that they are now highly interested in engineering. 96% would recommend the program to others, and 100% thought it was fun and interesting. Student comments: "I think that this was a good experience for me because I figured out what stages you have to take to design a water filter. I would like to do this unit again because learning real life engineer problems is a good thing for the kids that want to be an engineer." "I loved it because we got to learn a lot of stuff about engineering!! Then we also made some mistakes, but we do learn from our mistakes and that is what we did!"

Students Thinking Like Scientists

My students have learned to think outside of the box because of my STEM kits. Science used to be one of their least favorite subjects. If you ask them today, it is their favorite. They are curious about the world around them and the STEM kits helped them solve some of that curiosity.

Students are beginning to use scientific principles about prediction, data collection, and data sharing. They are always excited and often ask when do we get to do science? They have an increased use of science notebooks and are beginning to show use of scientific language and practice in everyday play and learning.

The students would refer to their STEM experiences and the process involved when doing other things. They gained an understanding of the importance of multiple trials and of accurate measuring. I hear them using the vocabulary outside of our "STEM time."

Science in the Real World

The kids are using science vocabulary in other appropriate situations. They are building a strong foundation of math, science, and technology and carrying their knowledge into centers, inquiring during library time, etc.

Several of my students made changes in their home lives to conserve energy and convinced family members to do the same. I had several students, after the Kirkwood College tour, become interested in energy jobs! I also have many girls who are interested in engineering careers!
The hands-on project allowed students to make real-life connections to science, math, and technology that they could not make reading and learning from a textbook. Some of the best work came from those students who struggle on a daily basis. It was fun to see these students come alive with confidence when constructing their jet toys.

Through this project they began to understand terms like mass, force, friction, and acceleration. They understood what role they played in the motion of their jet toy and were able to modify their toy as they tested.

The STEM program has provided my students with more hands-on activities that are related to real world scenarios. The kids really enjoyed being able to manipulate the objects and things that were used during our scale-up program.

Participating in the STEM program has made an impact on my preschoolers by increasing their awareness of what science and math is and how it is in our everyday lives as well. Many students now greatly enjoy going to the science center and cannot wait to complete another science experiment. I also overhear discussions about science and math topics.

<u>Teamwork and Student Collaboration and Developing Critical Thinking Skills</u>

I have really been able to see the growth in their questioning and higher level thinking! They have been forced to think of the hows and whys without a teacher just telling them.

It helped increase vocabulary acquisition along with higher-level thinking. It helped students be able to generate their own questions and helped make the students curious, lifelong learners.

In class, I have seen students develop better problem solving skills, communication skills, and collaborative skills. They are much more interested in the areas of math and science. Outside of school I know students have been "doing STEM" independently by researching, experimenting, problem-solving, and using the engineering design process as well as using the vocabulary with their families.

Collaboration between students excelled through this project. Students helped each other in the construction process. Problem solving increased—students saw that their cars were not traveling straight and wondered why. Then, made adjustments to fix the problem.

<u>Teacher Professional Development</u>

My students are excited about science and I am much more comfortable teaching science knowing that I have the needed materials. I also love all of the new ideas. I did not teach much science in my room and now I have found several ways to incorporate into our daily routine.

My students have had an excitement this year for science, and have worked very hard to learn and have fun through our explorations. I have focused my own professional development on the inquiry objective (from Teaching Strategies GOLD), and have seen a lot of growth in my student's ability to wonder, ask questions, solve problems, make predictions, and continue an exploration for multiple days.

> *Anytime you can put students into small groups where they have to be creative and apply their knowledge to problem solve there is a huge impact. This type of learning isn't utilized as much as it should be due to the requirements teachers are forced to meet, and time becomes a big issue when teaching. However, the experiences that are gained from this method of teaching are far more valuable and have a long term lasting effect on a student's education.*

Unexpected results Finally, respondents were asked to describe any unexpected experiences during implementation or any unexpected results (either positive or negative) of the program. Positive results included:

- increased confidence, pride, and engagement among students and teachers;
- students thinking and processing information more deeply and with richer outcomes;
- students taking their roles in the programs very seriously and learning to work together;
- students using science vocabulary and looking for STEM content in other subjects;
- using experiments that did not go as expected as learning experiences and opportunity to ask probing questions;
- the number of students who stuck it out for the entire program;
- adults having as much fun as the kids;
- teams receiving recognition at competitions; and
- non-participating teachers and others (like business partners) who were impressed with what the students were doing and accomplishing, and support from the community.

Some negative experiences included:

- late distributions of resources and materials;
- faulty materials (including mechanical issues, lost or broken seeds, unresponsive robots);
- students dropping out of the club/program before completing their projects;
- more participants than resources or time allowed;
- the number of students lacking the ability to work together with their peers in a group;
- some lack of administrative support to continue programs;
- the level of difficulty of the material and experiments and finishing activities in the time allotted; and
- some students did not have enough background knowledge.

Section 4.2 Report of participant information

Data Source Student Participant Lists, Iowa STEM Monitoring Project
Provided by Iowa Testing Programs, University of Iowa

Key findings

There were 23,779 students listed on student participant lists submitted to Iowa Testing Programs, of which 15,905 had matches to Iowa Assessments regardless of STEM Interest Inventory participation (66.9% match rate). Of these, 46% were females and 54% males. The distribution of students by race/ethnicity was 84% white, 9% Hispanic, 2% Black/African American, and 5% Other. This was a small decrease in the distribution of females and minority student participation from Year 2 (Table 48).

Table 48. Demographics of student Scale-Up program participants matched to Iowa Assessments[1]

		2012-2013	2013-2014	2014-2015
Number of students on student participant list submissions		7,771	26,238	23,779
Number of Scale-Up students matched to Iowa Assessments information (match rate)		6,225 (80.1%)	19,497 (74.3%)	15,905 (66.9%)
Gender distribution				
	Female	44%	48%	46%
	Male	56%	52%	54%
Race/ethnicity distribution				
	White	87%	80%	84%
	Black	6%	5%	2%
	Hispanic	3%	9%	9%
	Other	4%	6%	5%
Grade level (n)[2]				
	3rd grade	12% (755)	14% (2,534)	12% (1,604)
	4th grade	13% (795)	9% (1,693)	13% (1,761)
	5th grade	13% (805)	14% (2,475)	17% (2,194)
	6th grade	19% (1,202)	12% (2,109)	17% (2,225)
	7th grade	7% (439)	19% (3,403)	15% (1,972)
	8th grade	21% (1,309)	26% (4,707)	14% (1,843)
	9th grade	9% (584)	3% (583)	5% (655)
	10th grade	3% (167)	2% (341)	3% (417)
	11th grade	3% (168)	2% (303)	4% (471)

1. Reflects distribution of Scale-Up program student participants matched to their Iowa Assessments scores alone regardless of a match to the STEM Interest Inventory.
2. Iowa Assessments are standardized tests taken annually by nearly every student in grades 3 through 11 in the state of Iowa. For the past three years, an 8-item interest inventory has been added to the Iowa Assessments. Schools have the option to administer the inventory with their students.

STEM Interest among Scale-Up students versus students statewide

The proportion of Scale-Up participants expressing interest in STEM subjects and careers was compared to the proportion of students statewide that expressed interest.

- A higher percentage of students who participate in STEM Scale-Up programs said *I like it a lot* (Grades 3-5) or were *very interested* (Grades 6-12) in STEM subjects and in pursuing a STEM career compared to all students statewide (Figure 60).

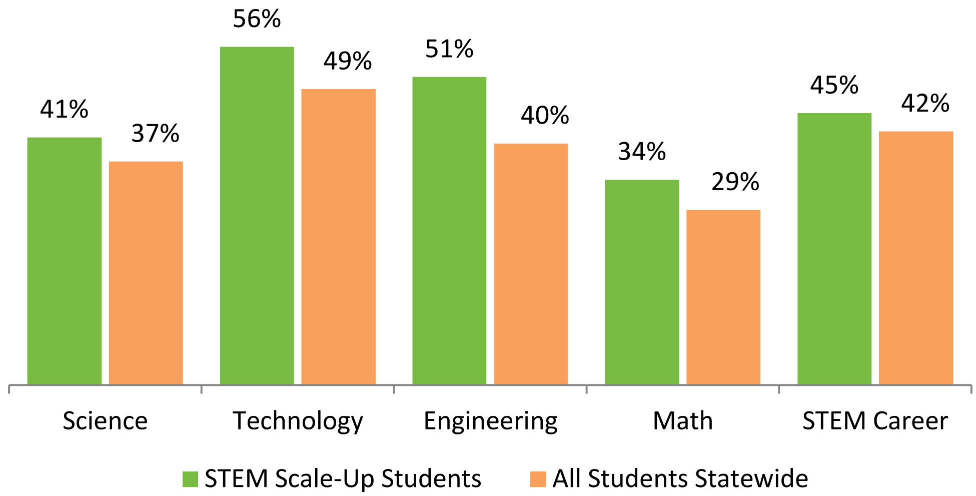


Figure 60. STEM Interest among Scale-Up students versus students statewide, 2014-2015

- For students in grades 3-5 and grades 6-8, interest in STEM topics and STEM careers between Scale-Up participants and students statewide is very similar (Figure 61 and Figure 62, respectively).
- For grades 9-12, students participating in Scale-Up programs showed more interest in STEM topics and STEM careers than students statewide (Figure 63).

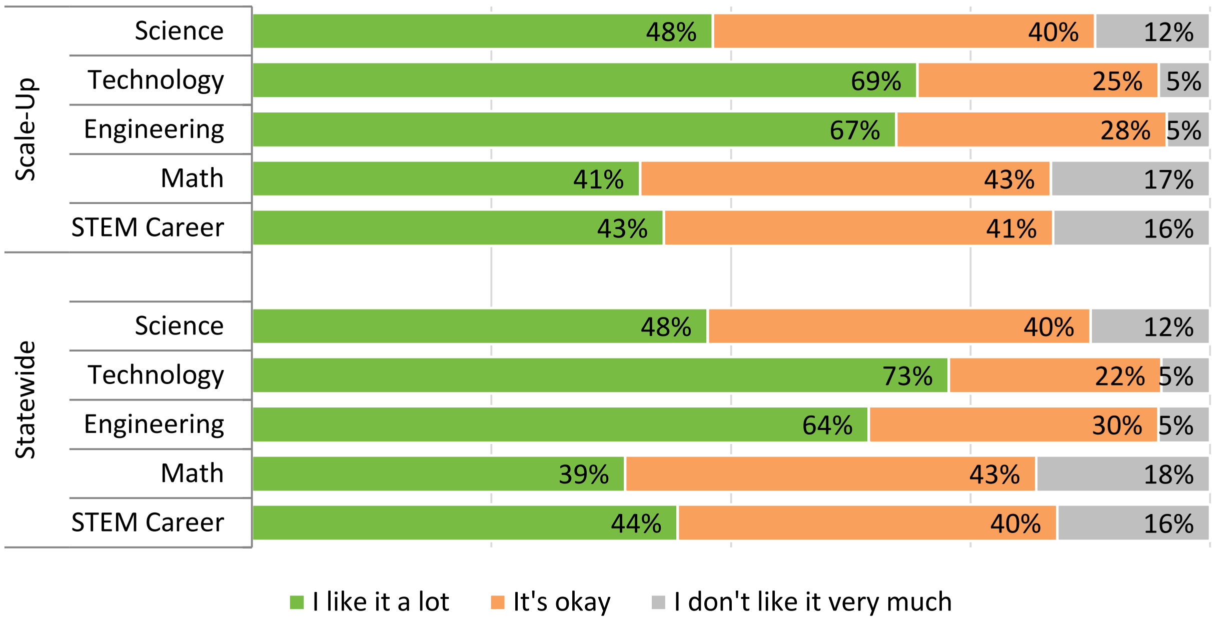


Figure 61. Interest in STEM topics and careers for *grades 3-5* Scale-Up students and students statewide, 2014-2015

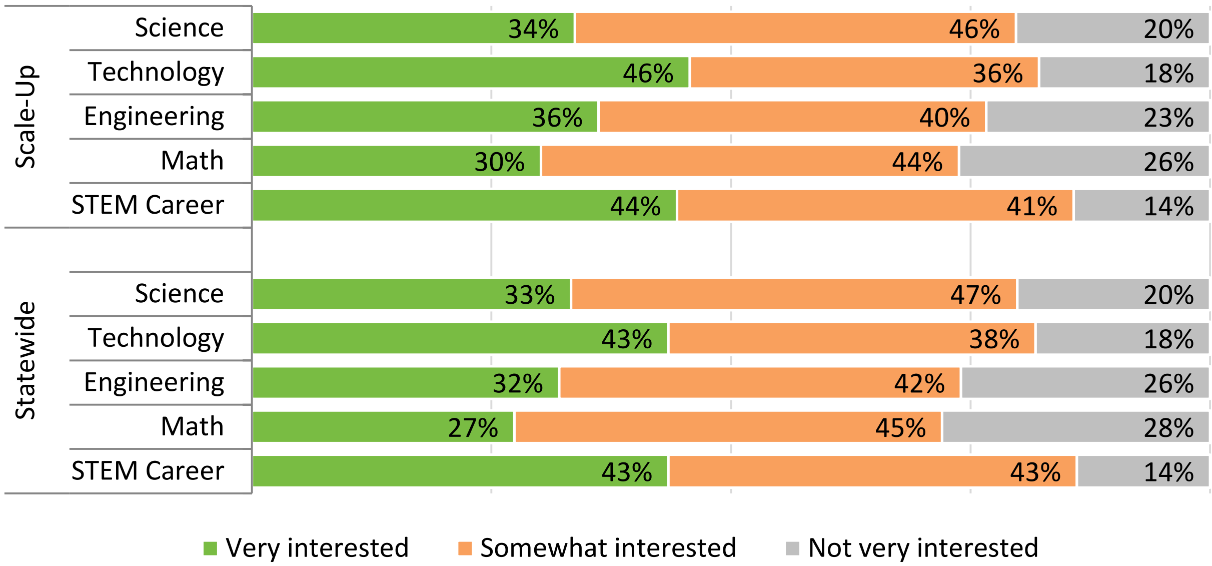


Figure 62. Interest in STEM topics and careers for *grades 6-8* Scale-Up students and students statewide, 2014-2015

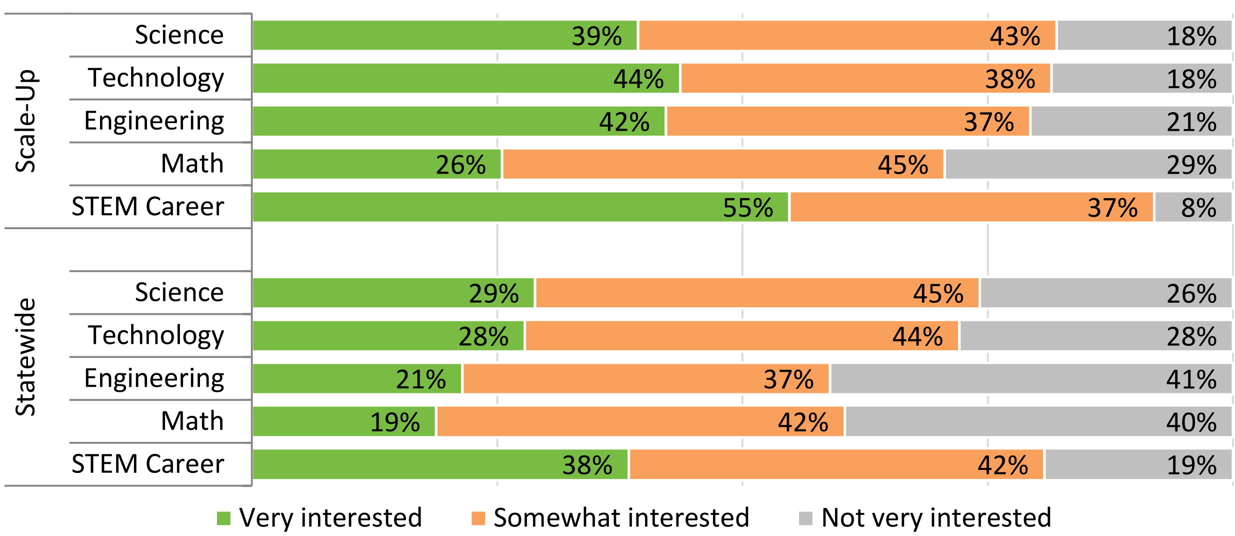


Figure 63. Interest in STEM topics and careers for *grades 9-12* Scale-Up students and students statewide, 2014-2015

Achievement in math and science on the Iowa Assessments, Scale-Up student versus statewide comparison

The matched Scale-Up participants were also compared to students statewide with regard to achievement in math and science. The Iowa Assessment scores in these two subjects were compared using National Percentile Rank (NPR). Note that comparisons reflect association between Scale-Up Programs and achievement in science and math only, not causation. Therefore, these findings should be interpreted with caution.

- In Year 3 (2014-2015), Scale-Up participants scored higher than students statewide, an average of 6 percentage points better in National Percentile Rank in both *math* (Table 49) and *science*, respectively (Table 50).
- In 2014-2015, students across all grade groups who participated in STEM Scale-Up programs had higher average National Percentile Rank of math and science scores on the Iowa Assessments compared to all students statewide (Figure 64).
- This is in contrast to differences observed in 2013-2014 in National Percentile Rank between students in Scale-Up programs and students statewide which had diminished from Year 1 to Year 2. For 2013-2014, there were no differences in NPR in *math* (Table 49), and only a one percentage point difference in NPR in *science* (Table 50).
- In Year 1 (2012-2013), Scale-Up participants scored higher than students statewide, an average of 10 percentage points better in National Percentile Rank in *math*, and an average of 8 percentage points better in National Percentile Rank in *science*. However, this may have been a function of students with more interest and aptitude participating in Scale-Up programs in Year 1.

Table 49. *Math* achievement by grade level on the Iowa Assessments, statewide versus Scale-Up student comparison

	All students Statewide[1]			Scale-Up Students[2,3]			Difference		
	NPR *Math*			NPR *Math*			NPR *Math*		
Grade	2012-2013	2013-2014	2014-2015	2012-2013	2013-2014	2014-2015	2012-2013	2013-2014	2014-2015
3	58	62	62	62	56	68	+4	-6	+6
4	58	62	64	71	66	70	+13	+4	+6
5	57	62	63	66	56	66	+9	-6	+3
6	53	58	61	58	61	61	+5	+3	0
7	57	62	64	74	61	69	+17	-1	+5
8	58	61	63	61	61	69	+3	0	+6
9	65	64	64	72	66	69	+7	+2	+5
10	65	67	68	79	69	77	+14	+2	+9
11	65	70	70	82	72	81	+17	+2	+11
Average[4]	60	63	64	69	63	70	+10	0	+6

NPR=National Percentile Rank

1. Statewide student achievement data based on n=342,494 for 2012-2013, n=346,774 for 2013-2014, and n=346,914 for 2014-2015, respectively.
2. Scale-Up student achievement data based on n=6,225 for 2012-2013, n=18,156 for 2013-2014, and n=13,142 for 20145-2015, respectively.
3. In June 2014, ITP provided updated 2012-2013 math and science achievement scores and NPR for Scale-Up students regardless of Interest Inventory participation; this reflects a larger sample than used to report achievement in the ISMP, Year 1 report.
4. Average reported for National Percentile Rank. The range of math and science scores vary by grade level which prevents the ability to average scores across grades.

Table 50. *Science* achievement by grade level on the Iowa Assessments, statewide versus Scale-Up student comparison

	All students Statewide[1]			Scale-Up Students[2,3]			Difference		
	NPR *Science*			NPR *Science*			NPR *Science*		
Grade	2012-2013	2013-2014	2014-2015	2012-2013	2013-2014	2014-2015	2012-2013	2013-2014	2014-2015
3	62	64	64	66	61	70	+4	-3	+6
4	66	67	68	75	73	73	+9	+6	+5
5	59	60	61	69	58	65	+10	-2	+4
6	58	59	61	66	62	61	+8	+3	0
7	59	63	65	72	63	69	+13	0	+4
8	61	67	68	63	67	72	+2	0	+4
9	71	66	66	78	70	74	+7	+4	+8
10	73	67	68	82	69	79	+9	+2	+11
11	71	68	69	84	71	82	+13	+3	+13
Average[4]	64	65	66	73	66	72	+8	+1	+6

NPR=National Percentile Rank

1. Statewide student achievement data based on n=342,494 for 2012-2013, n=346,774 for 2013-2014, and n=346,914 for 2014-2015, respectively.
2. Scale-Up student achievement data based on n=6,225 for 2012-2013, n=18,156 for 2013-2014, and n=13,142 for 20145-2015, respectively.
3. In June 2014, ITP provided updated 2012-2013 math and science achievement scores and NPR for Scale-Up students regardless of Interest Inventory participation; this reflects a larger sample than used to report achievement in the ISMP, Year 1 report.
4. Average reported for National Percentile Rank. The range of math and science scores vary by grade level which prevents the ability to average scores across grades.

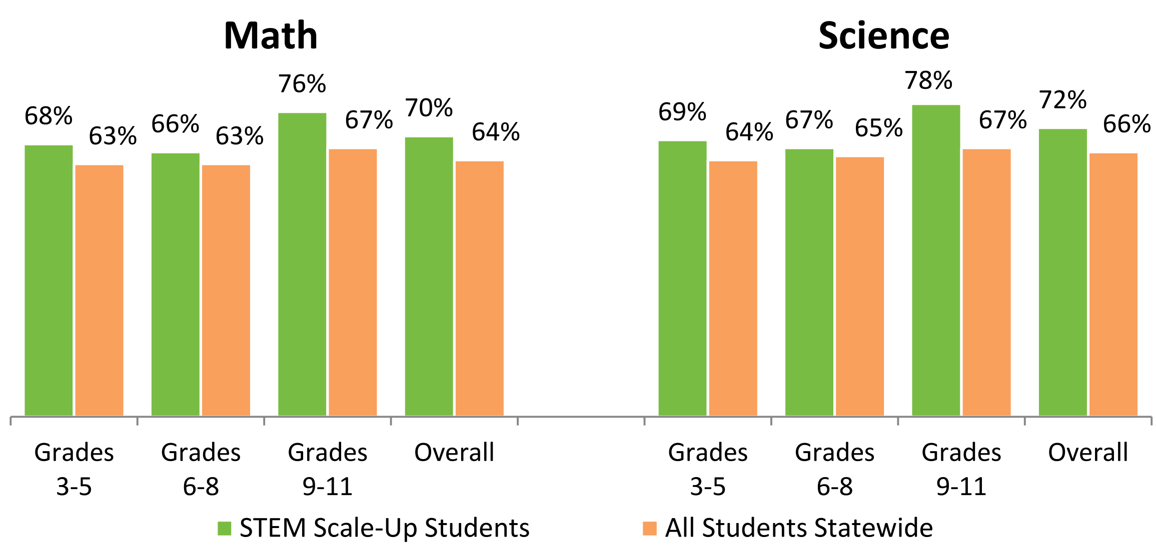


Figure 64. National Percentile Rank of *Math* and *Science* achievement on the Iowa Assessments, statewide versus Scale-Up student comparison

Section 4.3 Scale-Up Program Student Survey

Data source Student Survey, Iowa STEM Monitoring Project; Provided by Center for Social and Behavioral Research, University of Northern Iowa

Key findings

For 2014-2015, 15,794 student questionnaires were returned (Table 51). Of these, 8,467 were completed by male participants (54%) and 7,258 by female (46%). The average age of participants was 10 years (range: 5-19 years) (Table 52). Elementary students (ages 5-10 years old) returned 54% of the total sample of questionnaires (n = 8,481), followed by middle school students (ages 11-13 years old; 28%, n = 4,385) and high school students (ages 14-19 years old; 18%, n = 2,745), respectively.

An important data note: In Year 3 (2014/15), we modified the protocol for student surveys from Scale-Up student participants younger than 5 years. We received feedback from several Scale-Up educators that in their experience the early elementary student survey was developmentally out of range for preschool aged students. Upon review of best practices for assessment in the pre-Kindergarten age group, and discussion with experts in the field, we waived the student survey for the preschool age group (less than 5 years). Educators were still asked to complete a teacher survey and a student participant list. Any completed student surveys we received from participants younger than age 5 years were excluded from analysis.

Table 51. Demographic characteristics of Scale-Up student survey respondents

	n	(%)
TOTAL	**15,794**	
Gender		
Male	8,467	(54%)
Female	7,258	(46%)
Iowa STEM Hub Region		
Northwest	2,817	(18%)
North Central	3,704	(24%)
Northeast	2,871	(18%)
Southwest	2,118	(13%)
South Central	2,464	(16%)
Southeast	1,820	(12%)
Scale-Up Program		
A World in Motion	4,473	(28%)
FIRST Tech Challenge	645	(4%)
Pint Size Science: 1 and 2	2,332	(15%)
Curriculum for Agricultural Science Education (CASE)	496	(3%)
Defined STEM	501	(3%)
KidWind: Wind Power and Renewable Energy	1,075	(7%)
Engineering is Elementary	3,448	(22%)
HyperStream and VREP	799	(5%)
Project Lead the Way (PLTW) Gateway	985	(6%)
Project Lead the Way (PLTW) Engineering	103	(1%)
Multiple Programs	937	(6%)
Age Group		
Elementary school (5-10y)	8,481	(54%)
Middle school (11-13y)	4,385	(28%)
High school (14-19y)	2,745	(18%)
Not specified	183	

Table 52. Gender and mean age of respondents by Scale-Up program

	Male	Female	Mean Age	
Scale-Up Program	**N (%)**	**N (%)**	***M***	***SD***
A World in Motion	2,674 (52%)	2,479 (48%)	9.9	2.2
FIRST Tech Challenge	462 (72%)	182 (28%)	15.5	1.7
Pint Size Science: 1 and 2	1,245 (53%)	1,085 (47%)	5.4	0.9
Curriculum for Agricultural Science Education	284 (57%)	212 (43%)	15.9	1.1
Defined STEM	471 (54%)	408 (46%)	11.7	2.4
KidWind	911 (52%)	833 (48%)	11.7	2.3
Engineering is Elementary	2,117 (50%)	2,108 (50%)	9.1	1.5
HyperStream and VREP	530 (66%)	267 (34%)	14.1	2.3
Project Lead the Way Gateway	496 (50%)	486 (50%)	13.2	0.7
Project Lead the Way Engineering	94 (91%)	9 (9%)	17.1	0.8

Sums not equal to 15,794 due to students participating in more than one Scale-Up program.

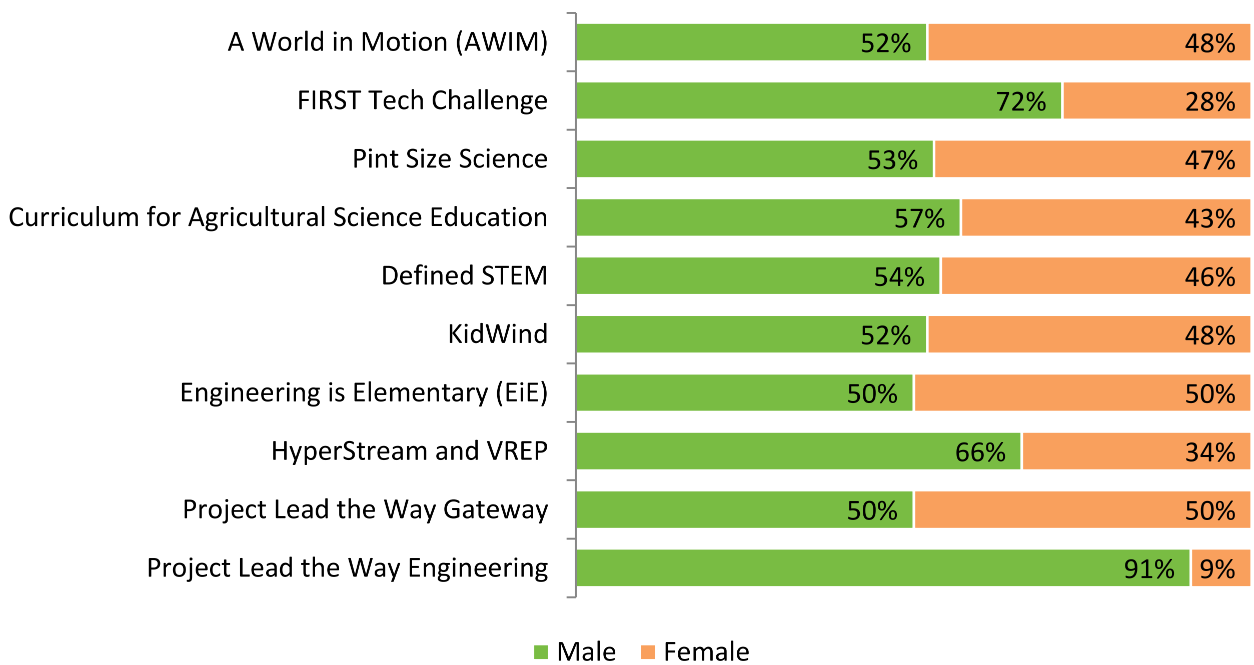


Figure 65. Proportion of male and female student survey respondents by Scale-Up program

A significantly larger proportion of elementary students said they were more interested in STEM topics and in STEM careers compared to middle school and high school students (Figure 66) after Scale-Up participation:

- Elementary school students were significantly more interested in both STEM topics and STEM careers than middle- or high-school students (p<.001 for all).
- Middle school students were significantly less interested in STEM careers than high school students (p<.05), but were significantly more interested in STEM careers than elementary students (p<.001).
- The majority of elementary students said that they were “more interested” in STEM topics and careers following Scale-Up participation.
- A reminder that these findings should be interpreted with caution as there was no baseline survey; therefore, this may be a function of the initial interest, not necessarily of participation.

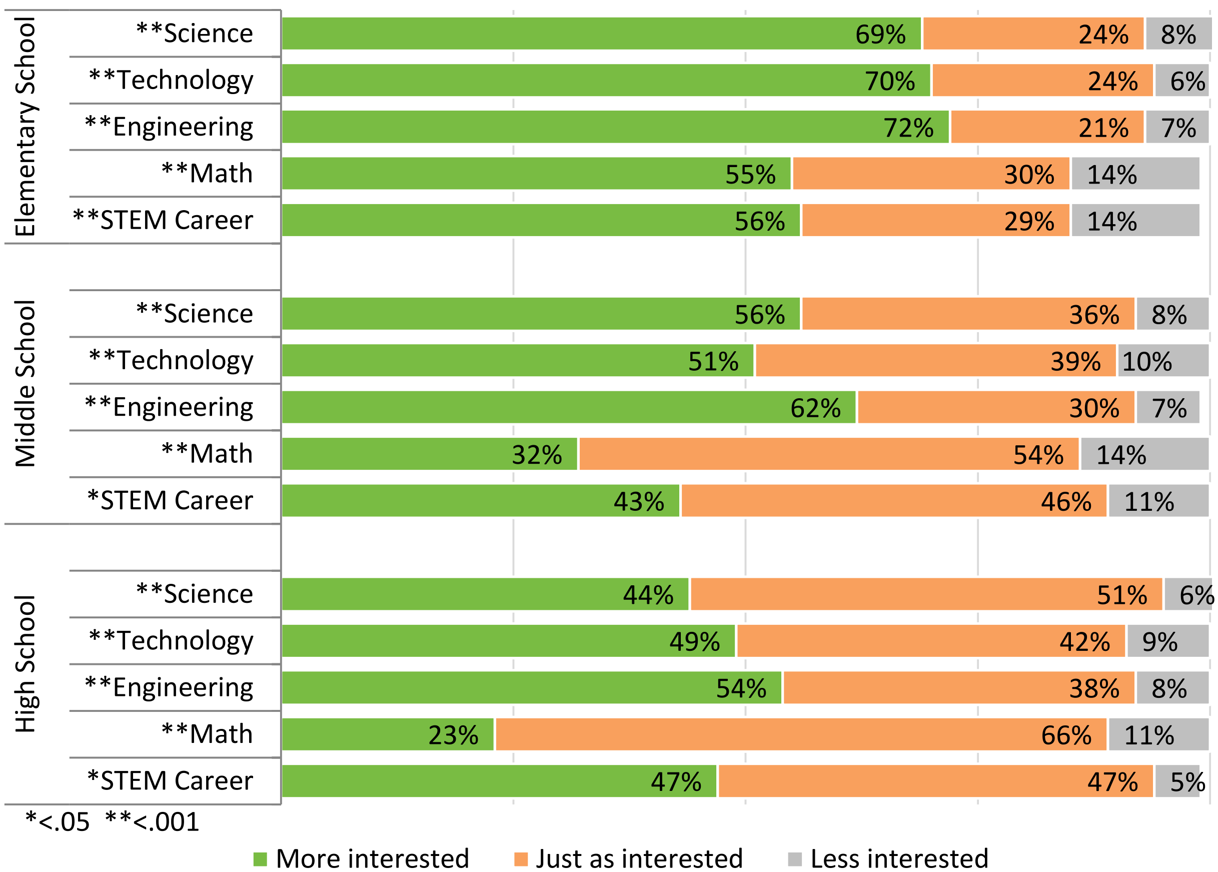


Figure 66. Percentage of student respondents by grade group who were *‘more interested,’ ‘just as interested,’* and *‘less interested’* in STEM topics/careers after participating in a Scale-Up program

Statistically significant differences were found between males and females in their reported interest in STEM topics and careers across all age groups.

For elementary students (Figure 67),

- Females were significantly more interested in math than males (p<.001).
- A significantly larger proportion of males said they were "more interested" in engineering than females.
- There were no significant differences in interest between males and females in all other STEM topics or in STEM careers.
- Both males and females were most interested in science, technology, and engineering.

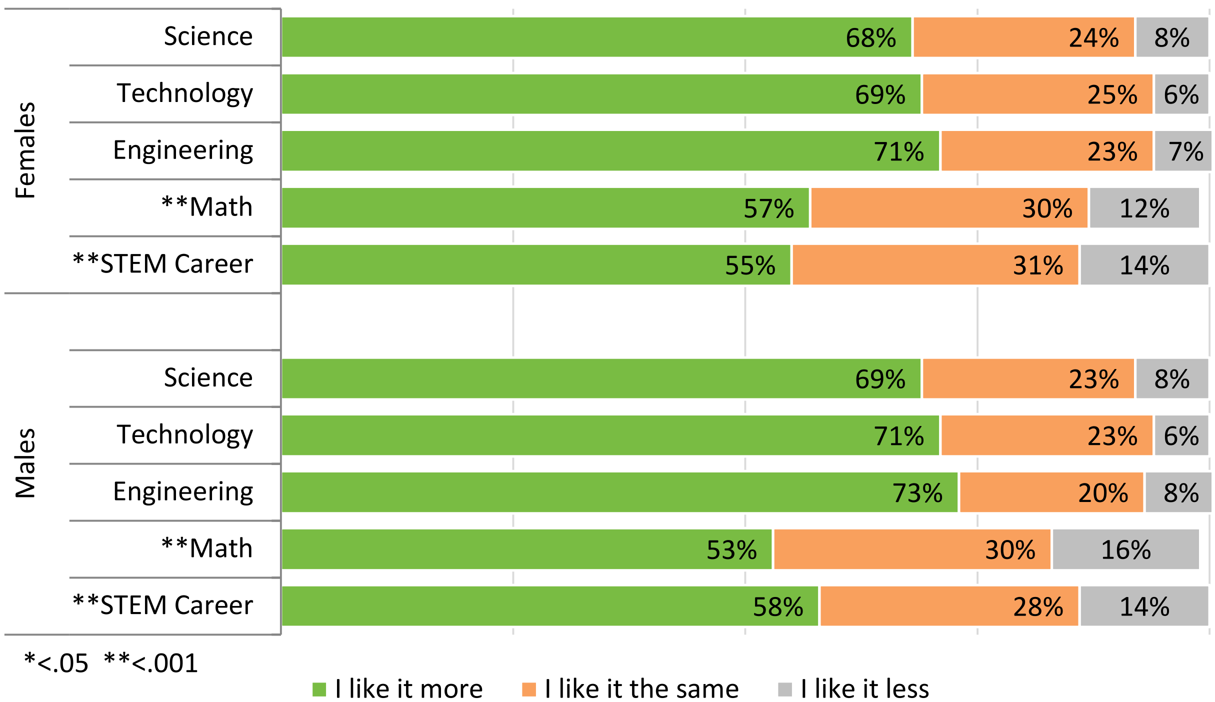


Figure 67. Interest among male and female student respondents, *aged 5-10 years*, in STEM topics/careers after participating in a Scale-Up program

For middle school students (Figure 68),

- Males were significantly more interested in science, technology, engineering, and STEM careers than females (p<.001).
- Males were most interested in engineering, technology, and science; females were most interested in engineering and science.
- For both males and females, the majority reported being "just as interested" in math after Scale-Up participation.

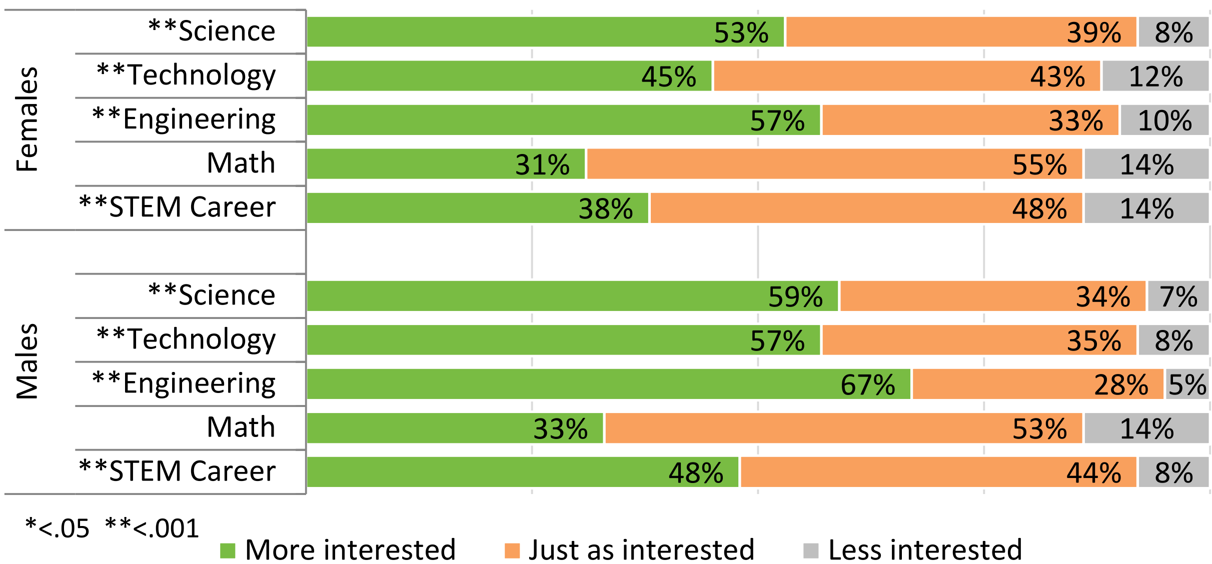


Figure 68. Interest among male and female student respondents, *aged 11-13 years*, in STEM topics/careers after participating in a Scale-Up program

For high school students (Figure 69),

- A significantly larger proportion of males said they were “more interested” in technology, engineering, and STEM careers than females (p<.001).
- There was no significant difference between males and females in math interest.
- Most females reported being “just as interested” in all STEM topics and in STEM careers since the start of the Scale-Up program.
- Most males were “more interested” in engineering and technology and for math and science, most males reported being “just as interested.”

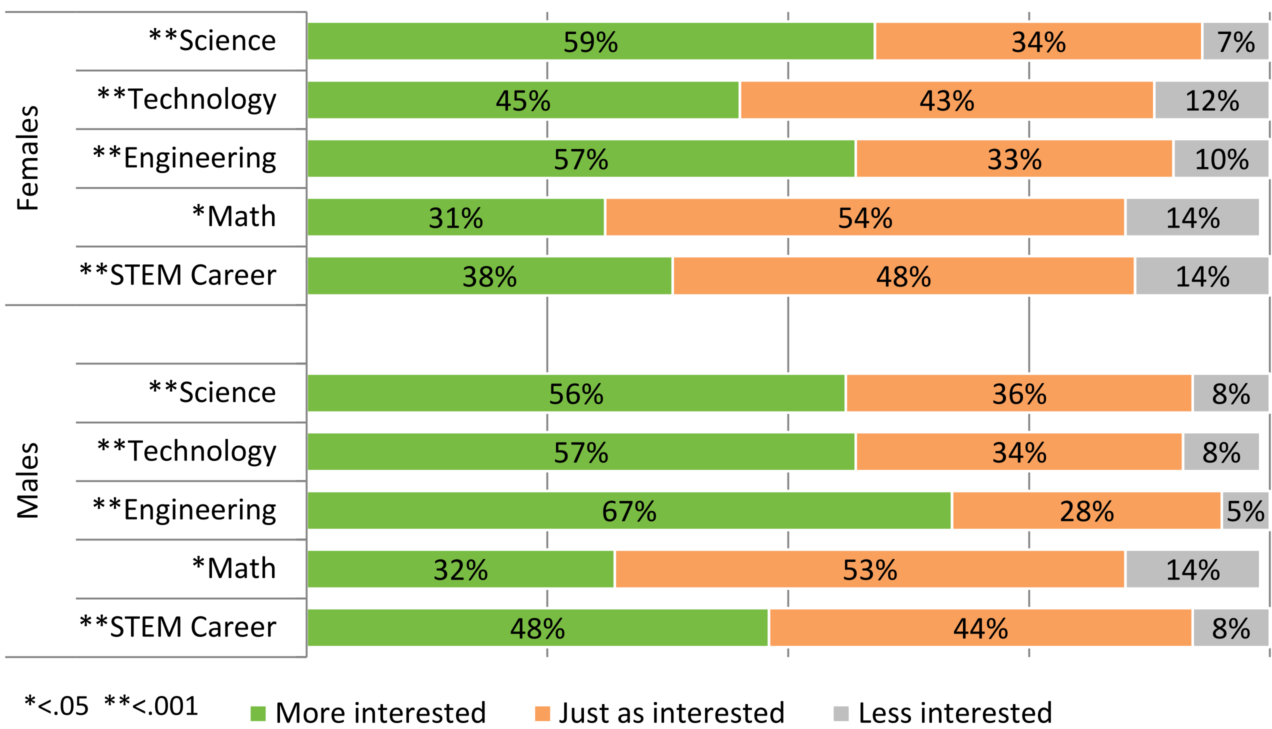


Figure 69. Interest among male and female student respondents, *aged 14-19 years*, in STEM topics/careers after participating in a Scale-Up program

- A larger proportion of students in year 3 reported change in interest in at least one STEM topic area or in pursuing a STEM career compared to year 1 and year 2, 91% of students said they were "more interested" in at least one STEM topic or in STEM careers on 2014-2015 versus 89% in 2012-2013 and 88% in 2013-2014. (Figure 70).
- In each of the last three years of the STEM Scale-Up program, approximately 9 in 10 participants reported higher interest in at least one STEM subject or in a STEM career following program participation.

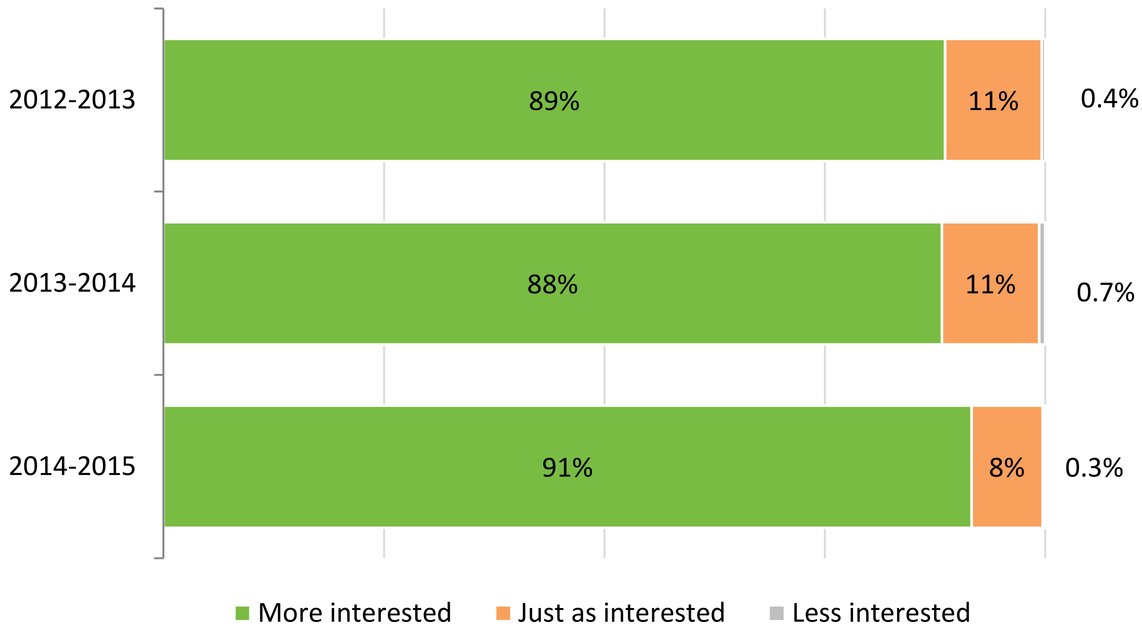


Figure 70. Percentage of student respondents who were *'more interested,' 'just as interested', or 'less interested'* in at least one STEM topic or in STEM careers by survey year

Student Interest in STEM by Scale-Up Program

Among the Scale-Up Programs implemented in 2014-2015, all of the programs had a positive effect on student interest and awareness in STEM topics and STEM careers. The following graph shows the percent of students who said they were “more interested”, “just as interested”, or “less interested” in STEM subjects or careers by Scale-Up program.

It is important to note that Scale-Up programs vary in their emphasis across individual STEM topics with some programs focusing on all four individual STEM topics and/or careers, where other programs might have only one or two areas of emphasis. For example, an engineering-based program may not include any math-based learning within their curriculum. This would likely affect how a student reports their change in interest in engineering, but not in math. Therefore, these findings should not be used to compare one program against another. Rather, the utility in these findings may be in identifying programs that are strong in the STEM subject area(s) that align with a particular school or organization’s desired goals and objectives. This may include choosing to implement a program with emphasis in a single STEM-topic area (e.g. science only), a few STEM-topic areas (e.g. engineering & technology), or all STEM topics and multiple careers.

Across all programs, the majority of students who participated in a Scale-Up program said they were “more interested” or “just as interested” in STEM topics and in STEM careers after participating in any Scale-Up program (Figure 71 and Figure 72).

- Very few students reported being “less interested” in STEM topics or in STEM careers after participating in any Scale-Up program (less than or equal to 18% of students for any program.

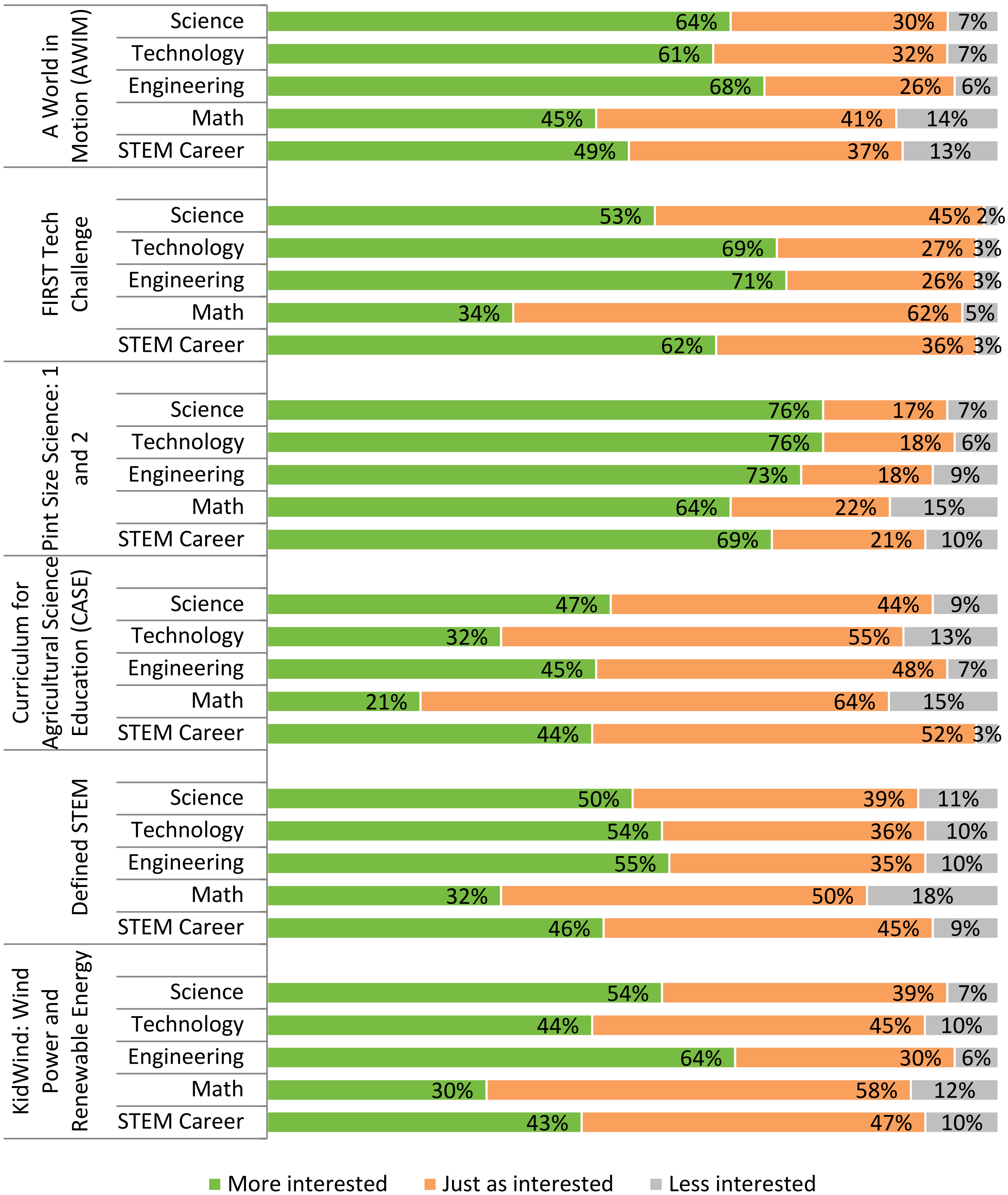


Figure 71. Interest of Scale-Up student survey respondents in STEM topics and careers after Scale-Up participation by program

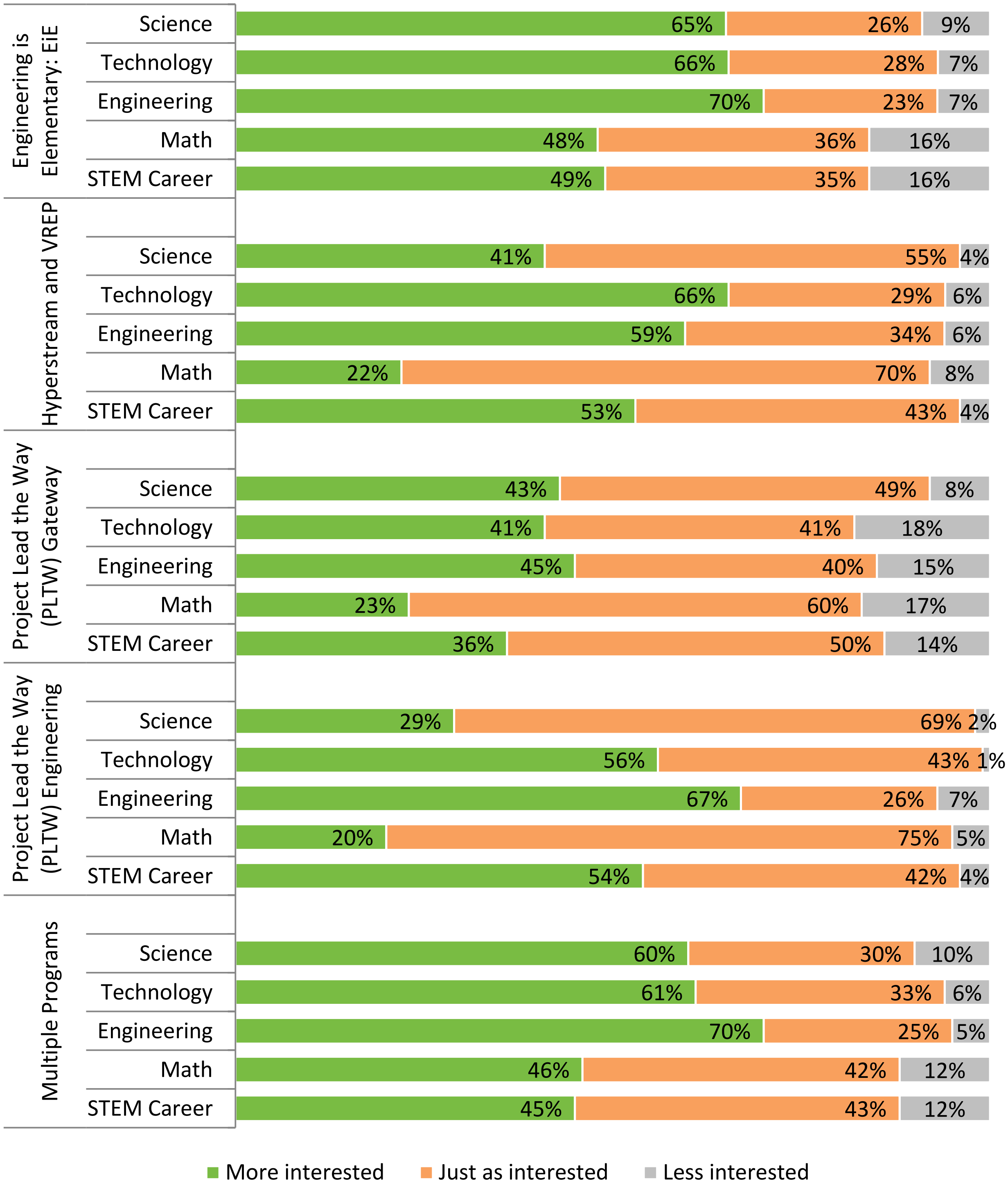


Figure 72. Interest of Scale-Up student survey respondents in STEM topics and careers after Scale-Up participation by program

Student Characteristics and Participation by Iowa STEM Hub Region

The number of students who participated in Scale-Up programs varied by Iowa STEM Hub region in terms of gender, age group, and type of Scale-Up program.

- Across all STEM Hub regions, most Scale-Up programs had more male participants than female participants (Table 53).
- Across all Iowa STEM Hub regions, most students were elementary school age.
- The mean age of participants ranged from 5.32 years (Pint Size Science) to 17.1 years (Project Lead the Way Engineering).

Table 53. Characteristics of student survey respondents by Iowa STEM Hub region[1]

	Northwest		North Central		Northeast		Southwest		South Central		Southeast	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Gender												
Male	1,488	(53%)	1,938	(52%)	1,584	(56%)	1,131	(54%)	1,349	(55%)	977	(54%)
Female	1,317	(47%)	1,757	(48%)	1,259	(44%)	978	(46%)	1,106	(45%)	841	(46%)
Scale-Up Program												
A World in Motion	579	(21%)	2,045	(55%)	704	(24%)	575	(27%)	297	(12%)	273	(15%)
FIRST Tech Challenge	109	(4%)	52	(1%)	97	(3%)	54	(2%)	126	(5%)	207	(11%)
Pint Size Science	593	(21%)	236	(6%)	677	(24%)	325	(15%)	308	(12%)	193	(11%)
Curriculum for Agricultural Science Education (CASE)	32	(1%)	136	(4%)	107	(4%)	90	(4%)	103	(4%)	28	(2%)
Defined STEM	--	--	162	(4%)	66	(2%)	20	(1%)	253	(10%)	--	--
KidWind: Wind Power and Renewable Energy	151	(5%)	277	(8%)	260	(9%)	41	(2%)	125	(5%)	221	(12%)
Engineering is Elementary	1,001	(36%)	204	(6%)	374	(13%)	793	(37%)	777	(32%)	299	(16%)
HyperStream and VREP	156	(6%)	124	(3%)	108	(4%)	75	(4%)	283	(12%)	53	(3%)
Project Lead the Way Gateway	--	--	20	(1%)	384	(13%)	--	--	80	(3%)	501	(28%)
Project Lead the Way Engineering	--	--	--	--	94	(3%)	--	--	9	(<1%)	--	--
Multiple Programs	196	(7%)	448	(12%)	--	--	145	(7%)	103	(4%)	45	(2%)
Age Group												
Elementary School (4-10y)	1,887	(68%)	1,661	(45%)	1,561	(56%)	1,476	(70%)	1,322	(54%)	574	(32%)
Middle School (11-13y)	603	(22%)	1,470	(40%)	458	(16%)	330	(16%)	568	(23%)	956	(53%)
High School (14-19y)	299	(11%)	540	(15%)	796	(28%)	293	(14%)	548	(22%)	269	(15%)

Sums not equal to 15,794 due to missing data and/or student participation in more than one Scale-Up program. Counts and percentages reflect the proportion of completed student questionnaires; not necessarily distribution of overall participation in any particular Scale-Up program in a particular region.

Changes in Student Interest from Scale-Up Student Surveys, 2012/2013 – 2014/2015

Fewer student Scale-Up surveys were returned for the 2014-2015 year compared to the 2013-2014 year (15,794 versus 21,350, respectively; Table 54). Because key differences are likely to exist between Scale-Up programs that were implemented across years, it is not appropriate to compare change in interest across years.

- A slightly higher proportion of males completed a student survey in the 2014-2015 year than in 2013-2014, but was the same as 2012-2013.

Table 54. Demographic comparison of Scale-Up student survey respondents, Year 1 to Year 3

	2012-2013		2013-2014		2014-2015	
	N	(%)	N	(%)	N	(%)
TOTAL[1]	**7,729**		**21,350**		**15,794**	
Gender						
Male	4,181	(54%)	11,002	(52%)	8,467	(54%)
Female	3,505	(46%)	10,248	(48%)	7,258	(46%)
Iowa STEM Hub Region						
Northwest	1,442	(19%)	6,295	(30%)	2,817	(18%)
North Central	1,253	(16%)	3,738	(18%)	3,704	(24%)
Northeast	1,749	(23%)	3,812	(18%)	2,871	(18%)
Southwest[2]			2,202	(10%)	2,118	(13%)
South Central	1,559	(20%)	2,416	(11%)	2,464	(16%)
Southeast	1,660	(22%)	2,887	(14%)	1,820	(12%)
Age Group						
Elementary (5-10y)	2,955	(38%)	8,340	(40%)	8,481	(54%)
Middle school (11-13y)	2,588	(34%)	7,995	(38%)	4,385	(28%)
High school (14-19y)	2,063	(27%)	4,794	(23%)	2,745	(18%)

1. Sums not equal to total due to student participation in multiple scale-up programs.

2. In 2012-2013, data from the Southwest region were excluded due differences in data collection.

Counts and percentages reflect the proportion of completed student questionnaires received; not necessarily distribution of overall student participation in all Scale-Up programs statewide.

- Across survey years, there is a similar trend in decreased interest in STEM topics and in pursuing STEM careers across age groups, with females showing a greater rate of decreased interest than males. There was no statistically significant difference in mean scores across years (Figure 73, Figure 74, and Figure 75).
- In general, when considering interest in any STEM topic or in pursuing a STEM career, the decrease in interest that occurs from Elementary in High School is more marked for females.

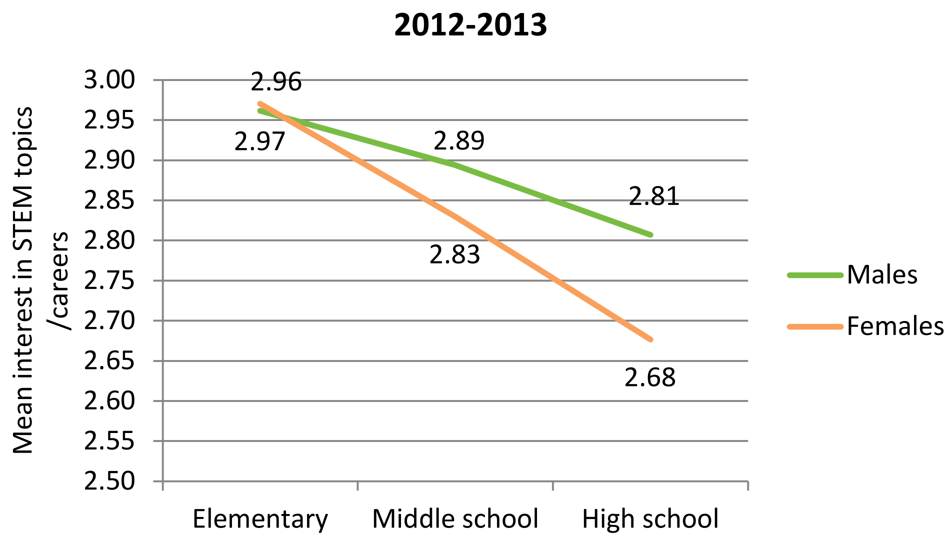


Figure 73. Mean interest in STEM topics and STEM careers by age group and gender among Scale-Up student survey respondents, 2012-2013

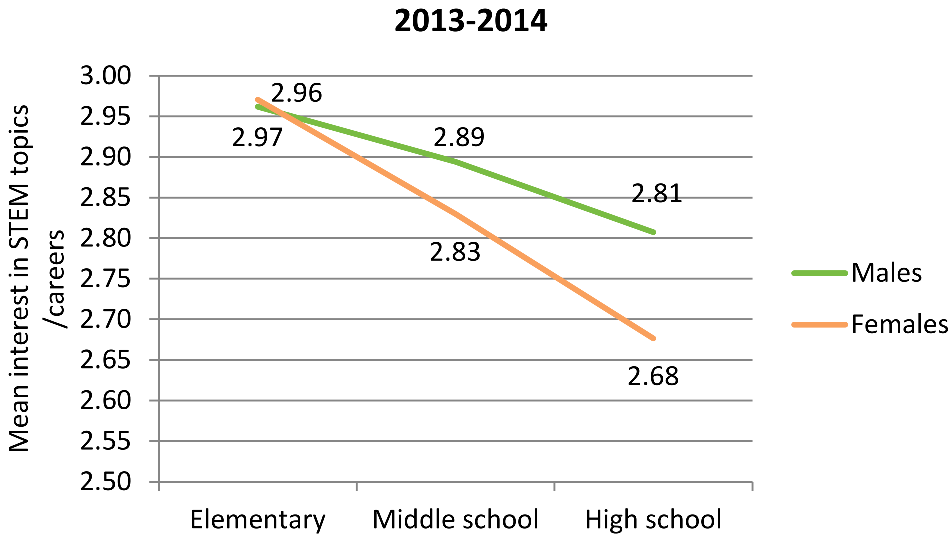


Figure 74. Mean interest in STEM topics and STEM careers by age group and gender among Scale-Up student survey respondents, 2013-2014

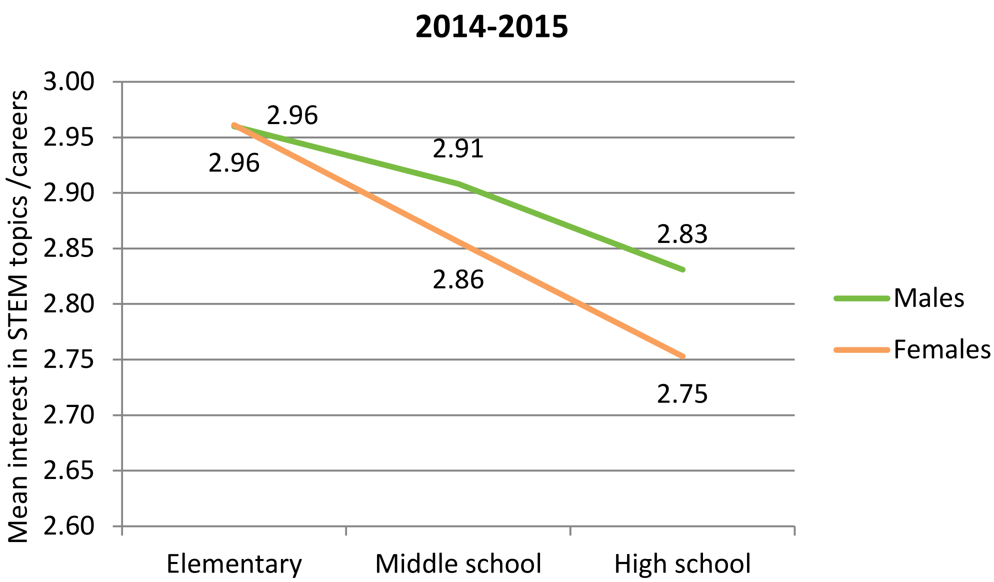


Figure 75. Mean interest in STEM topics and STEM careers by age group and gender among Scale-Up student survey respondents, 2014-2015

Summary & Conclusions

This report presented the third year of data compilation and synthesis of the Iowa STEM Monitoring Project (ISMP). A wide variety of data sources and measures were systematically reviewed to get a better understanding of STEM in Iowa from educational, public and workforce development perspectives.

Results indicate that math and science achievement (as measured by state and national standardized tests) have increased by a few percentage points, more so among elementary and middle school students. In addition, disparities in math and science achievement continue to persist. Compared to all students overall, a smaller proportion of underrepresented minority students, those eligible for free/reduced lunch, and students with disabilities are proficient in math and science. For all students statewide and in Scale-Up Programs, interest in the four main STEM disciplines and STEM careers is highest among elementary school students when compared to middle school and high school students.

In 2014, a majority of Iowans (74%) had heard something in the past month about K-12 education in general, and 61% had heard something about 'improving math, science, technology, and engineering education." After controlling for other factors, Iowans with some college education (p=.03) or college degree (p<.001), an annual gross income of $75,000 to less than $100,000 (p=.04), and/or who live in a large city of greater than 50K population (p=.02) were significantly more likely to have awareness of STEM. Over half of Iowans rate the quality of science, technology, and math education in their community as 'Excellent' or 'Good.' Among Iowans, the two most commonly cited barriers to STEM education were not enough access to or availability of resources for STEM, and personally held perceptions that suggest "STEM is not for me." While it was assessed in a relatively short time since being launched, 14% of Iowans reported having heard the slogan *Greatness STEMs from Iowans* approximately six months after the campaign began. As the campaign continues to unfold, the statewide survey will continue to assess annual changes in awareness and attitudes toward STEM, as well as whether perceived barriers to STEM are reduced in alignment with the campaign.

Among the ten STEM Scale-Up Programs awarded to schools and organizations in 2014-2015, all of the selected programs had positive effects on student interest and awareness in STEM topics and STEM careers. Among students who participated in a Scale-Up program in 2014-2015, 9 in 10 participants reported higher interest in at least one STEM subject or in a STEM career following the program participation. Elementary school students were significantly more interested in both STEM topics and STEM careers compared to middle- or high-school students.

Teachers and leaders reported several important impacts as a result of implementing Scale-Up programs this year. Teachers and leaders reported that they gained skills and confidence in teaching STEM topics as a result of their participation in the Scale-Up programs. Over 75% of the teacher/leaders agreed or strongly agreed that they now have more confidence to teach STEM content (81%), have increased their knowledge of STEM topics (86%), are better prepared to answer students' STEM-related questions (79%), and have learned effective methods for teaching in STEM content areas (76%). In addition, teachers and leaders reported working with an estimated 1,162 existing business partnerships and established 376 new school-business partnerships during 2014-2015. Some of the larger schools reported having more than 50 existing partnerships, while others benefited from only one or two. Over 80% of the teachers and leaders reported observing an increase in both student awareness and interest in STEM topics, while over 50% stated they observed an increase in awareness in STEM careers. Similar to last year, they again reported that students demonstrated an increase in motivation, engagement, and interest in STEM content areas as well as STEM careers. They also reported that students' critical thinking, problem solving, and teamwork skills showed improvement throughout the Scale-Up program.

Limitations & Conclusions

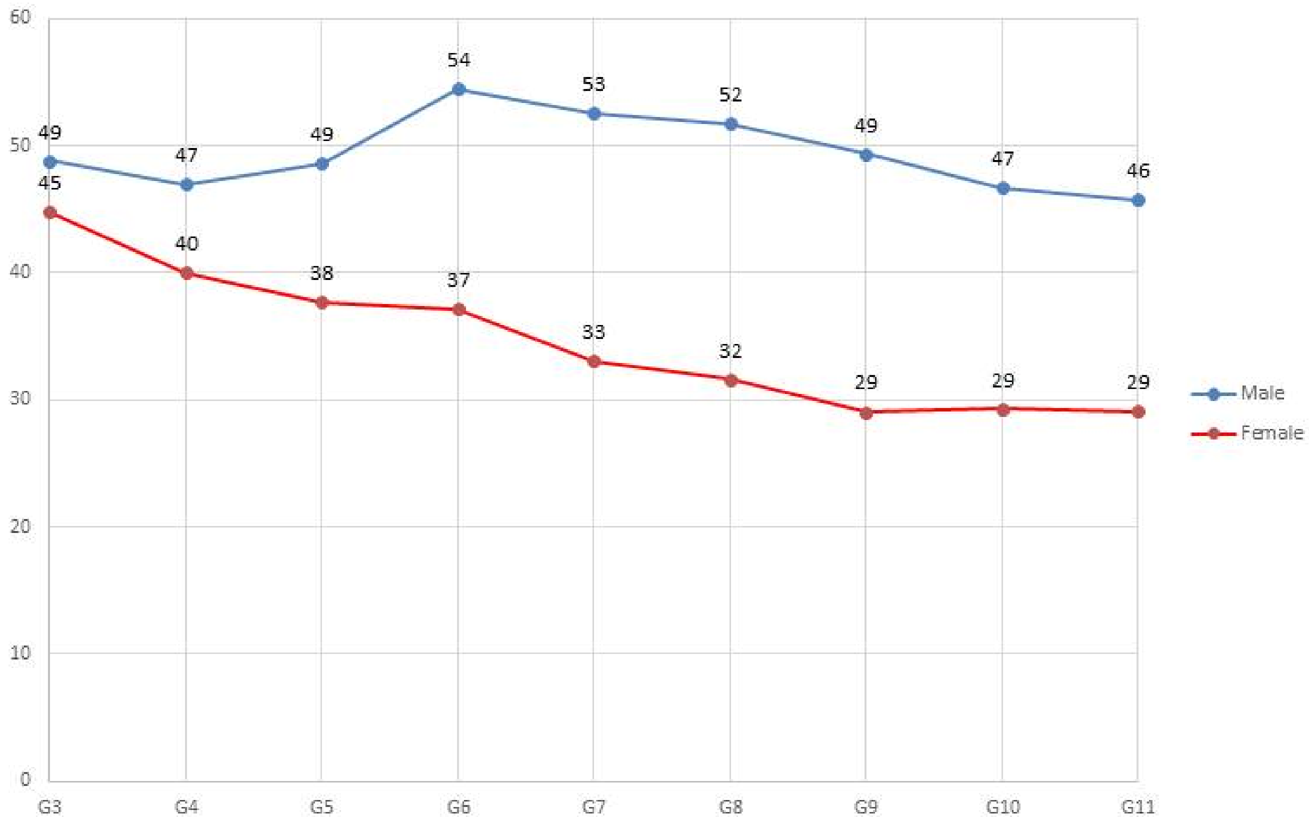
The data compiled, collected, and synthesized for this report come from a variety of sources. The data represent a wide range of characteristics, including periods of time, sub-populations, and data collection methods. This variation can lead to difficulty in synthesizing and interpreting the data. Following the benchmarks established in year one, year three showed promise in some indicators and some losses in others. The ISMP will continue to follow these indicators, identify and/or refine other metrics of STEM progress, and strengthen relationships with other data partners in the state. Taken together, this report provides a picture of Iowa's STEM landscape, and how it is evolving following the targeted initiatives of the Iowa Governor's STEM Advisory Council to improve STEM education and workforce development surrounding STEM in Iowa.

[This page intentionally left blank.]

List of Appendices

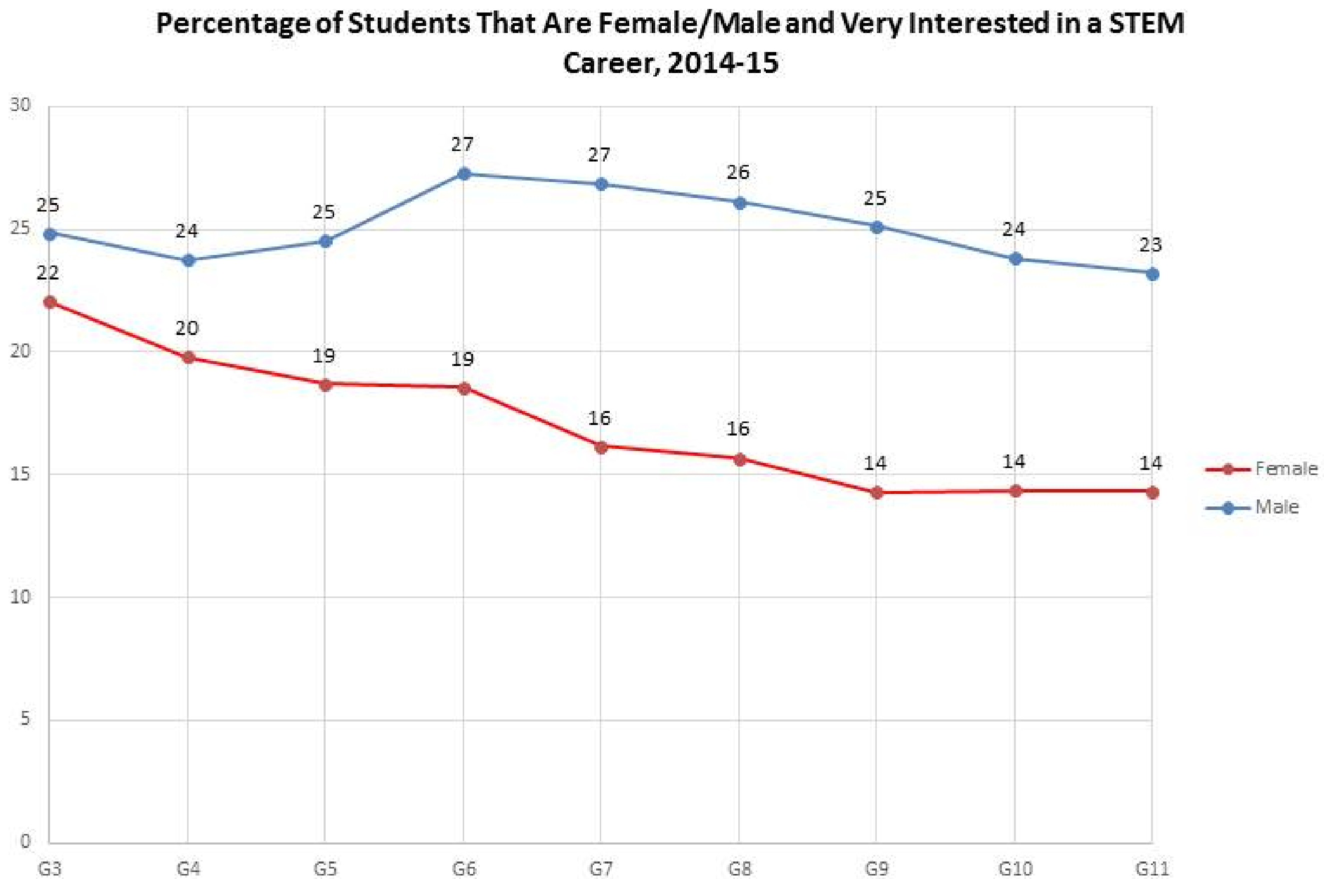
Appendix A: Additional representations Statewide Student Interest Inventory data (see Indicator 8, Section 3, and Section 4.2)

Percentage of Males or Females Very Interested in a STEM Career, 2014-15



1. Percentage of gender who responded *very interested* (Denominator used to calculate proportion was number of males or females, respectively.)

Prepared by Iowa Testing Programs, June 2015

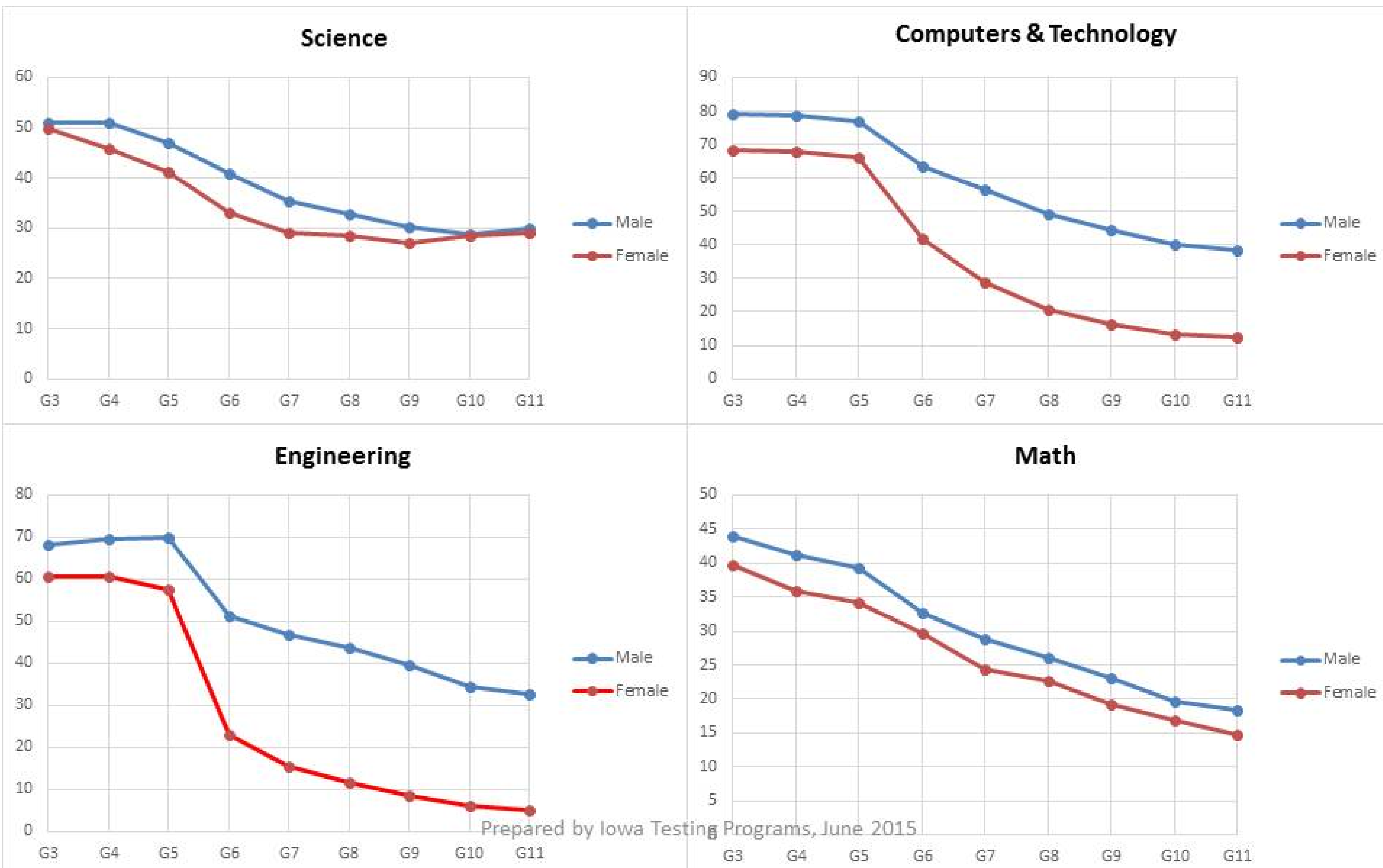


1. Percentage of respondents by gender who responded *very interested* (Denominator used to calculate proportion was the total number of respondents. For example, if 4 out of 8 respondents is male, and 2 males said they were *very interested*, 2 out of 8=25%. Use this slide when comparing to slides prepared in previous annual reports.)

Prepared by Iowa Testing Programs, June 2015

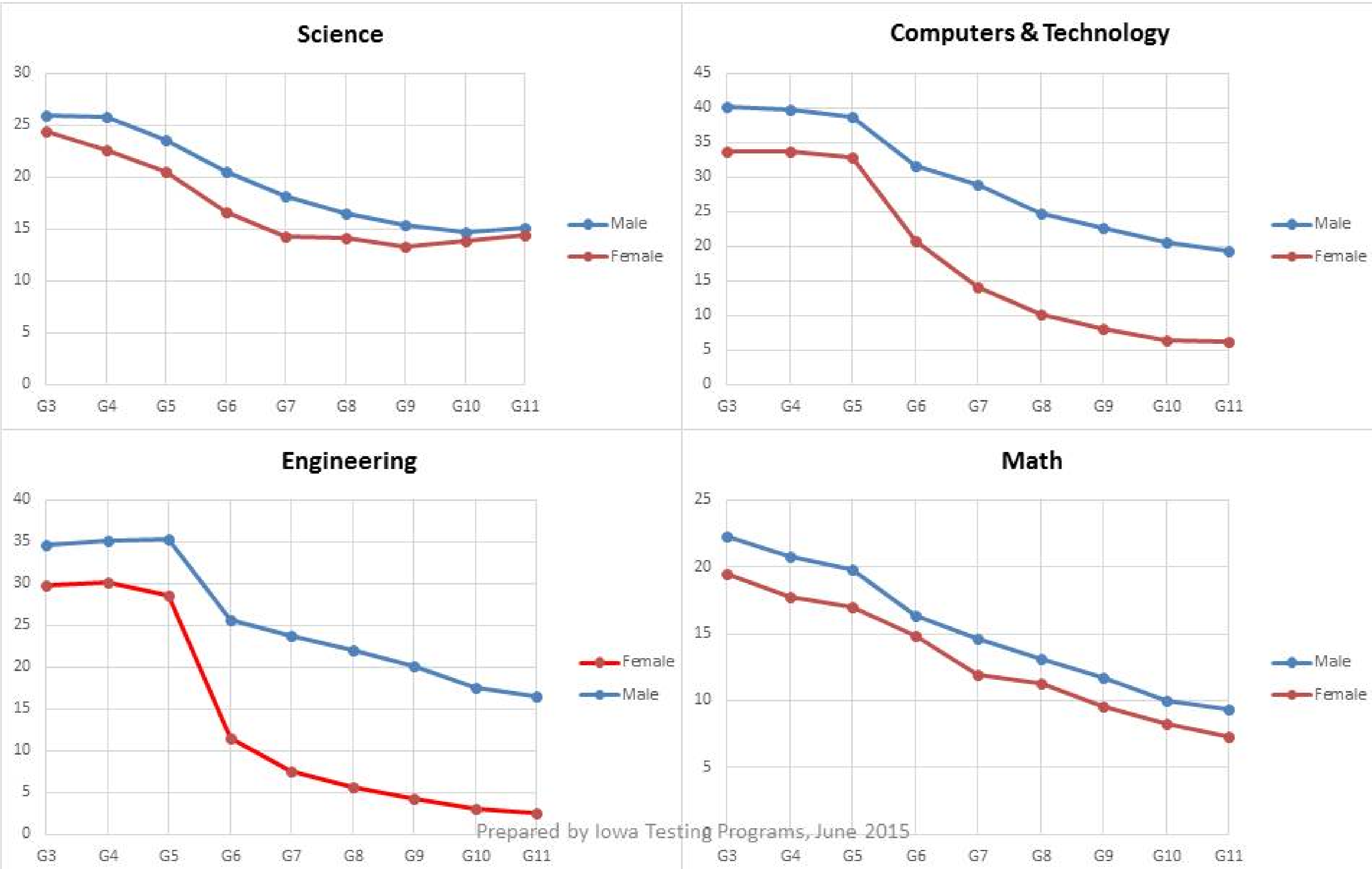
Percentages of Males or Females Very Interested in STEM Subject Areas, 2014-15

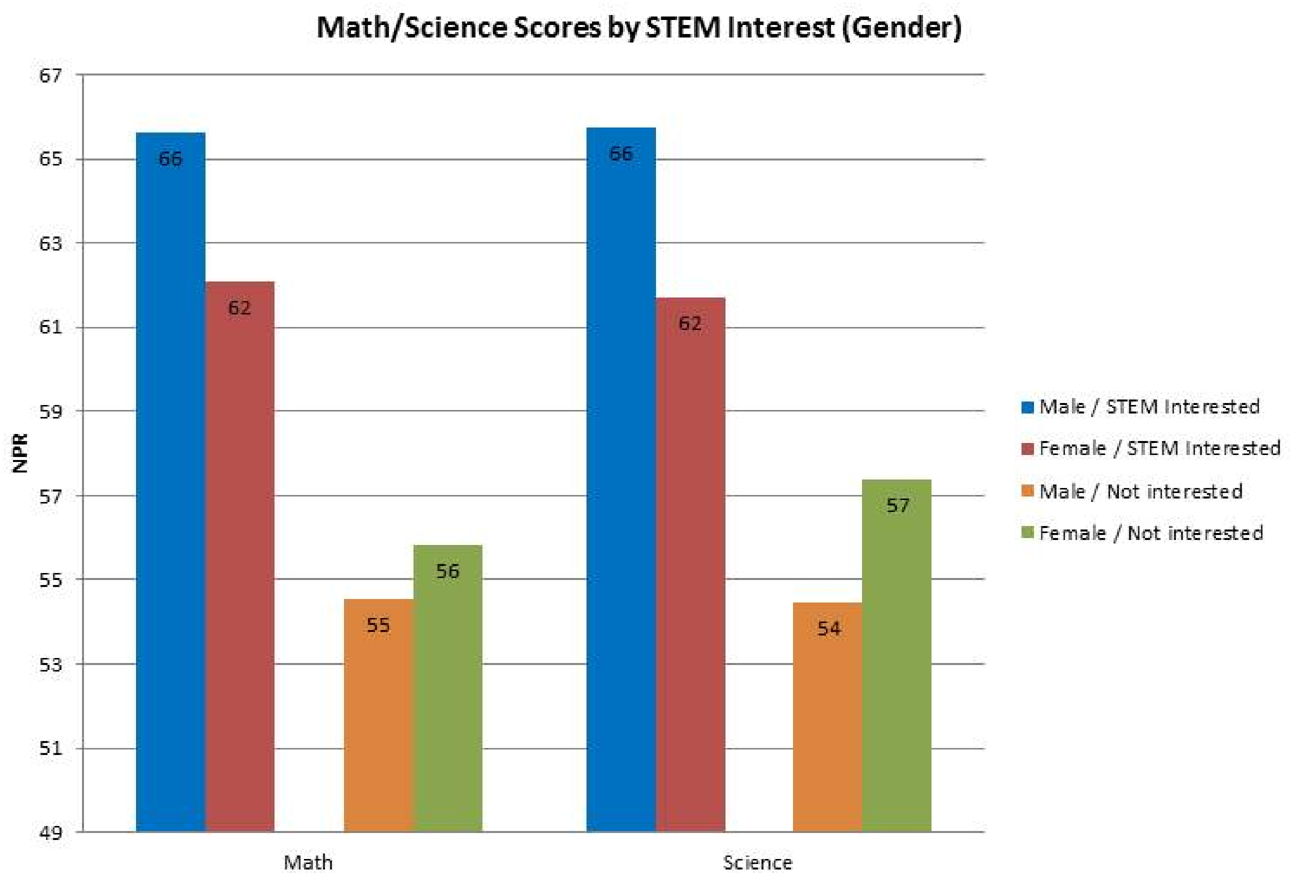
Percentage of gender who responded *very interested* (Denominator used to calculate proportion was number of males or females, respectively.)



Percentage of Students That Are Female/Male and Very Interested in STEM Subject Areas, 2014-15

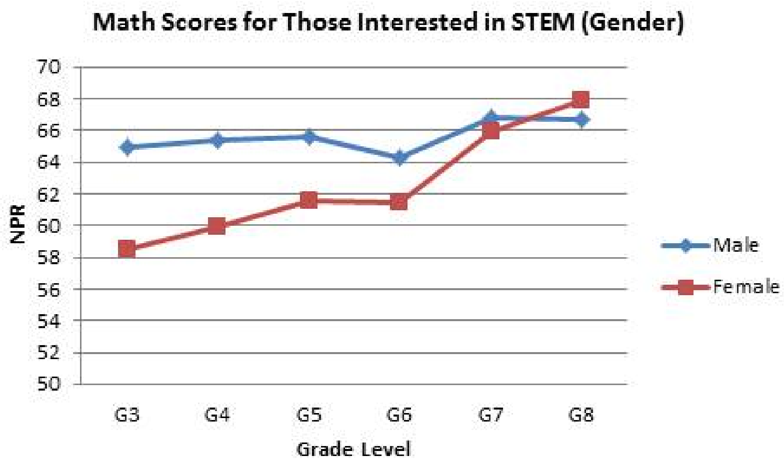
Percentage of respondents by gender who responded *very interested* (Denominator used to calculate proportion was the total number of respondents.)

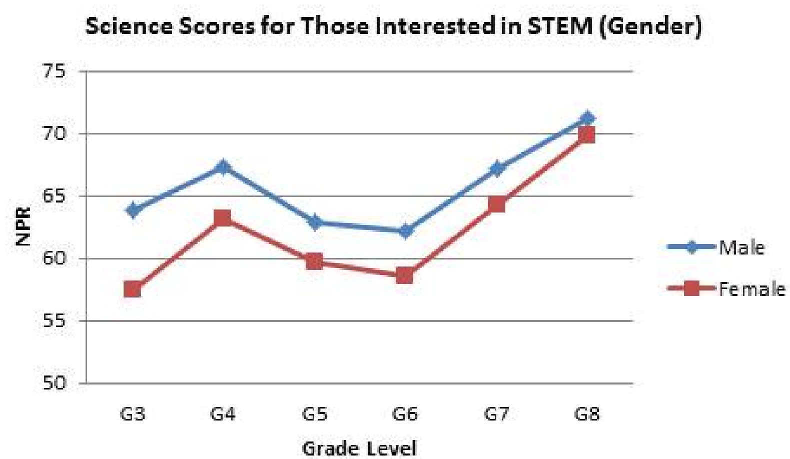




1. STEM Interested reflects respondents who responded *very interested*.

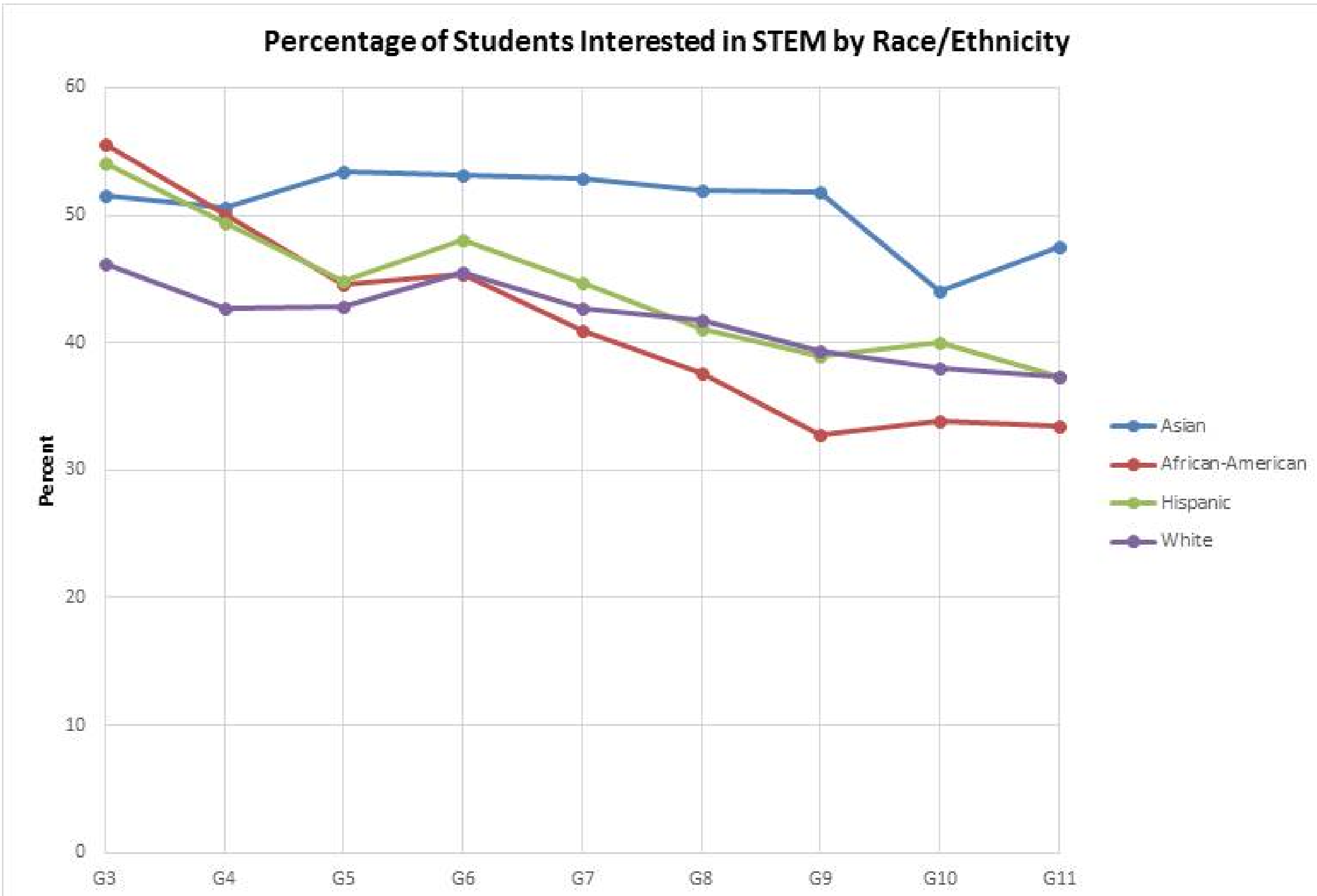
Prepared by Iowa Testing Programs, June 2015





1. Interest in STEM reflects respondents who responded *very interested*.

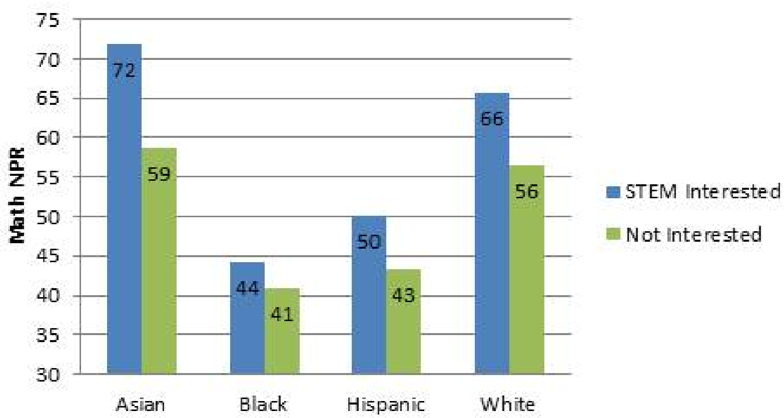
Prepared by Iowa Testing Programs, June 2015



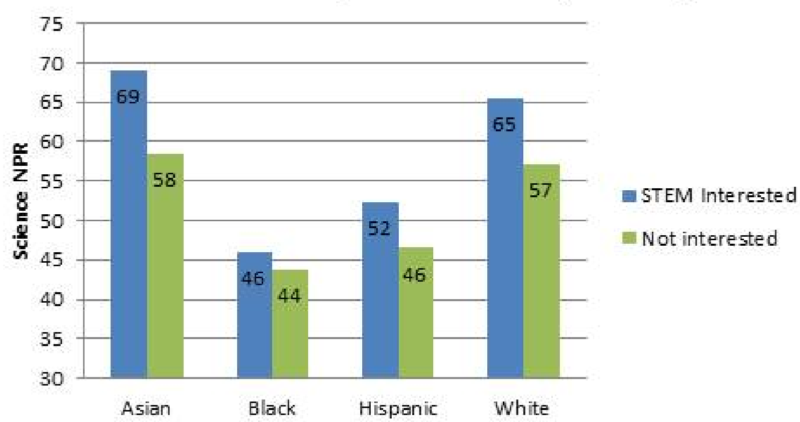
1. Interest in STEM reflects proportion who responded *very interested*.

Prepared by Iowa Testing Programs, June 2015

Math Scores by STEM Interest (Ethnicity)

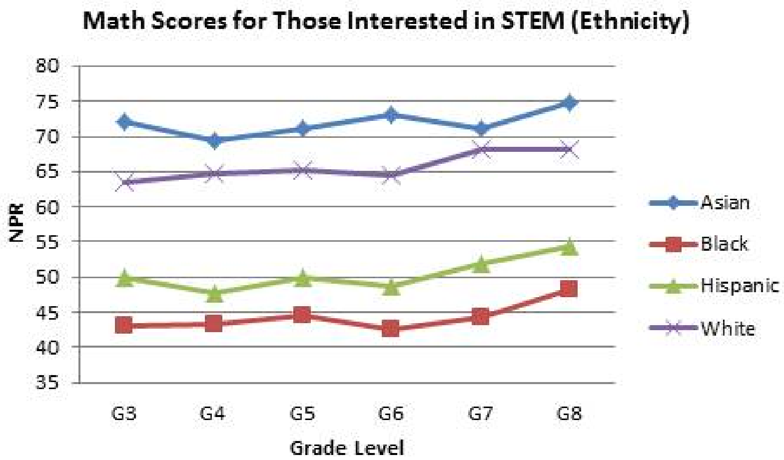


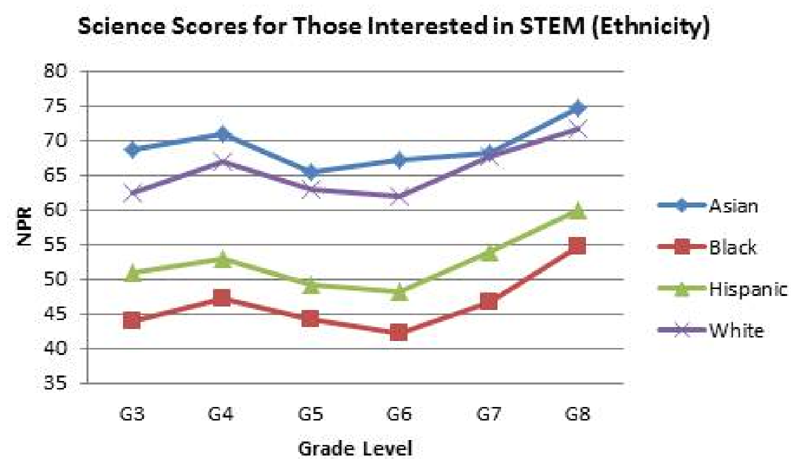
Science Scores by STEM Interest (Ethnicity)



1. STEM Interested reflects respondents who responded *very interested*.

Prepared by Iowa Testing Programs, June 2015



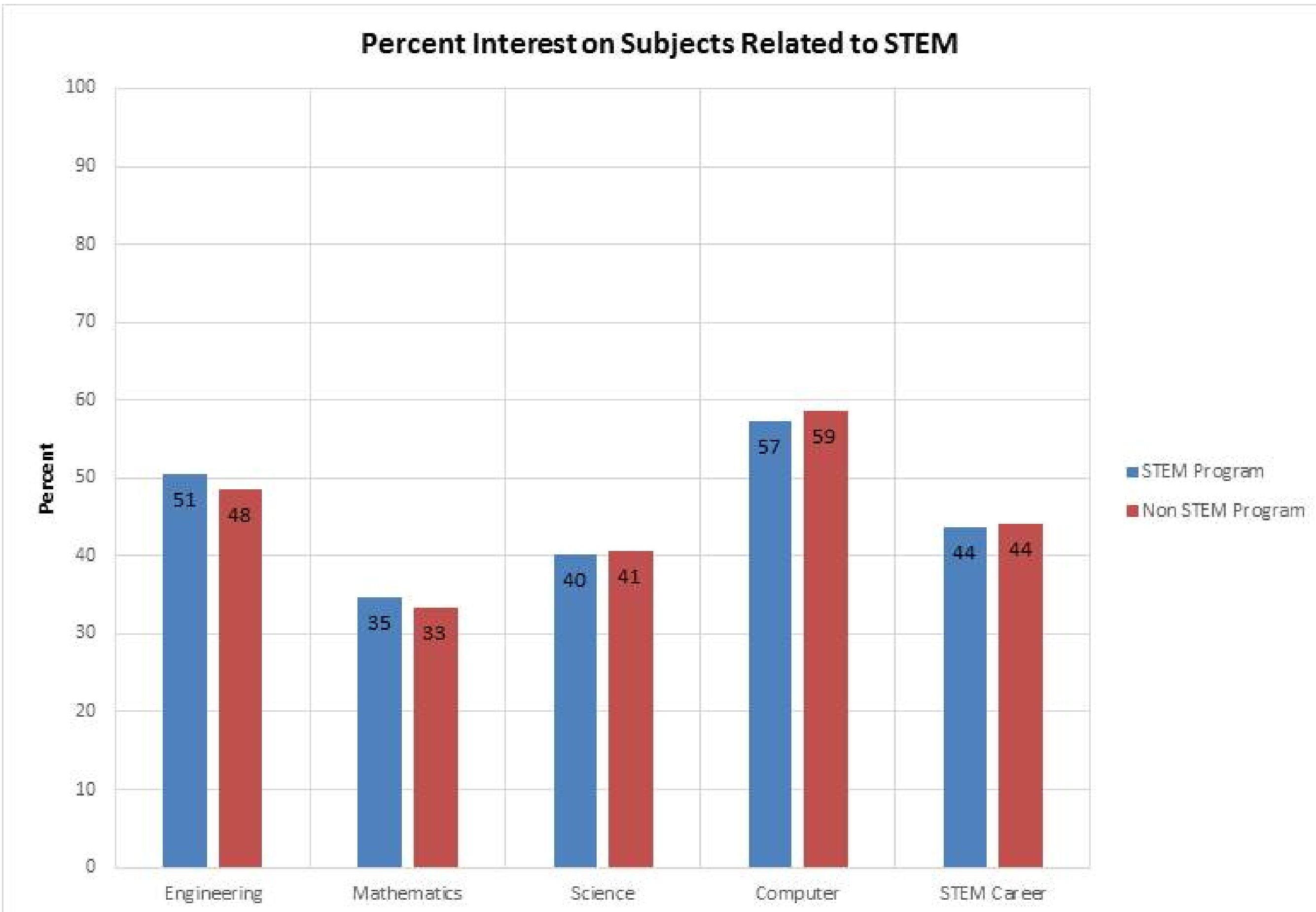


1. Interest in STEM reflects respondents who responded *very interested*.

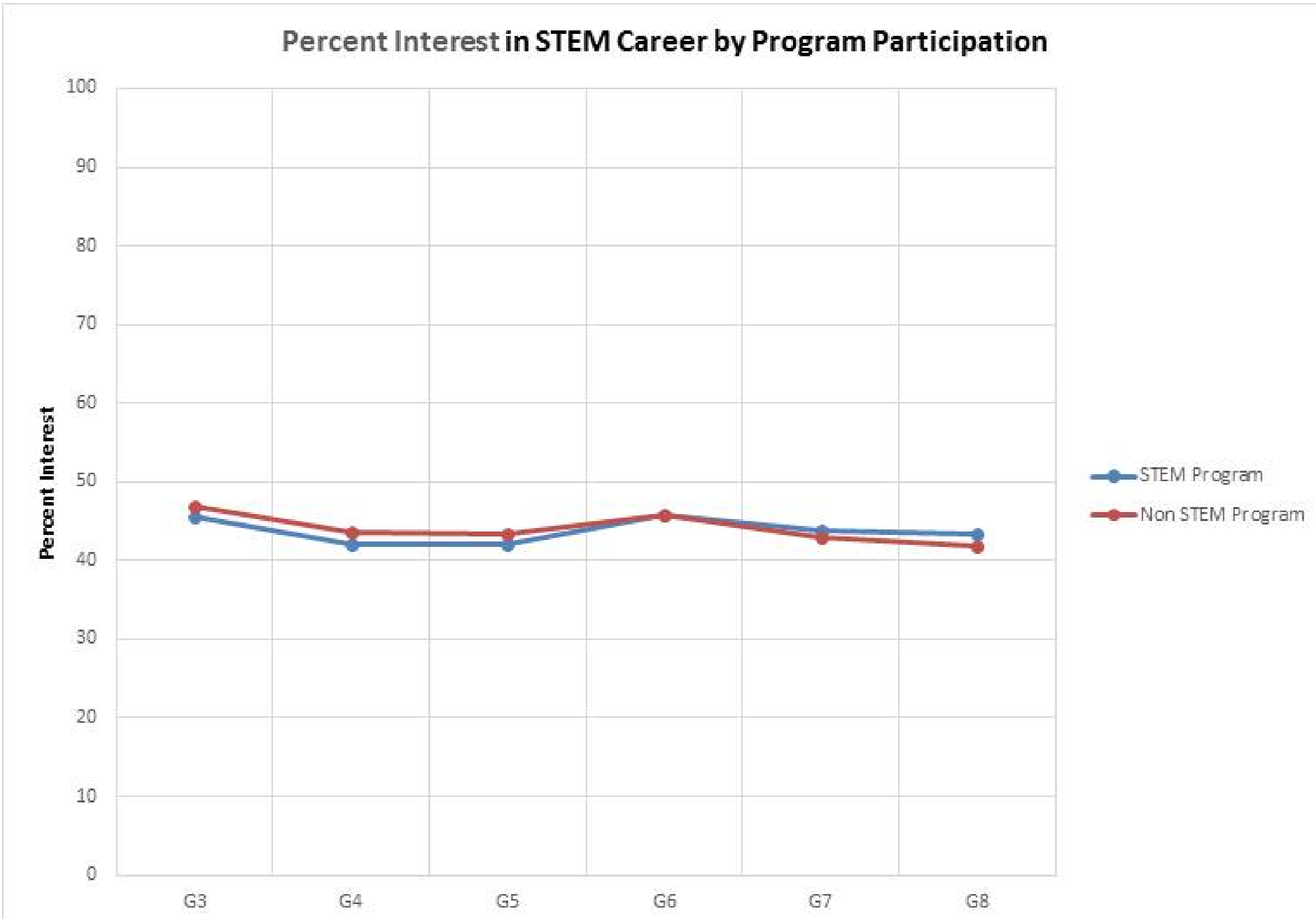
Prepared by Iowa Testing Programs, June 2015

Measuring Impact of STEM Program Involvement, Grades 3-8

Prepared by Iowa Testing Programs, June 2015

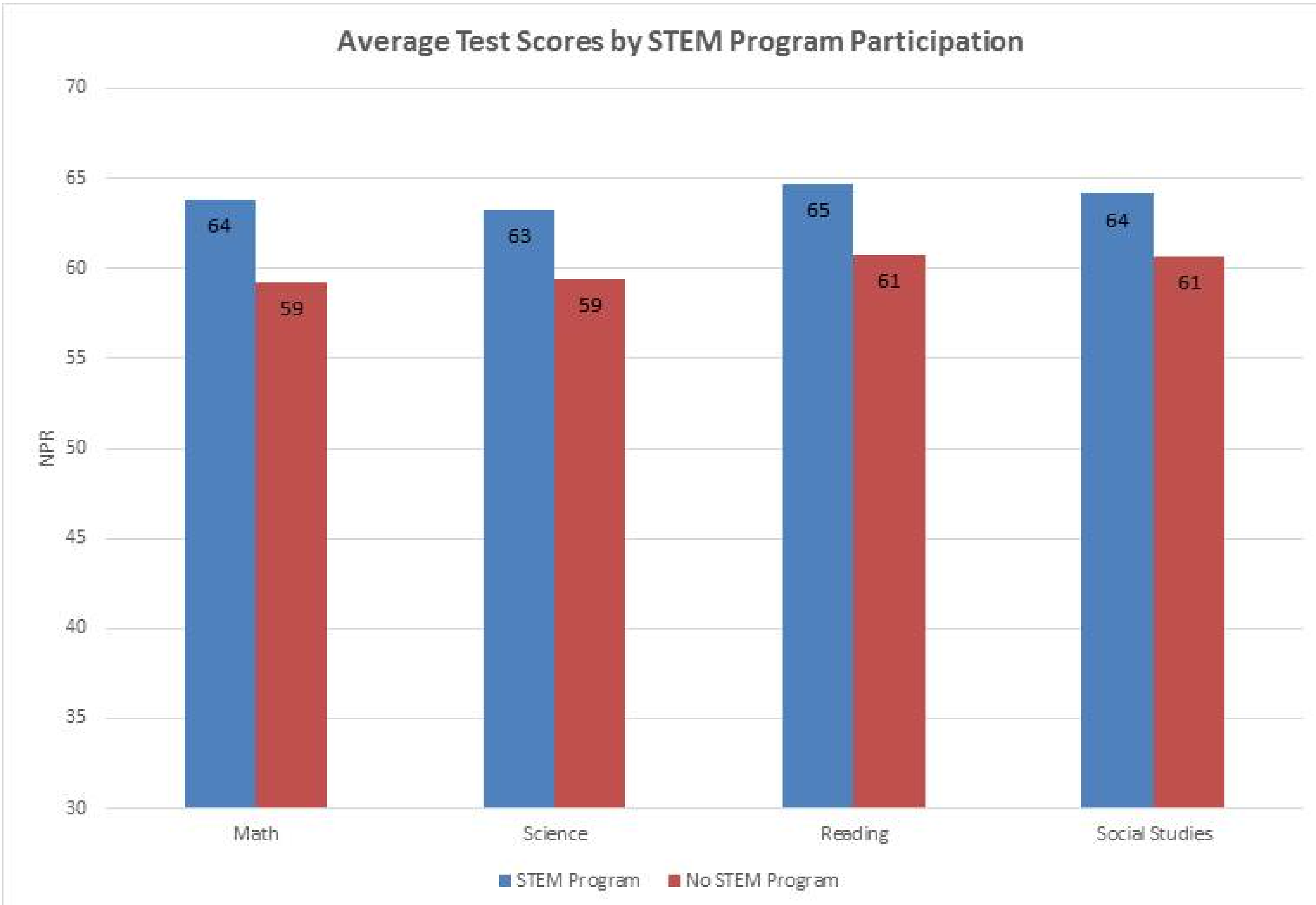


Prepared by Iowa Testing Programs, June 2015

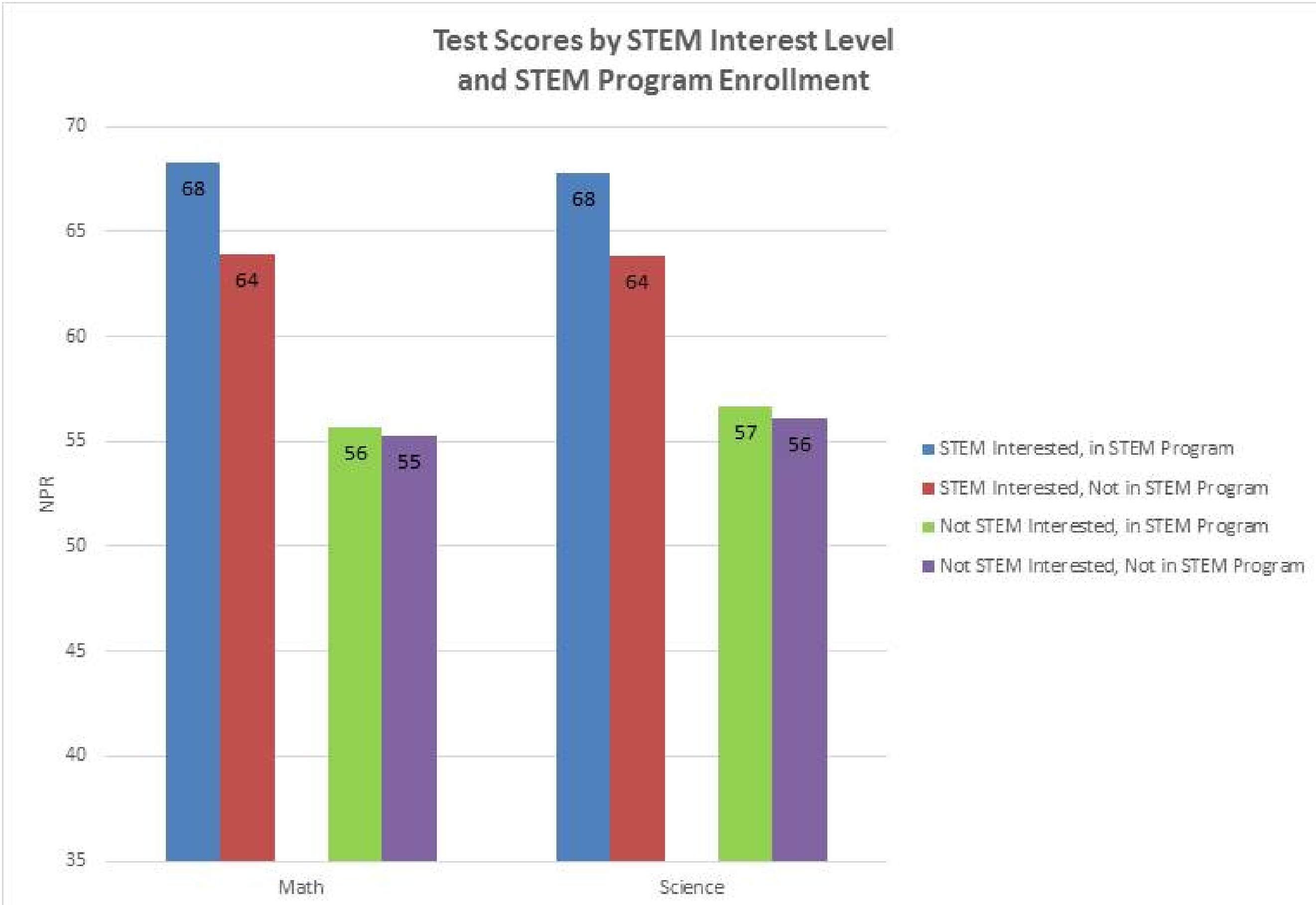


1. Interest in STEM reflects proportion who responded *very interested.*

Prepared by Iowa Testing Programs, June 2015

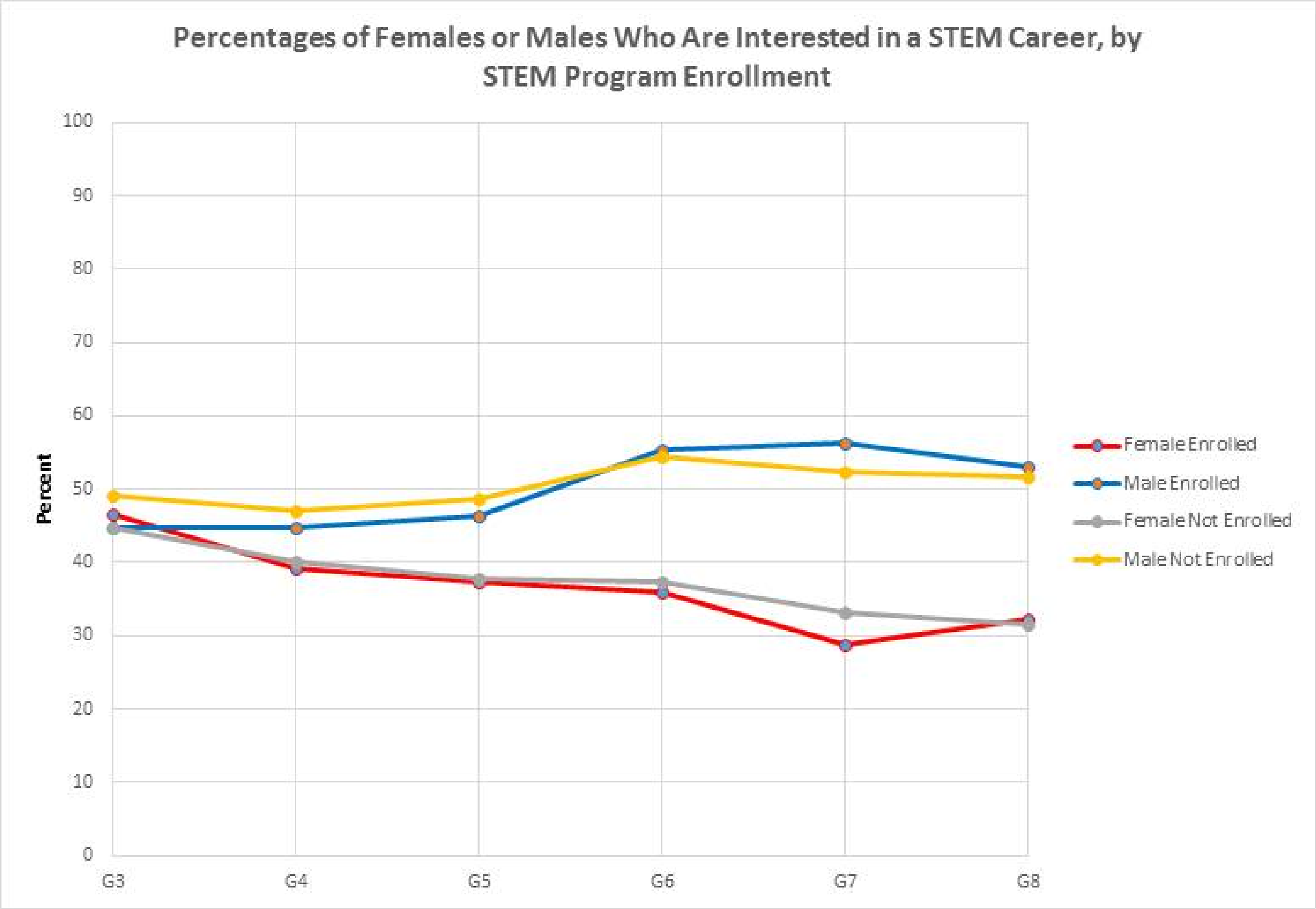


Prepared by Iowa Testing Programs, June 2015



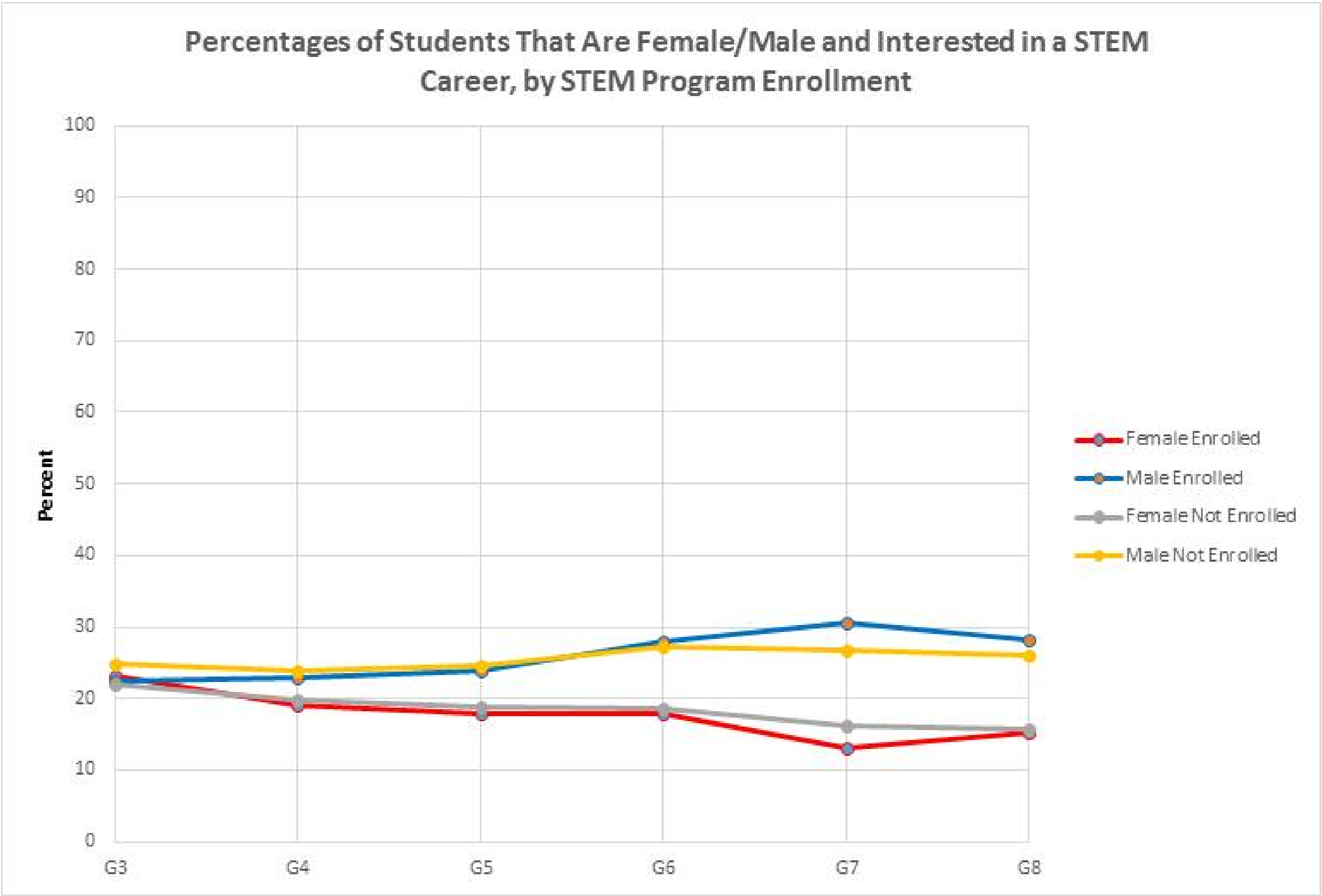
1. STEM Interested reflects respondents who responded *very interested*.

Prepared by Iowa Testing Programs, June 2015



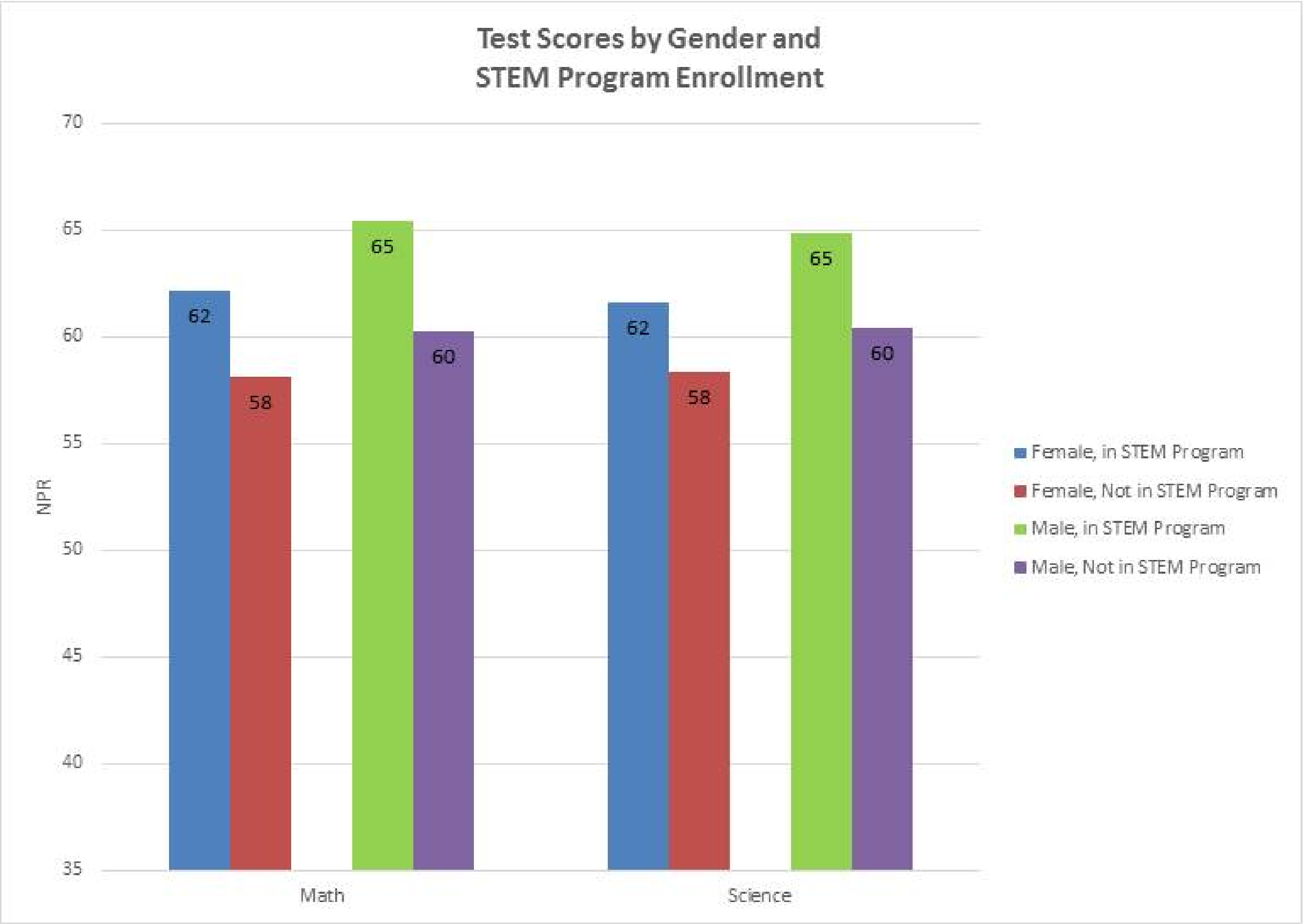
1. Percentage of gender who responded *very interested* (Denominator used to calculate proportion was number of males or females, respectively.)

Prepared by Iowa Testing Programs, June 2015

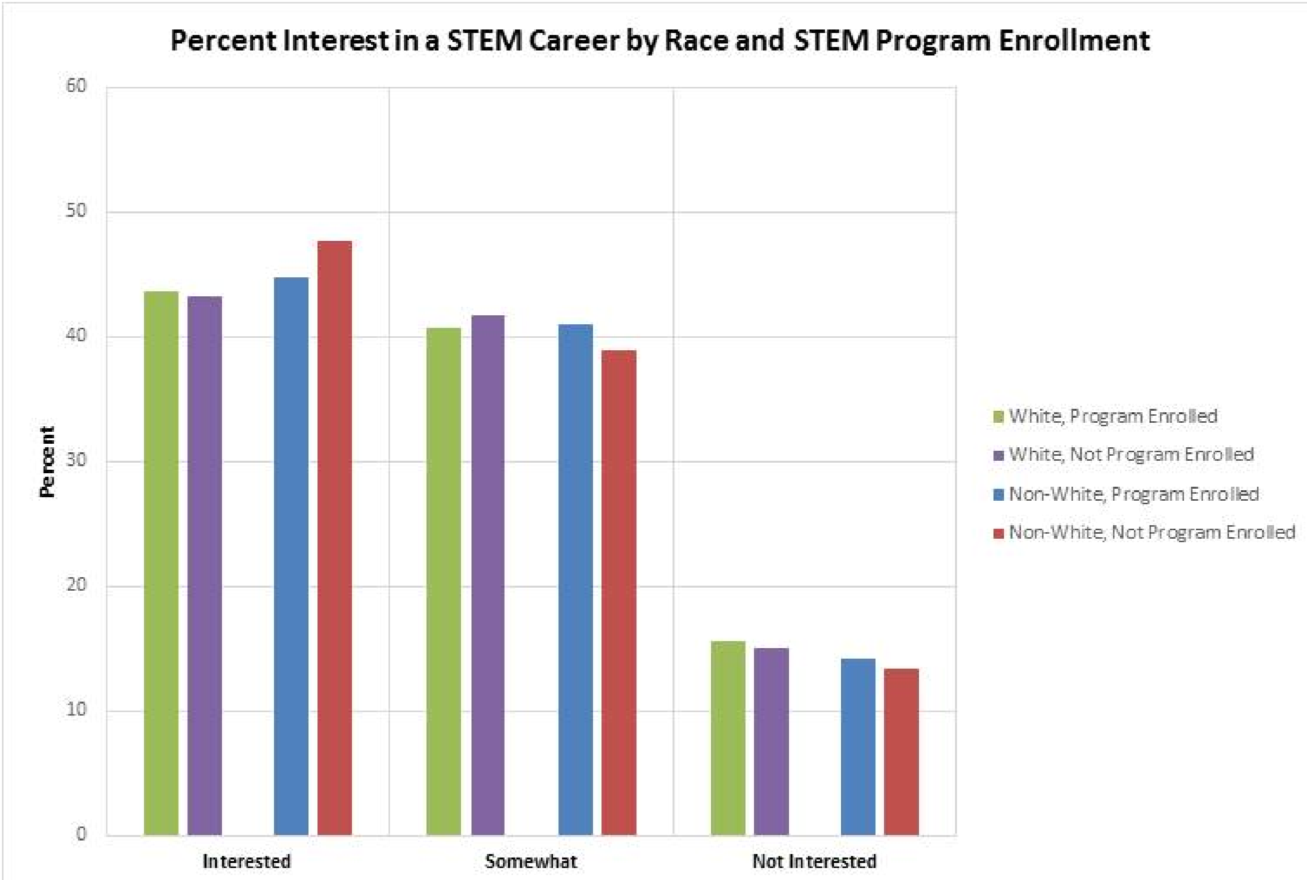


1. Percentage of respondents by gender who responded *very interested* (Denominator used to calculate proportion was the total number of respondents. For example, if 4 out of 8 respondents is male, and 2 males said they were *very interested,* 2 out of 8=25%. Use this slide when comparing to slides prepared in previous annual reports.)

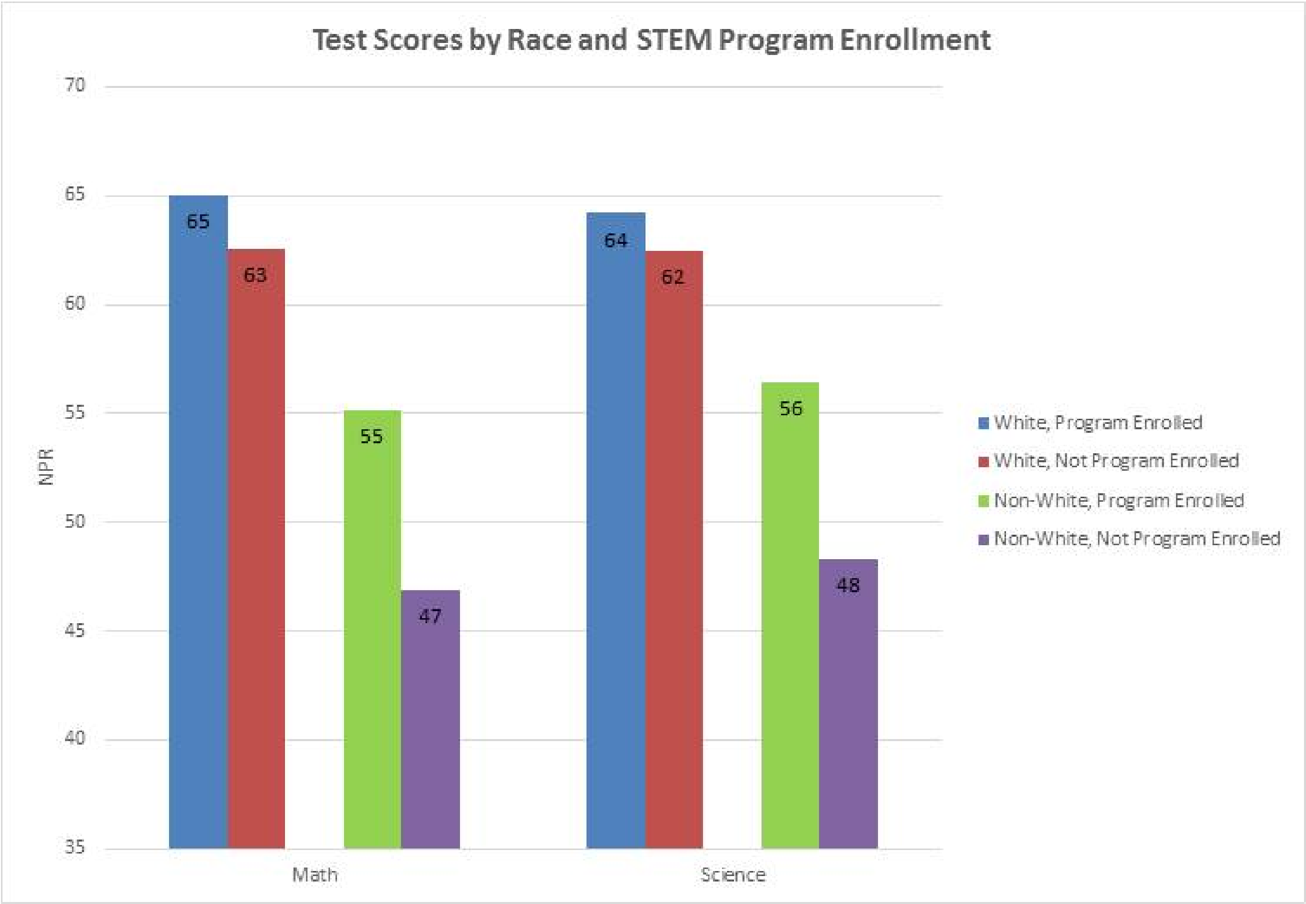
Prepared by Iowa Testing Programs, June 2015



Prepared by Iowa Testing Programs, June 2015

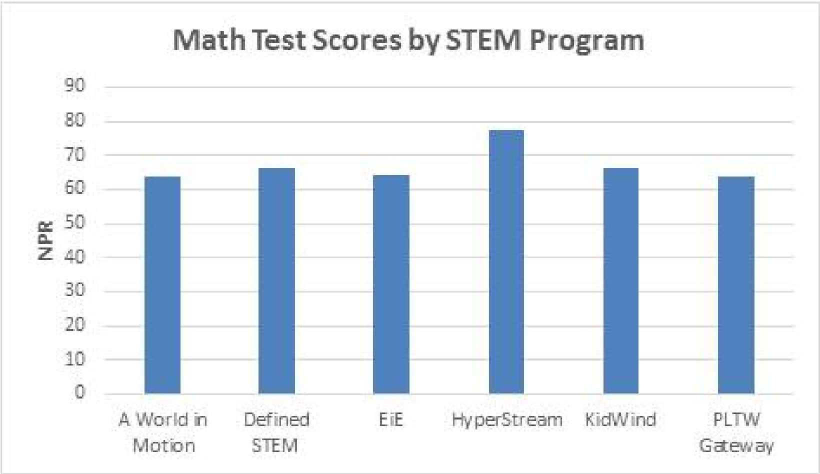


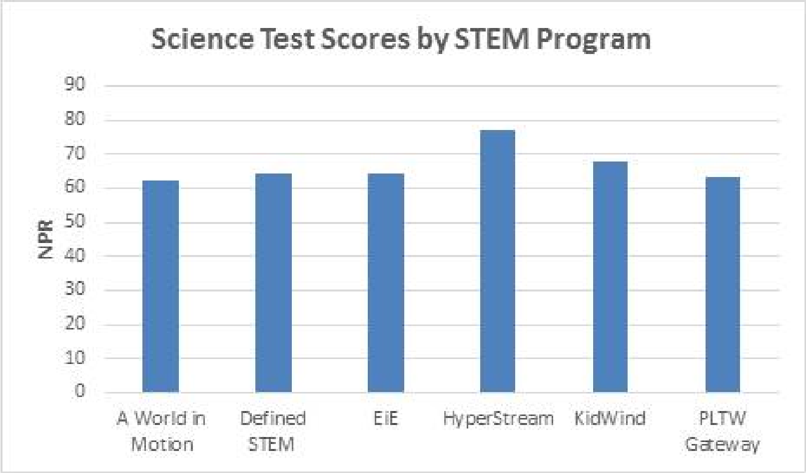
Prepared by Iowa Testing Programs, June 2015



Prepared by Iowa Testing Programs, June 2015

* Only considered programs with at least 175 participants, grades 3-8





Prepared by Iowa Testing Programs, June 2015

Appendix B: SCED codes for selected STEM subjects

K12 STEM	Course Description	SCED Course Titles	Definition
Math	02056	Algebra II	Algebra II course topics typically include field properties and theorems; set theory; operations with rational and irrational expressions; factoring of rational expressions; in-depth study of linear equations and inequalities; quadratic equations; solving systems of linear and quadratic equations; graphing of constant, linear, and quadratic equations; properties of higher degree equations; and operations with rational and irrational exponents.
Math	02057	Algebra III	Algebra III courses review and extend algebraic concepts for students who have already taken Algebra II. Course topics include (but are not limited to) operations with rational and irrational expressions, factoring of rational expressions, linear equations and inequalities, quadratic equations, solving systems of linear and quadratic equations, properties of higher degree equations, and operations with rational and irrational exponents. The courses may introduce topics in discrete math, elementary probability and statistics; matrices and determinants; and sequences and series.
Math	02101	Number Theory	Number Theory courses review the properties and uses of integers and prime numbers, and extend this information to congruences and divisibility.
Math	02102	Discrete Mathematics	Discrete Mathematics courses include the study of topics such as number theory, discrete probability, set theory, symbolic logic, Boolean algebra, combinatorics, recursion, basic algebraic structures and graph theory.
Math	02103	Trigonometry	Trigonometry courses prepare students for eventual work in calculus and typically include the following topics: trigonometric and circular functions; their inverses and graphs; relations among the parts of a triangle; trigonometric identities and equations; solutions of right and oblique triangles; and complex numbers.
Math	02105	Trigonometry/Math Analysis	Covering topics of both Trigonometry and Math Analysis, these courses prepare students for eventual work in calculus. Topics typically include the study of right trigonometric and circular functions, inverses, and graphs; trigonometric identities and equations; solutions of right and oblique triangles; complex numbers; numerical tables; polynomial, logarithmic, exponential, and rational functions and their graphs; vectors; set theory; Boolean algebra and symbolic logic; mathematical induction; matrix algebra; sequences and series; and limits and continuity.
Math	02106	Trigonometry/Algebra	Trigonometry/Algebra courses combine trigonometry and advanced algebra topics, and are usually intended for students who have attained Algebra I and Geometry objectives. Topics typically include right trigonometric and circular functions, inverses, and graphs; trigonometric identities and equations; solutions of right and oblique triangles; complex numbers; numerical tables; field properties and theorems; set theory; operations with rational and irrational expressions; factoring of rational expressions; in-depth study of linear equations and inequalities; quadratic equations; solving systems of linear and quadratic equations; graphing of constant, linear, and quadratic equations; and properties of higher degree equations.

K12 STEM	Course Description	SCED Course Titles	Definition
Math	02107	Trigonometry/Analytic Geometry	Covering topics of both Trigonometry and Analytic Geometry, these courses prepare students for eventual work in calculus. Topics typically include the study of right trigonometric and circular functions, inverses, and graphs; trigonometric identities and equations; solutions of right and oblique triangles; complex numbers; numerical tables; vectors; the polar coordinate system; equations and graphs of conic sections; rotations and transformations; and parametric equations.
Math	02110	Pre-Calculus	Pre-Calculus courses combine the study of Trigonometry, Elementary Functions, Analytic Geometry, and Math Analysis topics as preparation for calculus. Topics typically include the study of complex numbers; polynomial, logarithmic, exponential, rational, right trigonometric, and circular functions, and their relations, inverses and graphs; trigonometric identities and equations; solutions of right and oblique triangles; vectors; the polar coordinate system; conic sections; Boolean algebra and symbolic logic; mathematical induction; matrix algebra; sequences and series; and limits and continuity.
Math	02121	Calculus	Calculus courses include the study of derivatives, differentiation, integration, the definite and indefinite integral, and applications of calculus. Typically, students have previously attained knowledge of pre-calculus topics (some combination of trigonometry, elementary functions, analytic geometry, and math analysis).
Math	02122	Multivariate Calculus	Multivariate Calculus courses include the study of hyperbolic functions, improper integrals, directional directives, and multiple integration and its applications.
Math	02123	Differential Calculus	Differential Calculus courses include the study of elementary differential equations including first- and higher-order differential equations, partial differential equations, linear equations, systems of linear equations, transformations, series solutions, numerical methods, boundary value problems, and existence theorems.
Math	02124	AP Calculus AB	Following the College Board's suggested curriculum designed to parallel college-level calculus courses, AP Calculus AB provides students with an intuitive understanding of the concepts of calculus and experience with its methods and applications. These courses introduce calculus and include the following topics: elementary functions; properties of functions and their graphs; limits and continuity; differential calculus (including definition of the derivative, derivative formulas, theorems about derivatives, geometric applications, optimization problems, and rate-of-change problems); and integral calculus (including antiderivatives and the definite integral).
Math	02125	AP Calculus BC	Following the College Board's suggested curriculum designed to parallel college-level calculus courses, AP Calculus BC courses provide students with an intuitive understanding of the concepts of calculus and experience with its methods and applications, and also require additional knowledge of the theoretical tools of calculus. These courses assume a thorough knowledge of elementary functions, and cover all of the calculus topics in AP Calculus AB as well as the following topics: vector functions, parametric equations, and polar coordinates; rigorous definitions of finite and nonexistent limits; derivatives of vector functions and parametrically defined functions; advanced techniques of integration and advanced applications of the definite integral; and sequences and series.

K12 STEM	Course Description	SCED Course Titles	Definition
Math	02201	Probability and Statistics	Probability and Statistics courses introduce the study of likely events and the analysis, interpretation, and presentation of quantitative data. Course topics generally include basic probability and statistics: discrete probability theory, odds and probabilities, probability trees, populations and samples, frequency tables, measures of central tendency, and presentation of data (including graphs). Course topics may also include normal distribution and measures of variability.
Math	02202	Inferential Probability and Statistics	Probability and Statistics courses focus on descriptive statistics, with an introduction to inferential statistics. Topics typically include event probability, normal probability distribution, collection and description of data, frequency tables and graphs, measures of central tendency and variability, random variables, and random sampling. Course topics may also include covariance and correlation, central limit theorem, confidence intervals, and hypothesis testing.
Math	02203	AP Statistics	Following the College Board's suggested curriculum designed to parallel college-level statistics courses, AP Statistics courses introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students are exposed to four broad conceptual themes: exploring data, sampling and experimentation, anticipating patterns, and statistical inference.
Science	03101	Chemistry	Chemistry courses involve studying the composition, properties, and reactions of substances. These courses typically explore such concepts as the behaviors of solids, liquids, and gases; acid/base and oxidation/reduction reactions; and atomic structure. Chemical formulas and equations and nuclear reactions are also studied.
Science	03151	Physics	Physics courses involve the study of the forces and laws of nature affecting matter, such as equilibrium, motion, momentum, and the relationships between matter and energy. The study of physics includes examination of sound, light, and magnetic and electric phenomena.
Science	03001	Earth Science	Earth Science courses offer insight into the environment on earth and the earth’s environment in space. While presenting the concepts and principles essential to students’ understanding of the dynamics and history of the earth, these courses usually explore oceanography, geology, astronomy, meteorology, and geography.
Science	03002	Geology	Geology courses provide an in-depth study of the forces that formed and continue to affect the earth’s surface. Earthquakes, volcanoes, and erosion are examples of topics that are presented.
Science	03003	Environmental Science	Environmental Science courses examine the mutual relationships between organisms and their environment. In studying the interrelationships among plants, animals, and humans, these courses usually cover the following subjects: photosynthesis, recycling and regeneration, ecosystems, population and growth studies, pollution, and conservation of natural resources.
Science	03004	Astronomy	Astronomy courses offer students the opportunity to study the solar system, stars, galaxies, and interstellar bodies. These courses usually introduce and use astronomic instruments and typically explore theories regarding the origin and evolution of the universe, space, and time.
Science	03005	Marine Science	Courses in Marine Science focus on the content, features, and possibilities of the earth’s oceans. They explore marine organisms, conditions, and ecology and sometimes cover marine mining, farming, and exploration.

K12 STEM	Course Description	SCED Course Titles	Definition
Science	03006	Meteorology	Meteorology courses examine the properties of the earth's atmosphere. Topics usually include atmospheric layering, changing pressures, winds, water vapor, air masses, fronts, temperature changes and weather forecasting.
Science	03007	Physical Geography	Physical Geography courses equip students with an understanding of the constraints and possibilities that the physical environment places on human development. These courses include discussion of the physical landscape through geomorphology and topography, the patterns and processes of climate and weather, and natural resources.
Science	03008	Earth and Space Science	Earth and Space Science courses introduce students to the study of the earth from a local and global perspective. In these courses, students typically learn about time zones, latitude and longitude, atmosphere, weather, climate, matter, and energy transfer. Advanced topics often include the study of the use of remote sensing, computer visualization, and computer modeling to enable earth scientists to understand earth as a complex and changing planet.
Science	03052	Biology—Advanced Studies	Usually taken after a comprehensive initial study of biology, Biology—Advanced Studies courses cover biological systems in more detail. Topics that may be explored include cell organization, function, and reproduction; energy transformation; human anatomy and physiology; and the evolution and adaptation of organisms.
Science	03053	Anatomy and Physiology	Usually taken after a comprehensive initial study of biology, Anatomy and Physiology courses present the human body and biological systems in more detail. In order to understand the structure of the human body and its functions, students learn anatomical terminology, study cells and tissues, explore functional systems (skeletal, muscular, circulatory, respiratory, digestive, reproductive, nervous, and so on), and may dissect mammals.
Science	03054	Anatomy	Anatomy courses present an in-depth study of the human body and biological system. Students study such topics as anatomical terminology, cells, and tissues and typically explore functional systems such as skeletal, muscular, circulatory, respiratory, digestive, reproductive, and nervous systems.
Science	03055	Physiology	Physiology courses examine all major systems, tissues, and muscle groups in the human body to help students understand how these systems interact and their role in maintaining homeostasis. These courses may also cover such topics as cell structure and function, metabolism, and the human life cycle.
Science	03056	AP Biology	Adhering to the curricula recommended by the College Board and designed to parallel college level introductory biology courses, AP Biology courses stress basic facts and their synthesis into major biological concepts and themes. These courses cover three general areas: molecules and cells (including biological chemistry and energy transformation); genetics and evolution; and organisms and populations (i.e., taxonomy, plants, animals, and ecology). AP Biology courses include college-level laboratory experiments.

K12 STEM	Course Description	SCED Course Titles	Definition
Science	03057	IB Biology	IB Biology courses prepare students to take the International Baccalaureate Biology exams at either the Subsidiary or Higher level. In keeping with the general aim of IB Experimental Sciences courses, IB Biology promotes understanding of the facts, principles, and concepts underlying the biological field; critical analysis, evaluation, and generation of scientific information and hypotheses; improved ability to communicate scientific ideas; and an awareness of the impact of biology and scientific advances in biology upon both society and issues of ethical, philosophical, and political importance. Course content varies, but includes study of living organisms from the cellular level through functioning entities within the biosphere. Laboratory experimentation is an essential component of these courses.
Science	03059	Genetics	Genetics courses provide students with an understanding of general concepts concerning genes, heredity, and variation of organisms. Course topics typically include chromosomes, the structure of DNA and RNA molecules, and dominant and recessive inheritance and may also include lethal alleles, epistasis and hypostasis, and polygenic inheritance.
Science	03060	Microbiology	Microbiology courses provide students with a general understanding of microbes, prokaryotic and euaryotic cells, and the three domain systems. Additional topics covered may include bacterial control, cell structure, fungi, protozoa, viruses and immunity, microbial genetics, and metabolism.
Science	03102	Chemistry—Advanced Studies	Usually taken after a comprehensive initial study of chemistry, Chemistry—Advanced Studies courses cover chemical properties and interactions in more detail. Advanced chemistry topics include organic chemistry, thermodynamics, electrochemistry, macromolecules, kinetic theory, and nuclear chemistry.
Science	03103	Organic Chemistry	Organic Chemistry courses involve the study of organic molecules and functional groups. Topics covered may include nomenclature, bonding molecular structure and reactivity, reaction mechanisms, and current spectroscopic techniques.
Science	03104	Physical Chemistry	Usually taken after completing a calculus course, Physical Chemistry courses cover chemical kinetics, quantum mechanics, molecular structure, molecular spectroscopy, and statistical mechanics.
Science	03106	AP Chemistry	Following the curricula recommended by the College Board, AP Chemistry courses usually follow high school chemistry and second-year algebra. Topics covered may include atomic theory and structure; chemical bonding; nuclear chemistry; states of matter; and reactions (stoichiometry, equilibrium, kinetics, and thermodynamics). AP Chemistry laboratories are equivalent to those of typical college courses.
Science	03107	IB Chemistry	IB Chemistry courses prepare students to take the International Baccalaureate Chemistry exams at either the Subsidiary or Higher level. In keeping with the general aim of IB Experimental Sciences courses, IB Chemistry promotes understanding of the facts, patterns, and principles underlying the field of chemistry; critical analysis, evaluation, prediction, and generation of scientific information and hypotheses; improved ability to communicate scientific ideas; and an awareness of the impact of chemistry and scientific advances in chemistry upon both society and issues of ethical, philosophical, and political importance. Course content varies, but includes the study of the materials of the environment, their properties, and their interaction. Laboratory experimentation is an essential part of these courses.

K12 STEM	Course Description	SCED Course Titles	Definition
Science	03152	Physics—Advanced Studies	Usually taken after a comprehensive initial study of physics, Physics—Advanced Studies courses provide instruction in laws of conservation, thermodynamics, and kinetics; wave and particle phenomena; electromagnetic fields; and fluid dynamics.
Science	03155	AP Physics B	AP Physics B courses are designed by the College Board to parallel college-level physics courses that provide a systematic introduction to the main principles of physics and emphasize problem solving without calculus. Course content includes mechanics, electricity and magnetism, modern physics, waves and optics, and kinetic theory and thermodynamics.
Science	03156	AP Physics C	Designed by the College Board to parallel college-level physics courses that serve as a partial foundation for science or engineering majors, AP Physics C courses primarily focus on 1) mechanics and 2) electricity and magnetism, with approximately equal emphasis on these two areas. AP Physics C courses are more intensive and analytical than AP Physics B courses and require the use of calculus to solve the problems posed.
Science	03157	IB Physics	IB Physics courses prepare students to take the International Baccalaureate Physics exams at either the Subsidiary or Higher level. In keeping with the general aim of IB Experimental Sciences courses, IB Physics promotes understanding of the facts, patterns, and principles underlying the field of physics; critical analysis, prediction, and application of scientific information and hypotheses; improved ability to communicate scientific ideas; and an awareness of the impact of scientific advances in physics upon both society and issues of ethical, philosophical, and political importance. Course content varies, but includes the study of the fundamental laws of nature and the interaction between concepts of matter, fields, waves, and energy. Laboratory experimentation is essential; calculus may be used in some courses.
Science	03160	IB Physical Science	IB Physical Science courses prepare students to take the International Baccalaureate Physical Science exams at either the Subsidiary or Higher level. These courses integrate the study of physics and chemistry, showing how the physical and chemical properties of materials can be explained and predicted in terms of atomic, molecular, and crystal structures and forces. In keeping with the general aim of IB Experimental Sciences courses, IB Physical Science courses promote critical analysis, prediction, and application of scientific information and hypotheses; improved ability to communicate scientific ideas; and an awareness of the impact of science and scientific advances upon both society and issues of ethical, philosophical, and political importance. Students are required to develop and pursue an individual, experimental project, which is evaluated as part of the IB exam.
Science	03203	Applied Biology/Chemistry	Applied Biology/Chemistry courses integrate biology and chemistry into a unified domain of study and present the resulting body of knowledge in the context of work, home, society, and the environment, emphasizing field and laboratory activities. Topics include natural resources, water, air and other gases, nutrition, disease and wellness, plant growth and reproduction, life processes, microorganisms, synthetic materials, waste and waste management, and the community of life.

K12 STEM	Course Description	SCED Course Titles	Definition
Science	03207	AP Environmental Science	AP Environmental Science courses are designed by the College Board to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, identify and analyze environmental problems (both natural and human made), evaluate the relative risks associated with the problems, and examine alternative solutions for resolving and/or preventing them. Topics covered include science as a process, ecological processes and energy conversions, earth as an interconnected system, the impact of humans on natural systems, cultural and societal contexts of environmental problems, and the development of practices that will ensure sustainable systems.
Science	03208	IB Environmental Science	IB Environmental Systems courses prepare students to take the International Baccalaureate Environmental Systems exam at the Standard level by providing them with the knowledge, methods, and techniques to understand the nature and functioning of natural systems, the relationships that affect environmental equilibrium, and human impact on the biosphere. Topics also include ecosystem integrity and sustainability, students' own relationships to the environment, and the nature of internationalism in resolving major environmental issues.
Science	03209	Aerospace	Aerospace courses explore the connection between meteorology, astronomy, and flight across and around the earth as well as into outer space. In addition to principles of meteorology (e.g., atmosphere, pressures, winds and jet streams) and astronomical concepts (e.g., solar system, stars, and interplanetary bodies), course topics typically include the history of aviation, principles of aeronautical decision-making, airplane systems, aerodynamics, and flight theory.
Science	03212	Scientific Research and Design	In Scientific Research and Design courses, students conceive of, design, and complete a project using scientific inquiry and experimentation methodologies. Emphasis is typically placed on safety issues, research protocols, controlling or manipulating variables, data analysis, and a coherent display of the project and its outcome(s).
Technology	10007	IB Information Technology in a Global Society	IB Information Technology in a Global Society courses prepare students to take the International Baccalaureate Information Technology exams and examine the interaction among information, technology, and society. Course content is designed to help students develop a systematic, problem solving approach to processing and analyzing information using a range of information tools. In these courses, students also discuss and evaluate how modern information technology affects individuals, relationships among people, and institutions and societies.
Technology	10051	Information Management	Information Management courses provide students with the knowledge and skills to develop and implement a plan for an information system that meets the needs of business. Students develop an understanding of information system theory, skills in administering and managing information systems, and the ability to analyze and design information systems.
Technology	10052	Database Management and Data Warehousing	Database Management and Data Warehousing courses provide students with the skills necessary to design databases to meet user needs. Courses typically address how to enter, retrieve, and manipulate data into useful information. More advanced topics may cover implementing interactive applications for common transactions and the utility of mining data.

K12 STEM	Course Description	SCED Course Titles	Definition
Technology	10053	Database Applications	Database Application courses provide students with an understanding of database development, modeling, design, and normalization. These courses typically cover such topics as SELECT statements, data definition, manipulation, control languages, records, and tables. In these courses, students may use Oracle WebDB, SQL, PL/SQL, SPSS, and SAS and may prepare for certification.
Technology	10054	Data Systems/Processing	Data Systems/Processing courses introduce students to the uses and operation of computer hardware and software and to the programming languages used in business applications. Students typically use BASIC, COBOL, and/or RPL languages as they write flowcharts or computer programs and may also learn data-processing skills.
Technology	10101	Network Technology	Network Technology courses address the technology involved in the transmission of data between and among computers through data lines, telephone lines, or other transmission media (such as hard wiring, cable television networks, radio waves, and so on). These courses may emphasize the capabilities of networks, network technology itself, or both. Students typically learn about network capabilities—including electronic mail, public networks, and electronic bulletin boards—and network technology—including network software, hardware, and peripherals involved in setting up and maintaining a computer network.
Technology	10102	Networking Systems	Networking Systems courses are designed to provide students with the opportunity to understand and work with hubs, switches, and routers. Students develop an understanding of LAN (local area network), WAN (wide area network), wireless connectivity, and Internet-based communications with a strong emphasis on network function, design, and installation practices. Students acquire skills in the design, installation, maintenance, and management of network systems that may help them obtain network certification.
Technology	10103	Area Network Design and Protocols	Area Network Design and Protocols courses address the role of computers in a network system, the Open Systems Interconnection (OSI) model, structured wiring systems, and simple LAN (local area network) and WAN (wide area network) designs.
Technology	10104	Router Basics	Router Basics courses teach students about router components, start-up, and configuration using CISCO routers, switches, and the IOS (Internetwork Operation System). These courses also cover such topics as TCP/IP protocol, IP addressing, subnet masks, and network trouble-shooting.
Technology	10105	NetWare Routing	NetWare Routing courses introduce students to such topics as Virtual LANs (VLAN) and switched internetworking, comparing traditional shared local area network (LAN) configurations with switched LAN configurations, and they also discuss the benefits of using a switched VLAN architecture. These courses also may cover routing protocols like RIP, IGRP, Novell IPX, and Access Control Lists (ACLs).
Technology	10106	Wide Area Telecommunications and Networking	Wide Area Telecommunications and Networking courses provide students with the knowledge and skills to enable them to design Wide Area Networks (WANs) using ISDN, Frame-Relay, and PPP. Students gain knowledge and skills in network management and maintenance and develop expertise in trouble-shooting and assessing the adequacy of network configuration to meet changing conditions.

K12 STEM	Course Description	SCED Course Titles	Definition
Technology	10107	Wireless Networks	Wireless Networks courses focus on the design, planning, implementation, operation, and trouble-shooting of wireless computer networks. These courses typically include a comprehensive overview of best practices in technology, security, and design, with particular emphasis on hands-on skills in (1) wireless LAN set-up and trouble-shooting; (2) 802.11a & 802.11b technologies, products, and solutions; (3) site surveys; (4) resilient WLAN design, installation, and configuration; (5) vendor interoperability strategies; and (6) wireless bridging.
Technology	10108	Network Security	Network Security courses teach students how to design and implement security measures in order to reduce the risk of data vulnerability and loss. Course content usually includes typical security policies; firewall design, installation, and management; secure router design, configuration, and maintenance; and security-specific technologies, products, and solutions.
Technology	10109	Essentials of Network Operating Systems	Essentials of Network Operating Systems courses provide a study of multi-user, multi-tasking network operating systems. In these courses, students learn the characteristics of the Linux, Windows 2000, NT, and XP network operating systems and explore a variety of topics including installation procedures, security issues, back-up procedures, and remote access.
Technology	10110	Microsoft Certified Professional (MCP)	Microsoft Certified Professional courses provide students with the knowledge and skills necessary to be employed as a network administrator in the latest Windows server-networking environment. Topics include installing, configuring, and trouble-shooting the Windows server. These courses prepare students to set up network connections; manage security issues and shares; and develop policies. Students are typically encouraged to take the MCP exam.
Technology	10152	Computer Programming	Computer Programming courses provide students with the knowledge and skills necessary to construct computer programs in one or more languages. Computer coding and program structure are often introduced with the BASIC language, but other computer languages, such as Visual Basic (VB), Java, Pascal, C++, and COBOL, may be used instead. Initially, students learn to structure, create, document, and debug computer programs, and as they progress, more emphasis is placed on design, style, clarity, and efficiency. Students may apply the skills they learn to relevant applications such as modeling, data management, graphics, and text-processing.
Technology	10153	Visual Basic (VB) Programming	Visual Basic (VB) Programming courses provide an opportunity for students to gain expertise in computer programs using the Visual Basic (VB) language. As with more general computer programming courses, the emphasis is on how to structure and document computer programs and how to use problem-solving techniques. These courses cover such topics as the use of text boxes, scroll bars, menus, buttons, and Windows applications. More advanced topics may include mathematical and business functions and graphics.
Technology	10154	C++ Programming	C++ Programming courses provide an opportunity for students to gain expertise in computer programs using the C++ language. As with more general computer programming courses, the emphasis is on how to write logically structured programs, include appropriate documentation, and use problem solving techniques. More advanced topics may include multi-dimensional arrays, functions, and records.

K12 STEM	Course Description	SCED Course Titles	Definition
Technology	10155	Java Programming	Java Programming courses provide students with the opportunity to gain expertise in computer programs using the Java language. As with more general computer programming courses, the emphasis is on how to structure and document computer programs, using problem-solving techniques. Topics covered in the course include syntax, I/O classes, string manipulation, and recursion.
Technology	10156	Computer Programming—Other Language	Computer Programming—Other Language courses provide students with the opportunity to gain expertise in computer programs using languages other than those specified (such as Pascal, FORTRAN, or emerging languages). As with other computer programming courses, the emphasis is on how to structure and document computer programs, using problem-solving techniques. As students advance, they learn to capitalize on the features and strengths of the language being used.
Technology	10157	AP Computer Science A	Following the College Board's suggested curriculum designed to mirror college-level computer science courses, AP Computer Science A courses provide students with the logical, mathematical, and problem-solving skills needed to design structured, well-documented computer programs that provide solutions to real-world problems. These courses cover such topics as programming methodology, features, and procedures; algorithms; data structures; computer systems; and programmer responsibilities.
Technology	10158	AP Computer Science AB	Following the College Board's suggested curriculum designed to mirror college-level computer science courses, AP Computer Science AB courses (in addition to covering topics included in AP Computer Science A) provide a more formal and extensive study of program design, algorithms, data structures, and execution costs.
Technology	10159	IB Computing Studies	IB Computer Studies courses prepare students to take the International Baccalaureate Computing Studies exam at either the Subsidiary or Higher level. The courses emphasize problem analysis, efficient use of data structures and manipulation procedures, and logical decision-making. IB Computing Studies courses also cover the applications and effects of the computer on modern society as well as the limitations of computer technology.
Technology	10201	Web Page Design	Web Page Design courses teach students how to design web sites by introducing them to and refining their knowledge of site planning, page layout, graphic design, and the use of markup languages—such as Extensible Hypertext Markup, JavaScript, Dynamic HTML, and Document Object Model—to develop and maintain a web page. These courses may also cover security and privacy issues, copyright infringement, trademarks, and other legal issues relating to the use of the Internet. Advanced topics may include the use of forms and scripts for database access, transfer methods, and networking fundamentals.
Technology	10202	Computer Graphics	Computer Graphics courses provide students with the opportunity to explore the capability of the computer to produce visual imagery and to apply graphic techniques to various fields, such as advertising, TV/video, and architecture. Typical course topics include modeling, simulation, animation, and image retouching.

K12 STEM	Course Description	SCED Course Titles	Definition
Technology	10203	Interactive Media	Interactive Media courses provide students with the knowledge and skills to create, design, and produce interactive media products and services. The courses may emphasize the development of digitally generated and/or computer-enhanced media. Course topics may include 3D animation, graphic media, web development, and virtual reality. Upon completion of these courses, students may be prepared for industry certification.
Technology	10251	Computer Technology	Computer Technology courses introduce students to the features, functions, and design of computer hardware and provide instruction in the maintenance and repair of computer components and peripheral devices.
Technology	10252	Computer Maintenance	Computer Maintenance courses prepare students to apply basic electronic theory and principles in diagnosing and repairing personal computers and input/output devices. Topics may include operating, installing, maintaining, and repairing computers, network systems, digital control instruments, programmable controllers, and related robotics.
Technology	10253	Information Support and Services	Information Support and Services courses prepare students to assist users of personal computers by diagnosing their problems in using application software packages and maintaining security requirements.
Technology	10254	IT Essentials: PC Hardware and Software	IT Essentials: PC Hardware and Software courses provide students with in-depth exposure to computer hardware and operating systems. Course topics include the functionality of hardware and software components as well as suggested best practices in maintenance and safety issues. Students learn to assemble and configure a computer, install operating systems and software, and troubleshoot hardware and software problems. In addition, these courses introduce students to networking and often prepare them for industry certification.
Technology	10255	CISCO—The Panduit Network Infrastructure Essentials (PNIE)	CISCO—PNIE courses provide students with the knowledge to create innovative network infrastructure solutions. These courses offer students basic cable installer information and help them acquire the skills to build and use the physical layer of network infrastructure and develop a deeper understanding of networking devices.
Engineering	21002	Engineering Applications	Engineering Applications courses provide students with an overview of the practical uses of a variety of engineering applications. Topics covered usually include hydraulics, pneumatics, computer interfacing, robotics, computer-aided design, computer numerical control, and electronics.
Engineering	21003	Engineering Technology	Engineering Technology courses provide students with the opportunity to focus on one or more areas of industrial technology. Students apply technological processes to solve real engineering problems; develop the knowledge and skills to design, modify, use, and apply technology; and may also design and build prototypes and working models. Topics covered in the course include the nature of technology, use of technology, and design processes.
Engineering	21004	Principles of Engineering	Principles of Engineering courses provide students with an understanding of the engineering/technology field. Students typically explore how engineers use various technology systems and manufacturing processes to solve problems; they may also gain an appreciation of the social and political consequences of technological change.

K12 STEM	Course Description	SCED Course Titles	Definition
Engineering	21005	Engineering—Comprehensive	Engineering—Comprehensive courses introduce students to and expand their knowledge of major engineering concepts such as modeling, systems, design, optimization, technology-society interaction, and ethics. Particular topics often include applied engineering graphic systems, communicating technical information, engineering design principles, material science, research and development processes, and manufacturing techniques and systems. The courses may also cover the opportunities and challenges in various branches of engineering.
Engineering	21006	Engineering Design	Engineering Design courses offer students experience in solving problems by applying a design development process. Often using solid modeling computer design software, students develop, analyze, and test product solutions models as well as communicate the features of those models.
Engineering	21007	Engineering Design and Development	Engineering Design and Development courses provide students with the opportunity to apply engineering research principles as they design and construct a solution to an engineering problem. Students typically develop and test solutions using computer simulations or models but eventually create a working prototype as part of the design solution.
Engineering	21008	Digital Electronics	Digital Electronics courses teach students how to use applied logic in the development of electronic circuits and devices. Students may use computer simulation software to design and test digital circuitry prior to the actual construction of circuits and devices.
Engineering	21009	Robotics	Robotics courses develop and expand students' skills and knowledge so that they can design and develop robotic devices. Topics covered in the course may include mechanics, electrical and motor controls, pneumatics, computer basics, and programmable logic controllers.
Engineering	21010	Computer Integrated Manufacturing	Computer Integrated Manufacturing courses involve the study of robotics and automation. Building on computer solid modeling skills, students may use computer numerical control (CNC) equipment to produce actual models of their three-dimensional designs. Course topics may also include fundamental concepts of robotics, automated manufacturing, and design analysis.
Engineering	21011	Civil Engineering	Civil Engineering courses expose students to the concepts and skills used by urban planners, developers, and builders. Students may be trained in soil sampling and analysis, topography and surveying, and drafting or blueprint-reading. Additional course topics may include traffic analysis, geologic principles, and urban design.
Engineering	21012	Civil Engineering and Architecture	Civil Engineering and Architecture courses provide students with an overview of the fields of Civil Engineering and Architecture while emphasizing the interrelationship of both fields. Students typically use software to address real world problems and to communicate the solutions that they develop. Course topics typically include the roles of civil engineers and architects, project-planning, site-planning, building design, project documentation, and presentation.
Engineering	21013	Aerospace Engineering	Aerospace Engineering courses introduce students to the world of aeronautics, flight, and engineering. Topics covered in the course may include the history of flight, aerodynamics and aerodynamics testing, flight systems, astronautics, space life systems, aerospace materials, and systems engineering.

K12 STEM	Course Description	SCED Course Titles	Definition
Engineering	21014	Biotechnical Engineering	Biotechnical Engineering courses enable students to develop and expand their knowledge and skills in biology, physics, technology, and mathematics. Course content may vary widely, drawing upon diverse fields such as biomedical engineering, biomolecular genetics, bioprocess engineering, agricultural biology, or environmental engineering. Students may engage in problems related to biomechanics, cardiovascular engineering, genetic engineering, agricultural biotechnology, tissue engineering, biomedical devices, human interfaces, bioprocesses, forensics, and bioethics.
Engineering	21051	Technological Literacy	Technological Literacy courses expose students to the communication, transportation, energy, production, biotechnology, and integrated technology systems and processes that affect their lives. The study of these processes enables students to better understand technological systems and their applications and uses.
Engineering	21052	Technological Processes	Technological Processes courses provide students with the opportunity to focus on one or more areas of industrial technology, applying technological processes to solve real problems and developing the knowledge and skills to design, modify, use, and apply technology appropriately. Students may examine case studies, explore simulations, or design and build prototypes and working models.
Engineering	21053	Emerging Technologies	Emerging Technologies courses emphasize students' exposure to and understanding of new and emerging technologies. The range of technological issues varies widely but typically include lasers, fiber options, electronics, robotics, computer technologies, CAD/CAM, communication modalities, and transportation technologies.
Engineering	21054	Technology Innovation and Assessment	Technology Innovation and Assessment courses use engineering design activities to help students understand how criteria, constraints, and processes affect design solutions and provide students with the skills to systematically assess technological developments or solutions. Course topics may include brainstorming, visualizing, modeling, simulating, constructing, testing, and refining designs.
Engineering	21055	Aerospace Technology	Aerospace Technology courses introduce students to the technology systems used in the aerospace industry and their interrelationships. Examples of such systems include satellite communications systems, composite materials in airframe manufacturing, space station constructions techniques, space shuttle propulsion systems, aerostatics, and aerodynamics.
HEALTH CARE	14251	Health Science	Health Science courses integrate chemistry, microbiology, chemical reactions, disease processes, growth and development, and genetics with anatomy and physiology of the body systems. Typically, these courses reinforce science, mathematics, communications, health, and social studies principles and relate them to health care.
HEALTH CARE	14252	Biotechnology	Biotechnology courses involve the study of the bioprocesses of organisms, cells, and/or their components and enable students to use this knowledge to produce or refine products, procedures, and techniques. Course topics typically include laboratory measurement, monitoring, and calculation; growth and reproduction; chemistry and biology of living systems; quantitative problem-solving; data acquisition and display; and ethics. Advanced topics may include elements of biochemistry, genetics, and protein purification techniques.
HEALTH CARE	14253	Pharmacology	Pharmacology courses involve a study of how living animals can be changed by chemical substances, especially by the actions of drugs and other substances used to treat disease. Basic concepts of physiology, pathology, biochemistry, and bacteriology are typically brought into play as students examine the effects of drugs and their mechanisms of action.

Appendix C: Iowa school district mergers and consolidations, 2010-2014

Original District Name(s)	Year of Merger/ Consolidation	New District Name	New District Code
Lineville-Clio	2010	joined Wayne CSD	6854
South Clay (dissolved)	2010	*	*
Anita & C and M	2011	CAM	0914
Deep River Millersberg	2011	(joined already existing) English Valleys	2097
Greene (2664) & Allison-Bistrow	2011	North Butler	0153
Manning (4014) & IKM (3168)	2011	IKM-Manning	3168
Nishna Valley (4751) & Malvern (3978)	2011	East Mills School District	3978
North Central (4772) & Nora Springs-Rock Falls	2011	Central Springs	4772
Rockwell-Swaledale (5616) & Sheffield-Chapin (5922)	2011	West Fork	5922
Sac (5742) & Wall Lake View Auburn (6741)	2011	East Sac	6741
Graettinger (2556) & Terril	2011	Graettinger-Terril	2556
Anthon-Oto & Maple Valley	2012	Maple Valley-Anthon-Oto	4033
Palmer-Pomery (5301)	2012	(joined already existing) Pocahontas Area	5283
Fremont & Eddyville-Blakesburg	2012	Eddyville-Blakesburg-Fremont	0657
Preston & East Central	2013	Easton Valley	1965
Woden-Crystal Lake	2013	joined already existing (Forest City)	2295
Clearfield (dissolved)	2014	*	*
Dows (1854) & Clarion-Goldfield (1206)	2014	Clarion-Goldfield-Dows	1206
East Greene (1967) & Jefferson-Scranton (3195)	2014	Greene County	3195
Elk Horn-Kimballton (2016) & Exira (2151)	2014	Exira-Elk Horn-Kimballton	2151
Fredricksburg (2349)	2014	joined already existing (Sumner)	6273
Rockwell City-Lytton (5625) & Southern Cal (6091)	2014	South Central Calhoun	6091
Sentral (5868) & Armstrong-Ringstead (333)	2014	North Union	333
Titonka Consolidated (6417)	2014	joined already existing (Algona)	126
Central Clinton (1082)	2014	changed name to Central DeWitt	1082

Note: All mergers/consolidations were implemented at the beginning of the school year noted on the table (i.e., August 2010).

Appendix D: Statewide Survey of Public Attitudes Toward STEM_Questionnaire

Introduction
HELLO, my name is [YOUR NAME] and I am calling from the Center for Social and Behavioral Research at the University of Northern Iowa. Researchers here have been contracted by the state of Iowa to conduct a scientific study of public perceptions about math and science education in Iowa.

Screening questions
A series of screening questions not reported here was used to confirm phone number (cell or landline), private residence, that it was a safe time to talk, and to randomly select one adult from the household to be interviewed.

Consent

Let me tell you more about the study before we go on. Your phone number has been chosen randomly, and I would like to ask some questions about your views on math and science education in Iowa. We are interested in your views, regardless of how much you might know about the topic.

For most people the interview takes about 15 to 20 minutes. Participation is voluntary and your responses are anonymous. In all reports, the results of this interview will not be reported individually. There are no direct benefits to you for participating in the interview; however, your participation in the study is very important to us as your answers will be combined with many other Iowans to help us understand the perceptions of Iowans about math and science education. Risks are minimal and similar to those typically encountered in your day-to-day life. You do not have to answer any question you do not want to, and you can end the interview at any time. I can provide the name and telephone number of the project manager or the administrator in the Office of Research at UNI if you have any questions about the study.

SECTION 1: Understanding/awareness of STEM and exposure to STEM topics

1. I'm going to read a short list of topics. Please tell me how much you have heard about each one, if anything, in the past month.

   [RANDOMIZE LIST]

   a. Traffic safety
   b. The Iowa economy
   c. Foreign policy
   d. Agriculture
   e. K-12 education
   f. The environment
   g. Healthcare

   Have you heard…

   1 A lot,
   2 A little, or
   3 Nothing in the past month?

   7 Don't know/Not sure
   9 Refused

2. I'm going to read a list of topics about education in Iowa. Please tell me how much you have heard about each one, if anything, in the past month.

[RANDOMIZE LIST]

b. Requiring students to pass more rigorous tests before advancing to the next grade
c. Improving math, technology, science, and engineering education
d. Having tougher evaluation standards for teachers' performance
e. Raising teacher salaries
f. Homeschooling

Have you heard…

1 A lot,
2 A little, or
3 Nothing in the past month?

7 Don't know/Not sure
9 Refused

3. Have you visited any of the following in the past 12 months?

[RANDOMIZE LIST]

a. A museum?
b. A zoo or aquarium?
c. A science or technology center?
d. A public library?
e. A K-12 school?
f. An arboretum or botanical center?

1 Yes
2 No

7 Don't know/Not sure
9 Refused

4a. You may have heard about STEM education or STEM careers lately. What, if anything, comes to mind when you hear the letters S-T-E-M, or the word STEM?

1 **[OPEN ENDED]**

[7 Don't know/Not sure
9 Refused]

[**NOTE**: If respondent answered "science, technology, engineering, and math" to 4a; interviewer may select "1." to 4b without reading the question]

4b. STEM stands for "science, technology, engineering, and mathematics." Have you read, seen or heard of this before?

1 Yes
2 No

7 Don't know/Not sure
9 Refused

[IF Q4b=2, SKIP TO Q4f]

4c. What have you read, seen, or heard about STEM?

[SELECT ALL THAT APPLY - DO NOT READ]

1 Greatness STEMs from Iowans
2 Commit2STEM
3 Iowa's future demands STEM
4 Governor's STEM Advisory Council
5 Other **[SPECIFY]**

7 Don't know/Not sure
9 Refused

4d. In the past 30 days, have you read, seen or heard anything about STEM education from any of the following sources of information? Please answer yes or no to each source.

[RANDOMIZE LIST]

a. TV
b. Magazine
c. Newspaper
d. Billboard
e. Radio
f. A school or teacher
g. Internet or website
h. A child or student
i. A business

1 Yes
2 No

7 Don't know/Not sure
9 Refused

4e. In the past year, what have you heard, if anything, about either local or statewide STEM activities or programs in Iowa?

1 **[OPEN ENDED]**

7 Don't know/Not sure
9 Refused

4f. I'm going to read a short list of some groups promoting STEM education and careers. Please tell me how much you have heard, if anything, about each one in the past year. **[RANDOMIZE LIST]**

a. Corridor STEM Initiative
b. Iowa Governor's STEM Advisory Council
c. Iowa Student STEM Film Fest
d. A STEM Festival
[**INTERVIEWER NOTE:** This includes regional STEM festivals with location-based names, e.g. Cedar Valley Family STEM Festival, Southeast Iowa STEM Festival, Cedar Rapids iExplore STEM Festival, Muscatine STEM Festival]
e. Iowa Statewide STEM Conference or Iowa STEM Summit
f. A STEM Academy or STEM School

Have you heard…

1 A lot,
2 A little, or
3 Nothing in the past year?

7 Don't know/Not sure
9 Refused

[IF 4c=1, SKIP TO 4gb]

4g. I am going to read a list of slogans about STEM education.
Please tell me if you've heard the slogan…**[RANDOMIZE LIST]**

a. Greatness STEMs from Iowans?
b. Commit2STEM?
c. Iowa's future demands STEM?

1 Yes
2 No

7 Don't know/Not sure
9 Refused

[IF 4ga=1 or 4c=1]

4h. Where did you see, hear, or read about the slogan, "Greatness STEMs from Iowans"?
[Select all that apply. DO NOT READ]

11 TV
12 Magazine
13 Newspaper
14 Billboard
15 Radio
16 A school or teacher
17 Internet or website
18 A child or student
19 A business
20 Other [SPECIFY]

77 Don't know/Not sure
99 Refused

8. Now thinking about jobs that rely on science, technology, engineering, and math skills…. As far as you know, would you say there are…

1 More than enough skilled workers to fill STEM jobs,
2 Not enough skilled workers to fill STEM jobs, or
3 Just the right number of skilled workers to fill STEM jobs?

7 Don't know/Not sure
9 Refused

SECTION 2: Attitudes Toward STEM and the Role of STEM in Iowa

5. There are several initiatives in Iowa to improve STEM education and STEM careers. The next questions are about your thoughts regarding these topics. I'm going to ask you questions about science, technology, engineering, and math. I will often refer to these using the acronym "STEM." Please tell me whether you strongly agree, agree, disagree, or strongly disagree with each of the following statements.

[RANDOMIZE LIST]

a. Science, technology, and engineering make our lives better.
d. Many more companies would move or expand to Iowa if the state had a reputation for workers with great science and math skills.
f. Increased focus on STEM education in Iowa will improve the state economy.
g. Advancements in science, technology, engineering and math will give more opportunities to the next generation.
h. There are more jobs available for people who have good math and science skills.
i. There should be more STEM jobs available for rural Iowans.
j. More should be done to increase the number of women working in science, technology, engineering, and math jobs.
k. More should be done to increase the number of Hispanics and African Americans working in STEM jobs.
l. More people would choose a STEM job if it didn't seem so hard.
m. It is important for people to understand what engineering contributes to society.
n. I cannot follow developments in science and technology because the speed of development is too fast.
o. There is an urgent need in Iowa for more resources to be put toward STEM education.
p. Science, technology, and engineering are too specialized for most people to understand it.

Do you…

1 Strongly agree,
2 Agree,
4 Disagree, or
5 Strongly disagree?

3 Neither agree nor disagree

7 Don't know/Not sure
9 Refused

6. Compared to a year ago, would you say that Iowa K-12 student achievement in science is higher, about the same or lower than it was previously?

Would you say…

1 higher,
2 about the same, or
3 lower?

7 Don't know/Not sure
9 Refused

7. Compared to a year ago, would you say that Iowa K-12 student achievement in math is higher, about the same or lower than it was previously?

Would you say…

1 higher,
2 about the same, or
3 lower

7 Don't know/Not sure
9 Refused

SECTION 3: STEM Education

9. How well do you think the schools in your community are teaching each of the following subjects?

Would you say that the instruction in **[MATHEMATICS]** is…

[RANDOMIZE LIST]

a. Mathematics
b. Science
c. Social studies such as history, American studies, or government
d. English, language arts and reading
e. Designing, creating, and building machines and devices, also called engineering
f. Computers and technology
g. Foreign languages
h. Art
i. Music

1 Excellent,
2 Good,
3 Fair, or
4 Poor?

7 Don't know/Not sure
9 Refused

10. For each of the following topics or skills that might be taught during K-12 grades, please tell me whether you think it is absolutely essential, important but not essential or is not important to learn before graduating from high school.

[RANDOMIZE LIST]

a. Basic math
b. Basic scientific ideas and principles
c. Advanced sciences such as physics
d. Advanced math such as calculus
e. Using technology to support learning
f. Engineering and industrial technology principles

Would you say…

1 Absolutely essential,
2 Important but not essential, or
3 Not important?

7 Don’t know/Not sure
9 Refused

11. What do you think are the primary barriers to STEM education?

[DO NOT READ – SELECT UP TO 3.]

11 Parents do not encourage students to study math
12 Parents do not encourage students to study science
13 There are not enough qualified teachers.
14 There are not enough talented teachers.
15 Students think math is not relevant to their lives.
16 Students think science is not relevant to their lives.
17 Students think math is too hard.
18 Students think science is too hard.
19 Students are not willing to study enough to do well
20 Other **[SPECIFY]**

77 Don't know/Not sure
99 Refused

12. I'm going to read some statements about STEM education. Please tell me whether you strongly agree, agree, disagree, or strongly disagree with each of the following statements.

[RANDOMIZE LIST]

a. It is more important for students to graduate from high school with strong skills in reading and writing than it is to have strong skills in math and science.
b. Advanced math and science courses teach important critical thinking skills.
c. Overall, the quality of STEM education in Iowa is high.
d. Iowa colleges and universities are doing a good job preparing STEM teachers.
e. Iowa colleges and universities are doing a good job preparing students for careers in STEM fields.
f. Too few racial and ethnic minority students are encouraged to study STEM topics.
g. Too few female students are encouraged to study STEM topics.

Do you…

1 Strongly agree,
2 Agree,
4 Disagree, or
5 Strongly disagree?

3 Neither agree nor disagree

7 Don't know/Not sure
9 Refused

13. I am going to read a list of strategies that might impact math and science education. For each one, please tell me if you think it would or would not improve math and science education.

[RANDOMIZE LIST]

a. Businesses provided internships so high school students can gain practical job skills.
b. Students who are struggling with math or science were required to spend extra time after school or during the summer to catch up.
c. All high school students were required to take a science class that includes lab work.
d. We made sure that all Iowa students have the opportunity to take a full range of math courses.
e. Students were required to pass challenging tests in math and science in order to graduate from high school.
f. Fast learners were grouped together in one class and slower learners in another class.
h. We made sure that all Iowa students have the opportunity to take a full range of science courses.
i. Math and science teachers were paid more than other teachers.
j. Every school building had high-speed Internet access.
k. More hands-on science and technology activities were available to elementary students.

Would that ….

1 Improve math and science education
2 Not improve math and science education

7 Don't know/Not sure
9 Refused

[IF 13a-k=1]

13a1-k1. Would you say that would make a major or moderate improvement?

1 Major improvement
2 Moderate improvement

7 Don't know/Not sure
9 Refused

13z. Overall, how supportive, if at all, are you of state efforts to devote resources and develop initiatives to promote STEM education in Iowa? Would you say…

1 Very supportive,
2 Somewhat supportive,
3 Neither supportive or opposed,
4 Somewhat opposed, or
5 Very opposed?

7 Don't know/Not sure
9 Refused

SECTION 4: Child selection

14. How many children, if any, are …
a. Under age 3 in your household?
b. 3-11 years old in your household?
c. 12-19 years old in your household?
[ ] = number of children
99 Refused

[IF 14a-c=99, SKIP TO 34]
[IF 14a AND 14b AND 14c = 0, SKIP TO 34]
[IF 14a AND 14b + 14c = 1, SKIP TO 15]
[IF 14a AND 14b + 14c > 1, SKIP TO 16]

15. What is the age and gender of the child in your home?

[ ] **[SKIP TO 17]**

16. In order to randomly select one child in your household as the focus of the next few education questions, please tell me the age and gender of all school-aged children 3 to 19 in your household, starting with the youngest.

[Read if needed: Since this study is about math and science education, we want to know how many children are in your household so we can focus the questions related to school on a specific child going to school.

[Allow respondent to identify up to 11 children]

1.
2.

[IF MORE THAN ONE CHILD IN THE HOUSEHOLD, SYSTEM RANDOMLY SELECTS ONE CHILD FOR STUDY]

Based on the information you provided, we are going to ask questions about the education of **[AGE/GENDER]**

[INTERVIEWER NOTE: If asked, the computer randomly selected which child]

17a. How are you related to **[CHILD]?**

[DON'T READ OPTIONS]

Mother (birth/adoptive)	11
Father (birth/adoptive)	12
Step-mother	13
Step-father	14
Foster mother	15
Foster father	16
Brother	17
Sister	18
Grandmother	19
Grandfather	20
Aunt	21
Uncle	22
Cousin	23
Other relative	24
Non-relative guardian	25
Roommate, husband, wife, boy/girlfriend	26
Other **[SPECIFY]**	27
REFUSED	99

[IF 17a = 11-16 or 25, SKIP TO 18a]

17b. Are you a legal guardian of this child?

[INTERVIEWER NOTE: Do not ask if relationship is "self" or respondent IS the child, just select option 8.]

1	Yes	
2	No	**[SKIP TO 34]**
8	Respondent is the child	**[SKIP TO 34]**
7	Don't know/Not sure	**[SKIP TO 34]**
9	Refused	**[SKIP TO 34]**

SECTION 5: Parent module
[IF CHILD IS AGE 6 or YOUNGER]

18a. Has this child started pre-school or school?

1 Yes
2 No **[SKIP TO 34]**

7 Don't know/Not sure **[SKIP TO 34]**
9 Refused **[SKIP TO 34]**

18. Which of the following best describes this child's education situation?
This child…

1 Has been or will be attending a public school,
2 Has been or will be attending a private school,
3 Has been or will be attending a charter school,
4 Is home-schooled, or
5 Has graduated from high school or has their GED? **[SKIP TO 34]**

7 Don't know/Not sure
9 Refused

18b. Has your child used, or have you used, the internet or a smartphone to help them complete their homework or school assignments?

1 Yes
2 No

7 Don't know/Not sure
9 Refused

18c. Does your child have a school-issued iPad, tablet, or laptop computer?

1 Yes
2 No

7 Don't know/Not sure
9 Refused

19. Thinking about your child, please tell me how much your child enjoys or does not enjoy each of the following activities. Please use a scale from 1 to 5 where 1 is definitely does not enjoy and 5 is definitely enjoys. **[RANDOMIZE LIST]**

a. Building or constructing things – e.g., with block, Legos, construction sets or even odds and ends
b. Repairing things that are broken
c. Cooking in the kitchen or mixing things together outdoors (If needed, for example, stone soup, mud pies)
d. Playing music
e. Playing computer games
f. Creating pictures, crafts or other art projects
g. Writing/Poetry

[ ] Response 1 to 5

7 Don't know/Not sure

9 Refused

20. Outside of school, has your child taken classes or attended camps focusing on any of the following? [RANDOMIZE LIST]

a. Music
b. Arts/crafts
c. Cooking
d. Drama/theater
e. Robotics
f. Wildlife/Nature Study
g. Foreign Language(s)
h. Writing/Storytelling
i. Computer Programming/Gaming
j. Other? [SPECIFY]

1 Yes
2 No

7 Don't know/Not sure
9 Refused

21. In general, how much interest, if any, does this child show in these subjects?
[RANDOMIZE LIST]
How much interest in [Math], would you say…

a. Science
b. Computers and technology
c. Designing, creating, and building machines and devices, also called engineering
d. Math

1 A lot of interest,
2 Some interest, or
3 Little or no interest?

7 Don’t know/Not sure
9 Refused

22. In general, how well is this child doing in these subjects? **[RANDOMIZE LIST]**
In [Science], would you say…

a. Science
b. Computers and technology
c. Designing, creating, and building machines and devices, also called engineering
d. Math

1 Very well,
2 Ok,
3 Not very well, or
4 Does not apply?

7 Don’t know/Not sure

9 Refused

23b. Thinking about the past school year and this summer, has your child participated, enrolled, or plan to enroll in any of the following activities? **[RANDOMIZE LIST]**

a. day program or summer camp related to science, technology, engineering, or mathematics
b. after-school program for enriched learning about science, technology, engineering or mathematics
c. boy/girl scouts
d. 4-H
e. Any other structured activity related to science, technology, engineering or mathematics

1 Yes
2 No

7 Don't know/Not sure
9 Refused

[IF CHILD IS AGES 3-11, SKIP TO 28]

24. Which of the following do you think this child will most likely do after high school graduation?

Would you say…

1 Attend a 4-year college or university,
2 Attend a 2-year community college,
3 Attend a vocational or training school,
4 Enlist in the military,
5 Begin work immediately, or
6 Something else [SPECIFY]?

7 Don't know/Not sure
9 Refused

25. How likely is it, if at all, that your child will pursue a career in a field related to science, technology, engineering, or math? Would you say…

1 Very likely,
2 Somewhat likely,
3 Somewhat unlikely, or
4 Very unlikely?

7 Don't know/Not sure
9 Refused

[IF CHILD IS AGES 12-19, SKIP TO 30]

28. How important is it to you that your child…
[RANDOMIZE LIST]
    a. does well in math.
    b. does well in science.
    c. has good computer and technology skills.
    d. has some exposure to engineering concepts.

Is it…

1 Very important,
2 Important,
3 Somewhat important, or
4 Not important at all?

7 Don't know/No opinion
9 Refused

[IF CHILD IS AGES 3-11, SKIP TO 31]

30. How important is it to you that your child…
[RANDOMIZE LIST]

    a. has some advanced math skills.
    b. has some advanced science skills.
    c. has some advanced technology skills.
    d. has some exposure to advanced engineering concepts.

Is it…

1 Very important,
2 Important,
3 Somewhat important, or
4 Not important at all?

7 Don't know/No opinion
9 Refused

31. Is this child of Hispanic, Latino, or Spanish origin?

1 Yes
2 No

7 Don't know/Not sure
9 Refused

32. Which one or more of the following would you say is the race of this child? **[SELECT ALL THAT APPLY]**

Would you say...

1 White,
2 Black or African American,
3 Asian,
4 Native Hawaiian or Other Pacific Islander,
5 American Indian or Alaska Native,
Or
6 Other **[SPECIFY] ______________**?

Do not read:

8 No additional choices
7 Don’t know / Not sure
9 Refused

CATI note: If more than one response to 32; continue. Otherwise, go to 34.

33. Which one of these groups would you say best represents the race of this child?

1 White
2 Black or African American
3 Asian
4 Native Hawaiian or Other Pacific Islander
5 American Indian or Alaska Native
6 Other **[SPECIFY]** ______________

Do not read:

7 Don’t know / Not sure
9 Refused

SECTION 6: Demographics

34. Now I have just a few more background questions and we’ll be finished. And you are…

1 Male?
2 Female?

35. What is your current age?

______ [range 18-96]

96 96 or older
97 Don’t know/Not sure
99 Refused

36. What is the highest level of education you have completed?

1 Less than high school graduate
2 Grade 12 or GED (high school graduate)
3 One or more years of college but no degree
4 Associate's or other 2-year degree
5 College graduate with a 4 year degree such as a BA or BS
6 Graduate degree completed (MA, MS, MFA, MBA, MD, PhD, EdD, etc.)

7 Don't know/Not sure
9 Refused

If Q36 >2, else skip to Q38

37. Do you have a degree or some form of advanced training in a field related to science, technology, engineering, or math?

1 Yes
2 No

7 Don't know/Not sure
9 Refused

IF Q37 =1, else skip to Q38

37a. In what subject or field was your degree or advanced training, if any?

[OPEN]

38. Which of the following best describes where you live? Do you live…

1 On a farm or in an open rural area,
2 In a small town of less than 5,000 people,
3 In a large town of 5,000 to less than 25,000 people,
4 In a city of 25,000 to less than 50,000 people, or
5 In a city of 50,000 or more people?

7 Don't know/Not sure
9 Refused

39. Are you currently…?

11 Employed for wages,
12 Self-employed,
13 Out of work for more than 1 year,
14 Out of work for less than 1 year,
15 A Homemaker,
16 A Student,
17 Retired, or
18 Unable to work?

99 Refused

[IF 39=11, 12, 13, 14, or 17]

40. I already asked about your training/education. Now, please tell me are you or were you recently employed in a career that significantly uses skills in science, technology, engineering, or math?

1 Yes
2 No
7 Don't know/Not sure
9 Refused

IF Q40=1, else skip to Q41

40a. What is, or was, your job?
[Interviewer note: Enter job title and general description of the type of business where they work, e.g. counselor at a school]

[OPEN]

41. What is your annual gross household income from all sources before taxes?

Is it…

11 Less than $15,000,
12 $15,000 to less than $25,000,
13 $25,000 to less than $35,000,
14 $35,000 to less than $50,000,
15 $50,000 to less than $75,000,
16 $75,000 to less than $100,000,
17 $100,000 to less than $150,000, or
18 $150,000 or more?

77 Don't know/Not sure
99 Refused

[IF 41 < 77, SKIP TO 42]

41b. Can you tell me if your annual gross household income is less than, equal to, or greater than $50,000?

1 Less than $50,000
2 Equal to $50,000
3 More than $50,000

7 Don't know/Not sure
9 Refused

42. Are you of Hispanic, Latino, or Spanish origin?

1. Yes
2. No

7. Don't know/Not sure
9. Refused

43. Which one or more of the following would you say is your race?

[SELECT ALL THAT APPLY]

Would you say...

1 White,
2 Black or African American,
3 Asian,
4 Native Hawaiian or Other Pacific Islander,
5 American Indian or Alaska Native,

Or

6 Other **[SPECIFY] ______________**?

Do not read:

8 No additional choices
7 Don’t know / Not sure
9 Refused

CATI note: If more than one response to 43; continue. Otherwise, go to 46.

44. Which one of these groups would you say best represents your race?

1 White
2 Black or African American
3 Asian
4 Native Hawaiian or Other Pacific Islander
5 American Indian or Alaska Native
6 Other **[SPECIFY] ______________**

Do not read:

7 Don’t know / Not sure
9 Refused

46. What county do you live in?

_____________ County

47. What is your ZIP Code?

[ ]

77777. Don’t know/Not sure
99999. Refused

[NOTE: If talking to respondent on cell phone, skip to 48b]

48a. Can you also be reached via cell phone?
[Read only if clarification is necessary: Do you have a cell phone for personal or business use?]

1 Yes
2 No

7 Don't know /Not sure
9 Refused

[NOTE: If talking to respondent on landline, skip to 49]

48b. Does the house you live in also have a landline telephone?

1 Yes
2 No

7 Don't know /Not sure
9 Refused

[IF 48a or 48b = 2, SKIP TO REMARKS]

49. Thinking about all the phone calls that you receive on your landline and cell phone, what percent, between 0 and 100, are received on your cell phone?

_ _ _ Enter percent (1 to 100)

8 8 8 Zero
7 7 7 Don't know / Not sure
9 9 9 Refused

7 Don't know/Not sure
9 Refused

REMARKS

Is there anything else that you would like to say about STEM in Iowa?

[OPEN ENDED]

CLOSING STATEMENT

That is the last question about STEM. Everyone's answers will be combined to give us information about the views of people in Iowa on STEM Education.

Now I'd like to ask you if you'd be interested in participating in other research studies.

ENTER FIPS CODE
___ ___ ___ = FIPS

[INTERVIEWER COMMENTS]

Appendix E: Statewide Survey of Public Attitudes Toward STEM_Technical notes

To measure public awareness of and attitudes toward STEM in Iowa, the UNI Center for Social and Behavioral Research has conducted an annual statewide public survey of adult Iowans since 2012. The survey is funded by the Iowa Governor's STEM Advisory Council. The survey was developed in 2012, and revised slightly for 2013 and 2014. Survey topics included:

1. STEM awareness and exposure
2. Attitudes toward STEM and the role of STEM in Iowa
3. Perceptions and attitudes about STEM education
4. Perceptions about strategies to improve STEM education
5. Parent perceptions of STEM education
6. Demographics

The complete survey instrument used for 2014 data collection can be found in Appendix D.

Population & Sampling Design The 2014 Survey of Public Attitudes Toward STEM used a dual-frame random digit dial (DF-RDD) sample design that included both landline and cell phones. In addition, a targeted (landline list-assisted) oversample of three groups was included (parents, African-American adults and Hispanic adults). All samples were obtained from Marketing Systems Group (MSG). A modified Kish protocol was used for within-household selection for landline calls. Respondents were Iowans who were at least 18 years of age or older at the time of the interview. Interviews were completed from June 2, 2014 through August 7, 2014, and averaged 26 minutes in length. Interviews were conducted in both English and Spanish.

A total of 1,916 interviews were completed. This included 444 (23%) landline and 615 (32%) cell phone interviews with an additional targeted oversample of 396 (21%) parents, 355 (18%) Hispanic and African American adults, and 106 (6%) Spanish-speaking interviews. Note that sample counts are based on the number of completed interviews generated from each respective sampling frame: 1) landline telephone numbers, 2) cell phone telephone numbers, 3) listed landline numbers from the targeted oversample of likely households of parents of 4-19 year old children, or 4) listed landline numbers from the targeted oversample of likely households of Hispanic or African American adults. In addition, working telephone numbers that were transferred to a Spanish-speaking interviewer were tracked and counted separately. These counts may differ from the self-reported demographic characteristics of the participants described in the report.

Response rates were calculated using the American Association for Public Opinion Research (AAPOR) RR3 calculation. The overall response rate was 24%. The response rate for both the RDD and the cell phone samples were each 27%. The average response rate of the targeted oversamples was 20% (Parents: 18%, African American & Hispanic: 21% and Spanish-speaking: 20%). The overall cooperation rate (AAPOR CR3) was 64%. The cooperation rate for interviews completed via cell phone (78%) was higher than for landline (58%) and was 64% (parents), 56% (African American & Hispanic) and 60% (Spanish-speaking) for the oversamples.

Weighting & Precision of Estimates The data were weighted in order to obtain point estimates that are representative of all adult Iowans (gender, age, ethnicity, race, education, place of residence, and telephone status). The post-stratification weights were computed with SAS (see www.sas.com). Descriptive statistics, including frequencies and distributions were calculated for the total sample and for population subgroups including gender, education, parent status, and place of residence for select questions in the survey. Margin of sampling error taking into account the design effect is $\pm$3.2% for the overall sample and as high as $\pm$12.2% for the analyses using the smallest subgroups (Race subgroup: All other, including oversampling). The SPSS software (see www.ibm.com/software/analytics/spss/) was used for initial data management and descriptive analysis, and SUDAAN software (see www.rti.org/sudaan) was used to estimate population estimates of attitudes toward STEM. Analyses conducted in SUDAAN have been adjusted for the design effect[4] due to differential probabilities of selection, clustering and weighting. SUDAAN was also used for logistic regression to model some of the main findings of this study. Further explanation of this multivariate analysis (RLOGIST command in SUDAAN) can be found at www.rti.org/sudaan. The significance level was set at a p-value of 0.05 (or 5%) for all analyses. Unless otherwise noted, the term “percent” refers to the “weighted percent” of survey respondents.

Additional information about the survey and the findings is available from CSBR. Please contact Erin Heiden at erin.heiden@uni.edu or 319.273.2105.

[4] The Design Effect (**DEFF**) is a measure of estimated ratio between variances between cluster versus simple random sampling design in a weighted data analysis. See more information at www.rti.org/sudaan.

AAPOR Outcome Rate Calculator Version 3.1 November, 2010	STEM 1 Landline 2014	STEM 2 Cell 2014	STEM 3 Parents 2014	STEM 4 Hispanic /African American 2014	STEM Interviews conducted in Spanish 2014	Total Overall 2014
Interview (Category 1)						
Complete	444	615	396	355	106	1916
Partial						
Eligible, non-interview (Category 2)						
Refusal and breakoff	36	34	11	34	8	123
Household-level refusal	67	2	71	82	27	249
Known-respondent refusal	206	102	126	153	16	603
Break off/ Implicit refusal	8	39	10	7	19	83
Respondent never available	200	38	363	238	139	978
Telephone answering device (confirming HH)	73		154	39		266
Deceased respondent			1			1
Physically or mentally unable/incompetent	45	20	7	30	9	111
Household-level language problem		4			4	8
Respondent language problem		5		9	1	15
Unknown if housing unit/unknown about address	642	1648	480	584	158	3512
Not attempted or worked/not mailed/No invitation sent						
Always busy	44	22	8	12		86
No answer	581	21	171	206		979
Answering machine-don't know if household	408	828	370	323		1929
Call blocking	34		31	49		114
Housing unit, unknown if eligible respondent	245	1	187	207	36	676
Other - Center Do Not Call List	159	438	150	135	10	892
Not eligible (Category 4)						
Out of sample - other strata than originally coded	10	162	2	4	5	183
Fax/data line	226	2	14	17		259
Non-working/disconnect	2,302	485	382	961		4130
Nonresidence	284	174	28	23	3	512
No eligible respondent	5	134	10	13		162

	STEM 1	STEM 2	STEM 3	STEM 4	STEM	Total
				Hispanic /African	Interviews conducted	
AAPOR Outcome Rate Calculator	**Landline**	**Cell**	**Parents**	**American**	**in Spanish**	**Overall**
Version 3.1 November, 2010	**2014**	**2014**	**2014**	**2014**	**2014**	**2014**
Total phone numbers used	6019	4774	2972	3481	541	17787
I=Complete Interviews (1.1)	444	615	396	355	106	1916
P=Partial Interviews (1.2)	0	0	0	0	0	
R=Refusal and break off (2.1)	317	177	218	276	70	1058
NC=Non Contact (2.2)	273	38	517	277	139	1244
O=Other (2.0, 2.3)	45	29	8	39	14	135
Calculating e: e is the estimated proportion of cases of unknown eligibility that are eligible. Enter a different value or accept the estimate in this line as a default. 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). This will be used if you do not enter a different estimate. For guidance about how to compute other estimates of e, see AAPOR's 2009 *Eligibility Estimates.*	0.276242	0.473018	0.723175	0.481933842	0.976261	0.453485
UH=Unknown Household (3.1)	1709	2519	1060	1174	158	6620
UO=Unknown other (3.2-3.9)	404	439	337	342	46	1568
Response Rate 1						
I/(I+P) + (R+NC+O) + (UH+UO)	0.139098	0.161121	0.156151	0.144133171	0.198874	0.152779
Response Rate 2						
(I+P)/(I+P) + (R+NC+O) + (UH+UO)	0.139098	0.161121	0.156151	0.144133171	0.198874	0.152779
Response Rate 3						
I/((I+P) + (R+NC+O) + e(UH+UO))	0.267036	0.272342	0.184248	0.21161035	0.200698	0.237536
Response Rate 4						
(I+P)/((I+P) + (R+NC+O) + e(UH+UO))	0.267036	0.272342	0.184248	0.21161035	0.200698	0.237536
Cooperation Rate 1						
I/(I+P)+R+O)	0.550868	0.749086	0.636656	0.529850746	0.557895	0.616275
Cooperation Rate 2						
(I+P)/((I+P)+R+0))	0.550868	0.749086	0.636656	0.529850746	0.557895	0.616275
Cooperation Rate 3						
I/((I+P)+R))	0.583443	0.776515	0.644951	0.562599049	0.602273	0.64425
Cooperation Rate 4						
(I+P)/((I+P)+R))	0.583443	0.776515	0.644951	0.562599049	0.602273	0.64425

AAPOR Outcome Rate Calculator Version 3.1 November, 2010	STEM 1 Landline 2014	STEM 2 Cell 2014	STEM 3 Parents 2014	STEM 4 Hispanic /African American 2014	STEM Interviews conducted in Spanish 2014	Total Overall 2014
Refusal Rate 1						
R/((I+P)+(R+NC+O) + UH + UO))	0.099311	0.046371	0.085962	0.112058465	0.131332	0.084363
Refusal Rate 2						
R/((I+P)+(R+NC+O) + e(UH + UO))	0.190654	0.078381	0.10143	0.164519596	0.132536	0.131166
Refusal Rate 3						
R/((I+P)+(R+NC+O))	0.293791	0.206054	0.191396	0.291446674	0.212766	0.243051
Contact Rate 1						
(I+P)+R+O / (I+P)+R+O+NC+ (UH + UO)	0.252506	0.21509	0.245268	0.272025985	0.356473	0.247907
Contact Rate 2						
(I+P)+R+O / (I+P)+R+O+NC + e(UH+UO)	0.484754	0.363566	0.2894	0.39937728	0.359741	0.385439
Contact Rate 3						
(I+P)+R+O / (I+P)+R+O+NC	0.746988	0.955763	0.546093	0.70749736	0.577508	0.71422

Notes and general directions:

Each sampled element in the sample should be assigned a single, final disposition code (e.g., complete, 1.1, or language problem, 2.33).

Enter the total for each of the codes in their appropriate cells in the straw or blue-colored column.

Final disposition codes are mutually exclusive and are constructed to capture fine levels of detail.

Two examples are helpful: If you know only that the interview was refused in an eligible household, but nothing else about the call in an RDD survey, the outcome could be coded 2.11; if the interview was refused in an eligible household by a known respondent, then it could be coded 2.112. If a more precise code is used, the outcome would not be entered in a higher-level code. E.g., once coded 2.112, a final disposition would not appear in both 2.0 and 2.112.

More specific directions for classifying final dispositions for outcomes are in the published version of *Standard Definitions*.

AAPOR's Standard Definitions Committee recognizes that there are some minor inconsistencies in outcome code labeling between this version and earlier versions. Those inconsistencies do not affect outcome rate calculations and will be addressed in the next version of *Standard Definitions*. Version 3.1 corrects the calculation for "e" in V. 3.0.

About the calculator

This calculator was developed as a service to the research industry and survey research profession by AAPOR's Standard Definitions Committee.

Rob Daves lead a team that designed the original calculator, which also benefitted from Tom Smith's contributions; Daves rewrote this version to take additions to *Standard Definitions* into account. Questions or suggestions should be addressed to standards@aapor.org.

WEIGHTING METHODOLOGY REPORT
IOWA STEM SURVEY – 2014

Design Overview:

This study has secured a total of 1,916 interviews with adults 18 or older residing in Iowa. In order to provide a probability-based sample representative of all adults in Iowa, a dual-frame random digit dial (RDD) sampling methodology was use, whereby both landline and cellular telephone numbers were included in the sample. Moreover, listed households expected to include children 3 to 11 and 12 to 19, as well as Hispanic and African American households were oversampled to reduce screening costs. The following table provides a summary of completed interviews by sampling strata.

Table 1. Distribution of completed interviews by sampling strata

Stratum	Respondents	
1. Landline RDD	447	23.3%
2. Cellular RDD	620	32.4%
3. Listed Landline Households with 3 to 11 Year Olds	241	12.6%
4. Listed Landline Households with 12 to 19 Year Olds	156	8.1%
5. Block Groups with at Least 40% African Americans	165	8.6%
6. Listed Landline Households with Hispanic Surname	287	15.0%
Total	**1,916**	**100.0%**

Weighting:

Virtually, all survey data are weighted before they can be used to produce reliable estimates of population parameters. While reflecting the selection probabilities of sampled units, weighting also attempts to compensate for practical limitations of a sample survey, such as differential nonresponse and undercoverage. The weighting process for this survey essentially entailed two major steps. The first step consisted of computation of *base weights* to reflect unequal selection probabilities for different sampling strata, increased chance of selection for adults with both landline and cell phones, and selection of one adult per household. In the second step, base weights were adjusted so that the resulting final weights aggregate to reported totals for the target population.

For the second step, weights were adjusted (raked) simultaneously along several dimensions using the *WgtAdjust* procedure of SUDAAN. The needed population totals for weighting have been obtained from the July 2014 Current Population Survey (CPS). It should be noted that survey data for a number of demographic questions, such as race, age, and education, included missing values. All such missing values were first imputed using a *hot-deck* procedure before construction of the survey weights. As such, respondent counts reflected in the following tables correspond to the post-imputation step.

Table 2. First raking dimension for weight adjustments by gender and age

Age	Males				Females			
	Respondents		Population		Respondents		Population	
18-24	75	9.6%	162,917	14.2%	56	4.9%	185,982	15.4%
25-34	92	11.7%	207,663	18.2%	109	9.6%	193,142	16.0%
35-44	121	15.5%	158,399	13.9%	223	19.7%	159,130	13.2%
45-54	164	20.9%	203,338	17.8%	232	20.5%	202,126	16.7%
55-64	165	21.1%	223,531	19.5%	210	18.5%	250,650	20.8%
65+	166	21.2%	187,735	16.4%	303	26.7%	216,063	17.9%
Total	**783**	**100.0%**	**1,143,583**	**100.0%**	**1,133**	**100.0%**	**1,207,093**	**100.0%**

Table 3. Second raking dimension for weight adjustments by gender and ethnicity

Ethnicity	Males				Females			
	Respondents		Population		Respondents		Population	
Hispanic	92	11.7%	50,201	4.4%	127	11.2%	52,270	4.3%
Others	691	88.3%	1,093,382	95.6%	1,006	88.8%	1,154,823	95.7%
Total	**783**	**100.0%**	**1,143,583**	**100.0%**	**1,133**	**100.0%**	**1,207,093**	**100.0%**

Table 4. Third raking dimension for weight adjustments by race

Race	Respondents		Population	
White	1,766	92.2%	2,195,213	93.0%
African American	129	6.7%	66,717	3.0%
Others	21	1.1%	88,746	4.0%
Total	**1,916**	**100.0%**	**2,350,676**	**100.0%**

Table 5. Fourth raking dimension for weight adjustments by gender and education

Education	Males				Females			
	Respondents		Population		Respondents		Population	
Less than high school	37	4.7%	94,903	8.3%	82	7.2%	84,262	7.0%
High School or GED	210	26.8%	353,947	31.0%	251	22.2%	350,190	29.0%
College 1 year to 3 years	235	30.0%	366,040	32.0%	394	34.8%	408,138	33.8%
College 4 year or more	200	25.5%	243,462	21.3%	274	24.2%	266,647	22.1%
Graduate degree	101	12.9%	85,231	7.5%	132	11.7%	97,856	8.1%
Total	**783**	**100.0%**	**1,143,583**	**100.0%**	**1,133**	**100.0%**	**1,207,093**	**100.0%**

Table 6. Fifth raking dimension for weight adjustments by gender and place of residence

Place	Males				Females			
	Respondents		Population		Respondents		Population	
Farm	158	20.2%	247,880	21.7%	210	18.5%	232,215	19.2%
Small Town	176	22.5%	238,809	20.9%	277	24.4%	262,634	21.8%
Large Town	119	15.2%	212,975	18.6%	200	17.7%	233,405	19.3%
Small City	88	11.2%	109,339	9.6%	152	13.4%	121,287	10.0%
Large City	242	30.9%	334,580	29.3%	294	25.9%	357,552	29.6%
Total	**783**	**100.0%**	**1,143,583**	**100.0%**	**1,133**	**100.0%**	**1,207,093**	**100.0%**

Table 7. Sixth raking dimension for weight adjustments by telephone status

Telephone Status	Respondents		Population	
Cell-only	369	19.3%	615,877	26.2%
Others	1,547	80.7%	1,734,799	73.8%
Total	**1,916**	**100.0%**	**2,350,676**	**100.0%**

Variance Estimation for Weighted Data:

Survey estimates can only be interpreted properly in light of their associated sampling errors. Since weighting often increases variances of estimates, use of standard variance calculation formulae with weighted data can result in misleading statistical inferences. With weighted data, two general approaches for variance estimation can be distinguished. One method is *Taylor Series linearization* and the second is *replication*. There are several statistical software packages that can be used to produce design-proper estimates of variances using linearization or replication methodologies, including:

- SAS: http://www.sas.com
- SUDAAN: http://www.rti.org/sudaan
- WesVar: http://www.westat.com/westat/statistical_software/wesVar
- Stata: http://www.stata.com

An Approximation Method for Variance Estimation can be used to avoid the need for special software packages. Researchers who do not have access to such tools for design-proper estimation of standard errors can approximate the resulting variance inflation due to weighting and incorporate that in subsequent calculations of confidence intervals and tests of significance. With w_i representing the final weight of the i^{th} respondent, the inflation due to weighting, which is commonly referred to as *Design Effect*, can be approximated by:

$$\delta = 1 + \frac{\sum_{i=1}^{n} \frac{(w_i - \overline{w})^2}{n-1}}{\overline{w}^2}$$

For calculation of a confidence interval for an estimated percentage, $\hat{p}$, one can obtain the conventional variance of the given percentage $S^2(\hat{p})$, multiply it by the approximated design effect, δ, and use the resulting quantity as adjusted variance. That is, the adjusted variance $\hat{S}^2(\hat{p})$ would be given by:

$$\hat{S}^2(\hat{p}) \approx \frac{\hat{p}(1-\hat{p})}{n-1}\left(\frac{N-n}{N}\right) \times \delta$$

Subsequently, the (100-α) percent confidence interval for P would be given by:

$$\hat{p} - z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n-1}\left(\frac{N-n}{N}\right) \times \delta} \leq P \leq \hat{p} + z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n-1}\left(\frac{N-n}{N}\right) \times \delta}$$

Appendix F: Statewide Survey of Public Attitudes Toward STEM_Item frequencies

The tables in this section are presented in the order they were asked in the statewide public awareness survey. The subgroup data included in the frequency tables are presented as descriptive statistical summaries. Between-group analyses were conducted to determine which (if any) of the subgroups differed from one another based on inferential statistical tests.

Tests of significance included both the Wald Chi-square test and 95% confidence intervals of the weighted results. The significance level was set at a p-value of 0.05 (or 5%) for all analyses. For some variables, the Wald chi-square test was significant at p<.05, but the 95% confidence intervals overlapped or were separated by less than 1%. In these instances, the authors made the decision to interpret the subgroup differences as not significant since the tests were performed on population estimates. By definition, population estimates are the best estimation of the percentage of the population (e.g. a random sample of adult Iowans) for any given variable (e.g. number and percentage of Iowans who have heard of STEM). 95% confidence intervals are values above and below the population estimate that indicate with 95% probability the upper and lower range of the "true" value in the population of adult Iowans. Because the population estimate and 95% confidence intervals already represent an estimate of the percentage and range of the value in the "true" population, it is prudent to conservatively interpret statistically significant subgroup differences when the 95% confidence intervals are so close.

*p<.05; **p<.01

Q1. I'm going to read a short list of topics. Please tell me how much you have heard about each one, if anything, in the past month.

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Traffic safety																
A lot	413	466,423	19.9%	20.8%	19.0%	21.4%	18.9%	18.5%	18.8%	18.6%	26.1%	20.0%	22.2%	18.3%	19.3%	23.8%
A little	1,042	1,279,370	54.5%	53.1%	55.7%	50.9%	56.4%	57.2%	55.3%	51.8%	52.7%	53.2%	53.1%	57.6%	56.2%	40.3%
Nothing	458	602,776	25.7%	26.1%	25.3%	27.8%	24.7%	24.2%	25.8%	29.7%	21.2%	26.7%	24.7%	24.2%	24.5%	35.9%
Total	1,913	2,348,569														
b. The Iowa economy										**					**	
A lot	629	709,870	30.3%	32.2%	28.4%	29.4%	28.5%	33.1%	31.9%	23.2%	28.7%	29.1%	27.7%	34.2%	31.8%	18.5%
A little	987	1,196,479	51.0%	48.7%	53.2%	47.0%	53.8%	53.0%	48.9%	54.0%	58.4%	50.0%	54.4%	50.5%	51.9%	43.1%
Nothing	296	440,154	18.8%	19.2%	18.4%	23.6%	17.7%	13.9%	19.2%	22.8%	12.8%	21.0%	17.8%	15.3%	16.4%	38.3%
Total	1,912	2,346,502														
c. Foreign policy				**			**								**	
A lot	940	1,102,617	47.0%	53.1%	41.2%	37.6%	49.0%	56.6%	49.5%	37.2%	43.7%	45.5%	44.2%	52.8%	49.1%	30.0%
A little	663	812,203	34.6%	32.1%	37.0%	35.9%	33.3%	34.4%	33.1%	41.0%	36.6%	36.3%	31.7%	35.5%	35.0%	31.5%
Nothing	308	431,533	18.4%	14.8%	21.8%	26.5%	17.7%	9.0%	17.5%	21.8%	19.8%	18.2%	24.2%	11.8%	15.9%	38.5%
Total	1,911	2,346,352														
d. Agriculture							*						**		**	
A lot	827	948,734	40.4%	43.7%	37.2%	34.1%	43.5%	44.4%	40.5%	35.0%	44.6%	50.7%	32.4%	35.7%	42.6%	21.9%
A little	809	1,015,042	43.2%	39.7%	46.5%	42.6%	44.2%	43.2%	42.5%	45.9%	43.9%	36.1%	48.8%	48.3%	44.0%	37.0%
Nothing	280	386,900	16.5%	16.6%	16.3%	23.3%	12.4%	12.4%	17.0%	19.1%	11.5%	13.3%	18.8%	16.0%	13.4%	41.1%
Total	1,916	2,350,676														

e. K-12 education				**			**			**						
A lot	570	580,972	24.8%	19.9%	29.3%	19.9%	25.8%	29.8%	20.4%	35.7%	36.7%	21.5%	24.9%	27.2%	25.1%	22.4%
A little	900	1,144,505	48.8%	50.6%	47.1%	47.6%	46.5%	52.7%	49.7%	47.3%	45.8%	48.8%	48.7%	51.1%	48.6%	50.5%
Nothing	442	619,737	26.4%	29.5%	23.6%	32.6%	27.6%	17.5%	30.0%	17.0%	17.5%	29.7%	26.4%	21.7%	26.3%	27.2%
Total	1,912	2,345,214														
f. The environment										*					*	
A lot	744	883,807	37.6%	39.3%	36.1%	35.4%	35.3%	42.6%	39.4%	27.7%	37.7%	34.1%	38.0%	41.2%	37.2%	39.1%
A little	918	1,145,878	48.8%	46.5%	51.0%	46.9%	51.8%	48.1%	48.0%	54.3%	47.4%	51.2%	48.5%	47.7%	50.4%	37.1%
Nothing	252	319,364	13.6%	14.3%	13.0%	17.7%	12.8%	9.3%	12.5%	18.0%	14.9%	14.7%	13.6%	11.1%	12.3%	23.7%
Total	1,914	2,349,048														
g. Healthcare							**									
A lot	1,222	1,449,245	61.7%	61.0%	62.4%	55.5%	62.8%	68.1%	62.8%	57.1%	60.1%	57.1%	65.4%	65.0%	62.8%	50.7%
A little	567	743,719	31.7%	32.0%	31.3%	34.1%	31.8%	28.6%	30.4%	35.8%	34.3%	35.2%	28.7%	30.2%	31.1%	37.3%
Nothing	125	156,838	6.7%	7.0%	6.3%	10.4%	5.5%	3.3%	6.8%	7.1%	5.6%	7.7%	5.8%	4.8%	6.0%	12.0%
Total	1,914	2,349,802														

Q2. I'm going to read a list of topics about education in Iowa. Please tell me how much you have heard about each one, if anything, in the past month.

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Requiring students to pass more rigorous tests before advancing to the next grade																
A lot	242	273,150	11.6%	10.1%	13.1%	13.3%	9.0%	12.0%	11.5%	12.2%	11.7%	9.4%	14.5%	11.3%	10.6%	19.5%
A little	712	843,939	35.9%	36.9%	34.9%	30.8%	39.2%	38.7%	36.9%	32.0%	34.5%	33.9%	35.8%	38.9%	35.9%	35.8%
Nothing	962	1,233,586	52.5%	53.0%	52.0%	55.9%	51.7%	49.3%	51.6%	55.8%	53.8%	56.7%	49.7%	49.8%	53.5%	44.7%
Total	1,916	2,350,676														
b. Improving math, technology, science, and engineering education																
							**						*			
A lot	400	410,619	17.5%	14.8%	20.0%	13.2%	18.1%	22.3%	16.3%	15.8%	24.8%	13.9%	18.2%	22.6%	17.3%	18.0%
A little	814	1,010,853	43.0%	46.2%	40.0%	42.8%	39.9%	46.6%	43.4%	42.6%	41.3%	41.9%	46.5%	41.5%	42.3%	49.1%
Nothing	701	928,044	39.5%	39.0%	40.0%	44.1%	42.1%	31.1%	40.3%	41.6%	33.8%	44.2%	35.3%	35.8%	40.4%	32.9%
Total	1,915	2,349,515														
c. Having tougher evaluation standards for teachers' performance																
A lot	297	304,796	13.0%	10.8%	15.1%	10.7%	13.1%	15.7%	13.2%	11.6%	13.1%	11.0%	13.1%	15.2%	13.0%	12.5%
A little	771	901,040	38.4%	38.3%	38.5%	36.9%	38.1%	40.7%	37.5%	39.2%	42.5%	36.7%	36.9%	43.8%	38.8%	35.9%
Nothing	843	1,139,399	48.6%	50.8%	46.4%	52.3%	48.8%	43.6%	49.3%	49.3%	44.5%	52.3%	50.0%	41.0%	48.2%	51.6%
Total	1,911	2,345,235														
d. Raising teacher salaries										**						
A lot	266	309,748	13.2%	13.4%	12.9%	14.3%	14.8%	9.9%	14.0%	6.9%	14.7%	9.6%	21.0%	11.3%	12.3%	19.4%
A little	782	954,580	40.6%	42.2%	39.2%	35.7%	41.8%	45.7%	40.4%	38.3%	44.0%	41.4%	36.9%	42.3%	41.7%	31.9%
Nothing	866	1,085,069	46.2%	44.4%	47.9%	50.0%	43.4%	44.5%	45.6%	54.8%	41.3%	49.0%	42.1%	46.4%	45.9%	48.7%
Total	1,914	2,349,397														

e. Homeschooling										*						
A lot	201	219,713	9.4%	7.0%	11.6%	10.1%	9.7%	8.0%	7.5%	18.6%	10.3%	8.2%	9.5%	9.9%	8.9%	12.3%
A little	724	866,589	36.9%	39.7%	34.3%	36.5%	35.6%	38.4%	37.7%	35.7%	34.0%	34.6%	39.2%	36.8%	35.8%	45.3%
Nothing	989	1,262,605	53.8%	53.4%	54.1%	53.4%	54.6%	53.6%	54.9%	45.6%	55.7%	57.2%	51.3%	53.3%	55.3%	42.4%
Total	1,914	2,348,906														

Q3. Have you visited any of the following in the past 12 months?

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. A museum							**						**			
Yes	860	998,391	42.5%	41.2%	43.7%	30.2%	39.0%	62.0%	40.3%	48.3%	48.2%	34.9%	41.9%	56.8%	42.5%	42.6%
No	1,055	1,351,420	57.5%	58.8%	56.3%	69.8%	61.0%	38.0%	59.7%	51.7%	51.8%	65.1%	58.1%	43.2%	57.5%	57.4%
Total	1,915	2,349,810														
b. A zoo or aquarium				**			**			**			*			
Yes	705	830,747	35.3%	29.9%	40.5%	24.9%	39.3%	44.0%	29.1%	59.3%	44.3%	30.8%	35.3%	41.5%	36.1%	30.0%
No	1,210	1,519,741	64.7%	70.1%	59.5%	75.1%	60.7%	56.0%	70.9%	40.7%	55.7%	69.2%	64.7%	58.5%	63.9%	70.0%
Total	1,915	2,350,488														
c. A science or technology center							**			**			**			
Yes	515	616,928	26.3%	28.5%	24.2%	19.6%	24.8%	36.6%	20.9%	42.0%	38.4%	18.3%	29.0%	35.4%	25.7%	30.6%
No	1,398	1,728,747	73.7%	71.5%	75.8%	80.4%	75.2%	63.4%	79.1%	58.0%	61.6%	81.7%	71.0%	64.6%	74.3%	69.4%
Total	1,913	2,345,674														
d. A public library				**			**			**						
Yes	1,281	1,487,346	63.3%	54.1%	71.9%	53.4%	61.9%	77.2%	59.3%	73.6%	73.7%	61.6%	66.0%	64.5%	62.7%	68.6%
No	635	863,330	36.7%	45.9%	28.1%	46.6%	38.1%	22.8%	40.7%	26.4%	26.3%	38.4%	34.0%	35.5%	37.3%	31.4%
Total	1,916	2,350,676														
e. A K-12 school							**			**			*			
Yes	1,193	1,319,992	56.2%	51.9%	60.2%	47.9%	59.5%	63.2%	44.7%	86.8%	85.4%	58.2%	61.9%	49.1%	57.4%	46.9%
No	721	1,028,976	43.8%	48.1%	39.8%	52.1%	40.5%	36.8%	55.3%	13.2%	14.6%	41.8%	38.1%	50.9%	42.6%	53.1%
Total	1,914	2,348,968														
f. An arboretum or botanical center							**						**			
Yes	471	539,106	23.0%	19.5%	26.2%	16.3%	21.7%	32.8%	21.6%	26.6%	26.4%	16.5%	23.6%	30.8%	23.8%	16.2%
No	1,442	1,809,192	77.0%	80.5%	73.8%	83.7%	78.3%	67.2%	78.4%	73.4%	73.6%	83.5%	76.4%	69.2%	76.2%	83.8%
Total	1,913	2,348,298														

Q4b. STEM stands for 'science, technology, engineering, and mathematics.' Have you read, seen or heard of this before?

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
							**						**			
Yes	860	963,078	41.1%	39.9%	42.3%	27.4%	40.6%	58.7%	39.6%	41.5%	48.0%	35.0%	40.8%	50.7%	41.9%	33.6%
No	1,049	1,379,983	58.9%	60.1%	57.7%	72.6%	59.4%	41.3%	60.4%	58.5%	52.0%	65.0%	59.2%	49.3%	58.1%	66.4%
Total	1,909	2,343,061														

Q4c. What have you read, seen, or heard about STEM?

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
Q4c_1. Greatness STEMs from Iowans																
Checked	0	0														
Total	860	963,078														
Q4c_2. Commit2STEM																
Checked	0	0														
Total	860	963,078														
Q4c_3. Iowa's future demands STEM																
Checked	0	0														
Total	860	963,078														
Q4c_4. Governor's STEM Advisory Council																
Unchecked	852	959,088	99.6%	99.7%	99.5%	99.7%	99.7%	99.5%	99.8%	99.7%	98.8%	99.8%	99.8%	99.2%	99.7%	99.8%
Checked	8	3,990	.4%	.3%	.5%	.3%	.3%	.5%	.2%	.3%	1.2%	.2%	.2%	.8%	.3%	.2%
Total	860	963,078														
Q4c_5. Other [SPECIFY]																
Unchecked	83	101,324	10.5%	11.5%	9.6%	18.9%	9.8%	6.3%	12.1%	7.3%	6.5%	10.6%	10.4%	6.8%	10.3%	12.6%
Checked	777	861,754	89.5%	88.5%	90.4%	81.1%	90.2%	93.7%	87.9%	92.7%	93.5%	89.4%	89.6%	93.2%	89.7%	87.4%
Total	860	963,078														
Q4c _7. Don't know/Not sure																
Unchecked	785	866,945	90.0%	89.1%	90.8%	82.2%	90.7%	94.0%	88.3%	93.0%	94.8%	90.1%	89.9%	93.8%	90.1%	88.2%
Checked	75	96,133	10.0%	10.9%	9.2%	17.8%	9.3%	6.0%	11.7%	7.0%	5.2%	9.9%	10.1%	6.2%	9.9%	11.8%
Total	860	963,078														

Q4d. In the past 30 days, have you read, seen or heard anything about STEM education from any of the following sources of information?	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. TV																
Yes	331	373,932	39.0%	40.1%	38.0%	42.8%	40.7%	34.6%	42.3%	32.0%	30.8%	39.3%	42.3%	37.4%	38.5%	43.3%
No	526	585,301	61.0%	59.9%	62.0%	57.2%	59.3%	65.4%	57.7%	68.0%	69.2%	60.7%	57.7%	62.6%	61.5%	56.7%
Total	857	959,233														
b. Magazine																
										**						
Yes	194	200,318	20.8%	19.3%	22.1%	18.8%	14.7%	26.5%	22.0%	27.0%	11.2%	19.3%	21.2%	23.0%	18.6%	45.6%
No	665	761,748	79.2%	80.7%	77.9%	81.2%	85.3%	73.5%	78.0%	73.0%	88.8%	80.7%	78.8%	77.0%	81.4%	54.4%
Total	859	962,066														
c. Newspaper																
										**			**			
Yes	405	440,755	45.8%	47.1%	44.6%	36.2%	46.8%	50.9%	50.8%	27.5%	39.6%	40.7%	39.9%	57.3%	44.9%	50.4%
No	454	522,054	54.2%	52.9%	55.4%	63.8%	53.2%	49.1%	49.2%	72.5%	60.4%	59.3%	60.1%	42.7%	55.1%	49.6%
Total	859	962,808														
d. Billboard																
													**			
Yes	55	46,181	4.8%	5.2%	4.5%	9.3%	1.9%	4.4%	4.7%	4.6%	5.2%	4.9%	1.7%	7.2%	4.6%	7.2%
No	805	916,897	95.2%	94.8%	95.5%	90.7%	98.1%	95.6%	95.3%	95.4%	94.8%	95.1%	98.3%	92.8%	95.4%	92.8%
Total	860	963,078														
e. Radio																
Yes	216	230,055	23.9%	28.5%	19.9%	24.0%	19.2%	27.3%	25.8%	23.3%	16.8%	27.1%	23.2%	22.0%	24.0%	21.7%
No	642	731,329	76.1%	71.5%	80.1%	76.0%	80.8%	72.7%	74.2%	76.7%	83.2%	72.9%	76.8%	78.0%	76.0%	78.3%
Total	858	961,384														

f. A school or teacher																
										**						
Yes	388	400,353	41.6%	35.8%	46.7%	35.9%	40.8%	45.9%	37.1%	54.9%	49.4%	44.1%	43.4%	34.7%	40.6%	52.1%
No	472	562,725	58.4%	64.2%	53.3%	64.1%	59.2%	54.1%	62.9%	45.1%	50.6%	55.9%	56.6%	65.3%	59.4%	47.9%
Total	860	963,078														
g. Internet or website																
							**			**					*	
Yes	370	404,935	42.1%	40.1%	43.9%	30.7%	39.5%	51.0%	37.8%	60.6%	45.3%	35.7%	38.8%	51.6%	40.2%	62.7%
No	488	556,316	57.9%	59.9%	56.1%	69.3%	60.5%	49.0%	62.2%	39.4%	54.7%	64.3%	61.2%	48.4%	59.8%	37.3%
Total	858	961,251														
h. A child or student																
										**						
Yes	239	232,529	24.1%	20.9%	27.0%	23.5%	23.9%	24.6%	18.6%	42.8%	32.2%	22.4%	23.8%	23.8%	24.1%	24.9%
No	621	730,549	75.9%	79.1%	73.0%	76.5%	76.1%	75.4%	81.4%	57.2%	67.8%	77.6%	76.2%	76.2%	75.9%	75.1%
Total	860	963,078														
i. A business																
Yes	135	131,288	13.6%	11.7%	15.4%	10.7%	12.1%	16.4%	12.9%	20.6%	11.4%	15.1%	11.7%	10.7%	13.8%	10.6%
No	725	831,790	86.4%	88.3%	84.6%	89.3%	87.9%	83.6%	87.1%	79.4%	88.6%	84.9%	88.3%	89.3%	86.2%	89.4%
Total	860	963,078														

Q4f. I'm going to read a short list of some groups promoting STEM education and careers. Please tell me how much you have heard, if anything, about each one in the past year.

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Corridor STEM Initiative																
							**									
A lot	24	23,731	1.0%	.5%	1.5%	0.0%	1.1%	2.2%	.9%	1.1%	1.3%	.7%	1.4%	1.1%	1.1%	.2%
A little	247	246,072	10.5%	9.8%	11.1%	8.2%	8.2%	15.4%	10.4%	9.3%	11.9%	10.4%	9.6%	11.3%	10.5%	9.8%
Nothing	1,643	2,079,923	88.5%	89.7%	87.4%	91.8%	90.7%	82.4%	88.7%	89.6%	86.8%	88.9%	88.9%	87.7%	88.4%	90.0%
Total	1,914	2,349,726														
b. Iowa Governor's STEM Advisory Council																
							**									
A lot	67	68,402	2.9%	2.6%	3.2%	1.5%	1.9%	5.7%	2.5%	2.7%	5.0%	2.8%	2.0%	4.3%	3.0%	2.0%
A little	488	518,954	22.1%	21.6%	22.5%	17.8%	21.4%	28.2%	22.9%	18.0%	21.9%	21.0%	22.2%	22.9%	22.4%	19.4%
Nothing	1,359	1,760,805	75.0%	75.8%	74.2%	80.6%	76.7%	66.1%	74.6%	79.2%	73.1%	76.3%	75.8%	72.7%	74.6%	78.7%
Total	1,914	2,348,161														
c. Iowa Student STEM Film Fest																
A lot	27	31,160	1.3%	.7%	2.0%	2.3%	.6%	.7%	1.3%	1.4%	1.5%	.9%	.8%	1.0%	1.2%	2.3%
A little	243	261,499	11.1%	10.8%	11.5%	11.2%	11.6%	10.5%	12.1%	8.0%	9.1%	12.3%	10.6%	10.4%	10.3%	17.6%
Nothing	1,644	2,057,372	87.5%	88.6%	86.6%	86.5%	87.8%	88.8%	86.6%	90.6%	89.3%	86.8%	88.6%	88.7%	88.5%	80.1%
Total	1,914	2,350,031														
d. A STEM Festival																
							**									
A lot	37	40,969	1.7%	1.0%	2.5%	1.6%	.6%	3.2%	1.6%	3.0%	1.4%	1.5%	.5%	1.9%	1.6%	3.1%
A little	198	202,364	8.6%	8.0%	9.2%	5.9%	9.8%	10.7%	8.1%	9.1%	10.6%	8.4%	9.0%	8.7%	8.3%	10.3%
Nothing	1,680	2,106,654	89.6%	91.0%	88.4%	92.4%	89.6%	86.1%	90.3%	87.9%	88.0%	90.1%	90.5%	89.4%	90.1%	86.6%
Total	1,915	2,349,986														

e. Iowa Statewide STEM Conference or Iowa STEM Summit																
							**									
A lot	36	33,217	1.4%	1.5%	1.3%	1.0%	.4%	3.0%	1.1%	1.7%	2.6%	2.0%	1.1%	1.0%	1.5%	.7%
A little	339	365,029	15.5%	13.7%	17.3%	12.4%	14.6%	20.5%	14.7%	17.6%	17.8%	14.0%	13.2%	18.3%	15.1%	18.2%
Nothing	1,539	1,951,088	83.0%	84.8%	81.4%	86.6%	84.9%	76.5%	84.2%	80.7%	79.6%	84.0%	85.6%	80.7%	83.5%	81.1%
Total	1,914	2,349,334														
f. A STEM Academy or STEM School																
							**									
A lot	53	4,8423	2.1%	1.8%	2.3%	1.4%	.9%	4.2%	1.8%	3.5%	2.3%	2.0%	1.4%	3.1%	2.0%	2.1%
A little	316	323,051	13.8%	12.1%	15.3%	9.9%	12.9%	19.8%	12.7%	16.4%	16.6%	10.3%	14.2%	17.0%	13.6%	15.6%
Nothing	1,542	1,974,678	84.2%	86.1%	82.4%	88.7%	86.2%	75.9%	85.5%	80.1%	81.2%	87.7%	84.4%	80.0%	84.4%	82.3%
Total	1,911	2,346,151														

Q4g. I am going to read a list of slogans about STEM education. Please tell me if you've heard the slogan…

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Greatness STEMs from Iowans																
				**												
Yes	256	331,167	14.1%	10.6%	17.5%	13.4%	17.6%	11.3%	12.9%	17.3%	17.5%	15.3%	13.9%	11.3%	14.9%	8.4%
No	1,654	2,013,538	85.9%	89.4%	82.5%	86.6%	82.4%	88.7%	87.1%	82.7%	82.5%	84.7%	86.1%	88.7%	85.1%	91.6%
Total	1,910	2,344,705														
b. Commit2STEM																
Yes	126	147,075	6.3%	5.1%	7.3%	4.0%	7.4%	7.8%	6.0%	7.4%	6.4%	6.8%	5.7%	6.4%	6.5%	4.2%
No	1,783	2,199,392	93.7%	94.9%	92.7%	96.0%	92.6%	92.2%	94.0%	92.6%	93.6%	93.2%	94.3%	93.6%	93.5%	95.8%
Total	1,909	2,346,467														
c. Iowa's future demands STEM																
Yes	188	193,033	8.2%	7.6%	8.8%	6.1%	7.2%	12.1%	7.8%	9.8%	9.0%	8.3%	7.5%	9.4%	8.0%	10.1%
No	1,722	2,153,512	91.8%	92.4%	91.2%	93.9%	92.8%	87.9%	92.2%	90.2%	91.0%	91.7%	92.5%	90.6%	92.0%	89.9%
Total	1,910	2,346,545														

Q4h. Where did you see, hear, or read about the slogan, 'Greatness STEMs from Iowans'?

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
TV	45	62,795	21.8%	25.7%	19.5%	27.8%	19.1%	16.5%	24.9%	24.2%	7.9%	16.8%	29.0%	28.6%	19.8%	47.1%
Magazine	7	8,462	2.9%	.5%	4.3%	4.6%	1.5%	2.7%	1.1%	11.7%	1.7%	4.8%	3.0%	0.0%	3.0%	1.8%
Newspaper	43	38,397	13.3%	10.1%	15.1%	10.0%	15.3%	15.3%	14.0%	10.8%	12.9%	16.4%	11.7%	12.4%	13.6%	9.7%
Billboard	6	6,672	2.3%	4.0%	1.4%	.7%	3.7%	2.6%	1.3%	.6%	7.5%	1.0%	0.0%	7.7%	2.4%	1.4%
Radio	23	38,840	13.5%	23.0%	8.1%	17.4%	10.8%	11.5%	12.8%	9.5%	19.6%	14.6%	13.4%	10.6%	14.0%	6.7%
A school or teacher	19	41,140	14.3%	15.3%	13.6%	27.1%	5.5%	8.4%	18.0%	4.5%	9.3%	19.3%	6.5%	1.7%	15.3%	.4%
Internet or website	27	35,939	12.5%	4.8%	16.7%	.5%	21.5%	16.4%	14.1%	11.6%	7.2%	10.3%	23.1%	8.5%	12.6%	10.3%
A child or student	5	6,199	2.1%	0.0%	3.4%	0.0%	4.4%	1.8%	1.3%	3.8%	3.8%	1.5%	1.7%	4.4%	2.3%	0.0%
A business	5	9,238	3.2%	.6%	4.6%	.7%	6.4%	1.9%	3.6%	2.6%	2.1%	1.0%	.4%	11.2%	3.4%	1.2%
Other [SPECIFY]	40	40,976	14.2%	15.9%	13.2%	11.2%	11.8%	23.0%	8.9%	20.7%	28.1%	14.2%	11.3%	14.8%	13.6%	21.4%
Total	220	288,659														

Q8. Now thinking about jobs that rely on science, technology, engineering, and math skills. As far as you know, would you say there are…

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
							*									
More than enough skilled workers to fill STEM jobs	87	109,334	5.4%	6.7%	4.2%	7.9%	5.0%	2.9%	5.4%	3.5%	7.4%	6.0%	5.9%	4.3%	5.3%	6.7%
Not enough skilled workers to fill STEM jobs	1,386	1,654,099	82.1%	83.3%	80.9%	74.6%	85.2%	87.6%	82.4%	81.5%	81.4%	83.4%	78.0%	86.2%	84.3%	62.5%
Just the right number of skilled workers to fill STEM jobs	174	251,229	12.5%	9.9%	14.9%	17.4%	9.8%	9.5%	12.2%	15.0%	11.3%	10.6%	16.1%	9.5%	10.4%	30.8%
Total	1,647	2,014,662														

Q5. Please tell me whether you strongly agree, agree, disagree, or strongly disagree with each of the following statements.

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Science, technology, and engineering make our lives better.																
							**									
Strongly agree	680	806,092	34.6%	35.5%	33.7%	24.6%	33.4%	48.6%	34.2%	38.0%	33.6%	32.3%	29.9%	43.8%	35.7%	26.3%
Agree	1,155	1,421,356	61.0%	58.7%	63.2%	68.7%	63.5%	48.6%	61.1%	60.2%	61.4%	62.8%	65.9%	52.0%	59.7%	71.2%
Neither agree nor disagree	25	28,409	1.2%	1.2%	1.2%	.7%	1.2%	1.9%	1.3%	1.2%	1.0%	1.6%	.7%	1.4%	1.2%	1.3%
Disagree	38	73,322	3.1%	4.5%	1.8%	6.0%	2.0%	.9%	3.4%	.6%	4.1%	3.3%	3.6%	2.8%	3.4%	1.2%
Strongly disagree	1	691	.0%	.1%	0.0%	0.0%	0.0%	.1%	.0%	0.0%	0.0%	.1%	0.0%	0.0%	.0%	0.0%
Total	1,899	2,329,869														
d. Many more companies would move or expand to Iowa if the state had a reputation for workers with great science and math skills.																
Strongly agree	497	590,473	25.6%	26.4%	24.8%	21.6%	26.5%	29.8%	25.8%	27.6%	22.8%	21.5%	27.7%	30.2%	25.6%	25.8%
Agree	1,134	1,423,829	61.7%	60.7%	62.7%	65.3%	61.6%	57.1%	61.6%	62.2%	61.7%	67.1%	57.3%	57.2%	61.1%	66.8%
Neither agree nor disagree	37	38,057	1.6%	1.6%	1.7%	1.4%	1.6%	2.0%	1.3%	3.2%	2.0%	1.1%	1.4%	2.7%	1.8%	.6%
Disagree	193	236,081	10.2%	9.8%	10.7%	10.5%	9.9%	10.4%	10.4%	6.0%	13.4%	8.9%	13.0%	9.7%	10.6%	6.6%
Strongly disagree	12	18,398	.8%	1.5%	.2%	1.3%	.4%	.7%	.9%	1.0%	.0%	1.4%	.7%	.2%	.9%	.2%
Total	1,873	2,306,838														

f. Increased focus on STEM education in Iowa will improve the state economy.

							**								**	
Strongly agree	457	509,616	22.4%	23.6%	21.3%	16.2%	23.2%	29.5%	21.5%	25.4%	24.2%	20.9%	23.5%	24.7%	23.8%	11.9%
Agree	1,228	1,528,742	67.3%	65.2%	69.4%	74.3%	64.1%	62.5%	67.6%	68.1%	65.2%	68.2%	67.2%	64.8%	65.5%	81.7%
Neither agree nor disagree	48	54,954	2.4%	2.7%	2.1%	2.0%	3.2%	2.1%	2.2%	2.9%	2.8%	2.3%	1.7%	3.1%	2.6%	1.1%
Disagree	120	172,951	7.6%	8.0%	7.3%	7.3%	9.1%	5.9%	8.4%	3.6%	7.3%	8.3%	7.5%	7.0%	7.9%	5.3%
Strongly disagree	5	5,298	.2%	.5%	.0%	.2%	.4%	0.0%	.2%	.0%	.5%	.2%	.1%	.4%	.3%	.0%
Total	1,858	2,271,561														

g. Advancements in science, technology, engineering and math will give more opportunities to the next generation.

							**									
Strongly agree	767	937,368	40.3%	43.0%	37.7%	32.9%	38.5%	51.8%	38.8%	48.4%	40.1%	35.3%	41.7%	45.8%	40.9%	35.9%
Agree	1,093	1,323,781	56.9%	53.9%	59.6%	62.3%	60.5%	45.6%	57.9%	51.0%	57.0%	60.4%	56.8%	52.0%	56.3%	60.9%
Neither agree nor disagree	12	15,006	.6%	.5%	.7%	.7%	.1%	1.2%	.8%	.3%	.2%	.6%	.5%	.6%	.6%	1.0%
Disagree	33	44,195	1.9%	1.9%	1.9%	3.2%	.9%	1.4%	2.1%	.3%	2.5%	2.8%	1.0%	1.6%	1.8%	2.2%
Strongly disagree	2	8,068	.3%	.7%	0.0%	.9%	0.0%	0.0%	.4%	0.0%	.3%	.8%	0.0%	0.0%	.4%	0.0%
Total	1,907	2,328,418														

h. There are more jobs available for people who have good math and science skills.

				**											**	
Strongly agree	481	547,788	23.9%	25.5%	22.3%	20.7%	22.0%	30.1%	22.0%	28.1%	29.3%	24.1%	23.5%	25.0%	25.6%	10.1%
Agree	1,092	1,353,045	59.1%	61.0%	57.2%	58.7%	61.8%	56.3%	60.3%	56.7%	55.0%	57.7%	59.9%	59.2%	57.5%	72.0%
Neither agree nor disagree	33	40,087	1.7%	2.2%	1.3%	2.0%	1.4%	1.8%	1.7%	2.4%	1.6%	2.6%	1.0%	1.3%	1.9%	.6%
Disagree	249	337,827	14.7%	10.3%	19.0%	17.4%	14.5%	11.7%	15.3%	12.5%	13.9%	14.9%	15.3%	13.9%	14.4%	17.2%
Strongly disagree	7	12,430	.5%	1.0%	.1%	1.1%	.3%	.1%	.7%	.3%	.2%	.7%	.3%	.6%	.6%	.0%
Total	1,862	2,291,177														

i. There should be more STEM jobs available for rural Iowans.

Strongly agree	366	398,877	17.6%	18.2%	17.0%	16.0%	15.4%	21.9%	17.6%	14.2%	20.6%	19.8%	14.6%	17.9%	17.8%	15.4%
Agree	1,304	1,659,709	73.2%	70.7%	75.7%	75.1%	76.5%	67.4%	72.9%	77.4%	70.9%	72.1%	76.7%	70.8%	72.6%	79.1%
Neither agree nor disagree	56	53,059	2.3%	2.2%	2.5%	1.3%	2.0%	4.0%	2.1%	2.6%	3.2%	1.8%	2.1%	3.3%	2.4%	2.0%
Disagree	121	150,016	6.6%	8.5%	4.8%	7.5%	5.6%	6.7%	7.1%	5.8%	5.1%	6.2%	6.2%	7.9%	7.0%	3.5%
Strongly disagree	3	4,760	.2%	.4%	0.0%	.1%	.4%	.1%	.2%	0.0%	.3%	.1%	.4%	.1%	.2%	0.0%
Total	1,850	2,266,421														

j. More should be done to increase the number of women working in science, technology, engineering, and math jobs.

				**			**								**	
Strongly agree	586	647,398	28.2%	21.1%	34.7%	21.1%	27.6%	37.7%	28.0%	23.5%	33.2%	24.5%	27.9%	32.9%	28.1%	27.7%
Agree	1,058	1,383,427	60.2%	64.7%	55.9%	68.9%	59.5%	49.8%	61.0%	62.3%	54.1%	60.0%	63.3%	57.6%	59.2%	69.0%
Neither agree nor disagree	57	62,485	2.7%	3.0%	2.5%	1.9%	3.7%	2.6%	2.3%	2.8%	4.8%	3.7%	1.8%	2.5%	2.8%	1.9%
Disagree	155	184,940	8.0%	9.5%	6.7%	6.8%	8.9%	8.7%	7.9%	10.6%	6.5%	10.4%	6.4%	6.4%	8.8%	1.4%
Strongly disagree	15	21,445	.9%	1.7%	.2%	1.3%	.3%	1.2%	.9%	.8%	1.4%	1.4%	.5%	.7%	1.0%	0.0%
Total	1,871	2,299,695														

k. More should be done to increase the number of Hispanics and African Americans working in STEM jobs.

							**						**		**	
Strongly agree	316	317,290	14.1%	13.0%	15.1%	10.8%	12.5%	19.9%	14.3%	11.0%	15.9%	9.9%	16.1%	18.3%	13.2%	21.1%
Agree	1,039	1,327,269	58.9%	59.4%	58.4%	62.5%	56.0%	58.0%	59.0%	61.6%	55.9%	54.8%	62.4%	60.3%	57.3%	71.8%
Neither agree nor disagree	88	90,956	4.0%	4.1%	3.9%	2.9%	4.8%	4.6%	3.9%	3.5%	5.3%	4.7%	2.8%	4.5%	4.4%	1.5%
Disagree	350	460,459	20.4%	20.2%	20.6%	20.9%	24.3%	15.3%	20.2%	22.0%	20.1%	26.9%	16.3%	15.8%	22.4%	5.0%
Strongly disagree	46	57,417	2.5%	3.2%	1.9%	3.0%	2.4%	2.2%	2.6%	2.0%	2.8%	3.6%	2.5%	1.2%	2.7%	.6%
Total	1,839	2,253,390														

l. More people would choose a STEM job if it didn't seem so hard.

															**	
Strongly agree	252	303,031	13.4%	12.4%	14.3%	13.9%	15.2%	10.8%	13.0%	12.2%	15.9%	10.6%	14.0%	16.8%	13.5%	11.7%
Agree	1,129	1,385,627	61.1%	61.6%	60.6%	64.2%	59.6%	58.8%	62.9%	55.9%	57.2%	63.7%	61.9%	54.9%	60.0%	70.7%
Neither agree nor disagree	45	40,346	1.8%	1.8%	1.7%	1.5%	2.1%	1.7%	1.7%	1.1%	2.7%	1.1%	1.2%	3.1%	2.0%	.1%
Disagree	406	522,245	23.0%	23.2%	22.9%	20.0%	21.7%	28.2%	21.6%	30.1%	23.7%	23.8%	22.0%	24.5%	23.7%	16.7%
Strongly disagree	16	17,077	.8%	1.0%	.6%	.5%	1.4%	.5%	.8%	.7%	.4%	.8%	.8%	.7%	.8%	.8%
Total	1,848	2,268,326														

m. It is important for people to understand what engineering contributes to society.

															**	
Strongly agree	615	757,430	32.5%	31.3%	33.6%	29.4%	30.4%	38.7%	32.2%	34.9%	31.6%	30.6%	32.3%	35.8%	32.6%	30.9%
Agree	1,236	1,498,730	64.3%	64.7%	63.8%	66.0%	67.3%	58.8%	64.0%	63.9%	65.9%	66.0%	64.6%	61.0%	64.0%	67.5%
Neither agree nor disagree	12	9,247	.4%	.4%	.4%	.2%	.2%	.9%	.3%	.5%	.6%	.3%	.1%	.8%	.4%	.1%
Disagree	40	65,473	2.8%	3.5%	2.1%	4.4%	2.1%	1.6%	3.4%	.7%	1.7%	3.0%	2.8%	2.5%	3.0%	1.6%
Strongly disagree	2	1,250	.1%	.0%	.1%	.1%	0.0%	.1%	.0%	0.0%	.1%	0.0%	.1%	0.0%	.1%	0.0%
Total	1,905	2,332,130														

n. I cannot follow developments in science and technology because the speed of development is too fast.

							**									
Strongly agree	103	98,823	4.3%	3.6%	5.0%	6.6%	3.9%	2.0%	4.9%	1.9%	3.9%	4.0%	4.7%	4.7%	4.2%	5.9%
Agree	730	835,248	36.6%	34.0%	39.1%	46.3%	35.8%	26.0%	38.8%	29.0%	33.2%	39.6%	37.7%	29.0%	37.2%	31.2%
Neither agree nor disagree	46	51,873	2.3%	1.8%	2.7%	1.9%	2.8%	2.2%	2.5%	1.7%	1.6%	2.2%	2.0%	2.7%	2.5%	.9%
Disagree	845	1,125,783	49.4%	51.6%	47.3%	41.7%	49.7%	58.4%	47.5%	54.9%	53.6%	47.3%	49.5%	54.1%	48.5%	57.3%
Strongly disagree	132	167,665	7.4%	8.9%	5.9%	3.5%	7.8%	11.5%	6.3%	12.6%	7.7%	6.9%	6.1%	9.5%	7.7%	4.7%
Total	1,856	2,279,392														

o. There is an urgent need in Iowa for more resources to be put toward STEM education.

				*			**											
Strongly agree	403	435,959	19.3%	18.2%	20.4%	14.7%	17.8%	26.7%	17.9%	24.6%	21.7%	18.4%	18.0%	22.9%	20.4%	11.2%		
Agree	1,252	1,564,174	69.4%	66.9%	71.7%	71.5%	72.7%	63.2%	70.6%	63.3%	69.1%	67.5%	74.0%	66.2%	68.1%	79.7%		
Neither agree nor disagree	45	48,949	2.2%	1.8%	2.6%	1.9%	2.0%	2.7%	2.0%	3.2%	2.3%	2.1%	1.5%	3.0%	2.3%	1.2%		
Disagree	127	200,200	8.9%	12.8%	5.1%	11.7%	7.1%	7.1%	9.4%	8.9%	6.4%	11.9%	6.3%	7.4%	9.1%	7.3%		
Strongly disagree	6	5,833	.3%	.3%	.2%	.1%	.4%	.2%	.3%	0.0%	.5%	.1%	.2%	.5%	.2%	.6%		
Total	1,833	2,255,115																

p. Science, technology, and engineering are too specialized for most people to understand it.

							**									
Strongly agree	95	128,877	5.6%	4.8%	6.3%	9.0%	4.8%	2.2%	6.5%	3.3%	3.2%	4.7%	5.1%	6.0%	5.7%	4.9%
Agree	743	906,610	39.2%	40.6%	37.8%	54.8%	35.1%	23.7%	40.5%	33.8%	37.5%	40.8%	40.4%	33.8%	37.7%	50.1%
Neither agree nor disagree	32	36,307	1.6%	1.6%	1.5%	1.7%	1.7%	1.3%	1.2%	2.5%	2.5%	2.2%	.8%	1.3%	1.6%	1.3%
Disagree	911	1,113,624	48.1%	45.9%	50.1%	31.7%	51.7%	64.8%	46.0%	55.7%	51.5%	47.8%	46.7%	52.6%	49.4%	38.4%
Strongly disagree	105	129,955	5.6%	7.0%	4.3%	2.8%	6.6%	8.0%	5.8%	4.8%	5.3%	4.5%	7.0%	6.3%	5.7%	5.4%
Total	1,886	2,315,373														

Q6. Compared to a year ago, would you say that Iowa K-12 student achievement in science is higher, about the same or lower than it was previously?

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
Higher	323	425,869	21.3%	20.5%	22.1%	25.5%	22.0%	15.4%	21.4%	24.5%	18.2%	21.7%	22.4%	18.6%	20.9%	25.9%
About the same	982	1,157,794	58.0%	58.9%	57.3%	55.6%	55.1%	64.2%	57.2%	54.7%	64.7%	57.3%	59.1%	58.5%	58.6%	52.9%
Lower	321	411,235	20.6%	20.6%	20.6%	18.8%	22.9%	20.4%	21.4%	20.8%	17.2%	21.1%	18.5%	22.9%	20.5%	21.2%
Total	1,626	1,994,898														

Q7. Compared to a year ago, would you say that Iowa K-12 student achievement in math is higher, about the same or lower than it was previously?

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
Higher	327	400,779	19.6%	18.3%	20.8%	23.8%	16.3%	17.4%	17.7%	25.5%	22.6%	21.2%	18.5%	17.8%	19.0%	25.1%
About the same	989	1,169,054	57.1%	59.2%	55.3%	51.6%	59.3%	62.1%	58.3%	51.4%	57.3%	54.8%	61.2%	57.0%	57.8%	51.2%
Lower	365	476,652	23.3%	22.5%	24.0%	24.6%	24.4%	20.5%	24.1%	23.2%	20.0%	24.0%	20.3%	25.2%	23.2%	23.8%
Total	1,681	2,046,485														

Q9. How well do you think the schools in your community are teaching each of the following subjects?

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Mathematics																
Excellent	266	302,601	13.6%	13.9%	13.4%	13.9%	11.3%	15.8%	11.8%	15.4%	20.4%	12.8%	17.2%	12.1%	12.9%	19.4%
Good	840	998,207	45.0%	41.7%	48.0%	47.3%	46.5%	40.2%	44.4%	49.9%	43.0%	47.1%	48.2%	38.6%	46.6%	33.6%
Fair	508	671,075	30.2%	34.3%	26.5%	27.5%	32.0%	31.9%	32.1%	23.8%	27.2%	30.5%	24.9%	35.1%	29.7%	33.9%
Poor	201	247,655	11.2%	10.1%	12.1%	11.4%	10.2%	12.1%	11.6%	10.8%	9.4%	9.5%	9.7%	14.2%	10.7%	13.1%
Total	1,815	2,219,538														
b. Science																
Excellent	223	256,049	11.7%	8.9%	14.3%	11.9%	9.5%	13.7%	10.2%	13.2%	17.0%	11.7%	12.6%	9.9%	11.9%	9.6%
Good	892	1,069,864	48.7%	49.2%	48.3%	52.8%	47.7%	44.5%	48.6%	46.6%	51.2%	49.3%	50.2%	46.3%	47.8%	57.8%
Fair	548	706,468	32.2%	34.4%	30.1%	28.5%	35.4%	33.3%	33.6%	30.8%	27.1%	31.3%	32.0%	34.0%	32.9%	25.1%
Poor	144	163,911	7.5%	7.5%	7.4%	6.8%	7.4%	8.5%	7.7%	9.4%	4.7%	7.7%	5.2%	9.8%	7.4%	7.5%
Total	1,807	2,196,293														
c. Social studies such as history, American studies, or government										**						
Excellent	195	218,032	9.9%	8.8%	10.9%	11.5%	7.1%	10.5%	8.7%	12.0%	13.5%	9.0%	12.0%	7.2%	9.5%	13.0%
Good	829	972,834	44.2%	43.6%	44.8%	44.8%	40.5%	47.9%	42.0%	46.9%	51.9%	50.3%	39.9%	40.7%	44.9%	40.0%
Fair	537	715,335	32.5%	34.0%	31.0%	31.4%	36.9%	29.0%	34.7%	27.9%	26.3%	29.3%	34.3%	35.6%	31.8%	36.8%
Poor	241	295,885	13.4%	13.6%	13.3%	12.4%	15.4%	12.6%	14.6%	13.2%	8.3%	11.4%	13.9%	16.5%	13.8%	10.2%
Total	1,802	2,202,086														
d. English, language arts and reading										**						
Excellent	318	361,301	16.3%	13.7%	18.7%	17.6%	14.2%	16.7%	13.3%	21.8%	25.0%	14.9%	21.2%	12.8%	16.8%	12.5%
Good	864	1,041,591	47.0%	45.3%	48.6%	46.6%	45.2%	50.0%	46.7%	48.1%	47.5%	50.6%	45.0%	43.8%	46.1%	55.7%
Fair	469	599,952	27.1%	30.1%	24.2%	27.2%	28.3%	25.5%	29.3%	22.0%	21.5%	24.9%	25.8%	32.3%	27.5%	23.2%
Poor	172	212,759	9.6%	10.8%	8.5%	8.6%	12.3%	7.7%	10.7%	8.1%	6.0%	9.6%	8.0%	11.2%	9.6%	8.6%
Total	1,823	2,215,603														

e. Designing, creating, and building machines and devices, also called engineering																
Excellent	144	141,786	6.6%	7.4%	5.8%	7.8%	6.0%	5.7%	6.0%	6.7%	9.5%	5.6%	8.2%	5.7%	6.3%	9.0%
Good	543	649,548	30.3%	29.8%	30.9%	35.8%	28.4%	25.0%	31.0%	29.0%	28.4%	28.7%	36.1%	27.0%	29.5%	38.0%
Fair	618	774,133	36.1%	37.2%	35.1%	34.1%	35.2%	40.3%	36.6%	32.0%	37.8%	35.2%	33.6%	39.4%	37.1%	30.2%
Poor	432	576,108	26.9%	25.6%	28.2%	22.3%	30.4%	29.0%	26.4%	32.2%	24.3%	30.5%	22.0%	27.9%	27.2%	22.9%
Total	1,737	2,141,574														
f. Computers and technology																
Excellent	366	401,889	18.1%	16.3%	19.8%	20.3%	16.4%	16.9%	17.0%	20.4%	21.1%	18.4%	19.9%	16.0%	18.5%	14.7%
Good	910	1,086,871	48.9%	49.5%	48.4%	49.2%	48.8%	48.7%	51.1%	41.9%	45.0%	49.4%	47.2%	48.0%	49.3%	46.5%
Fair	425	551,355	24.8%	24.6%	25.0%	21.7%	25.9%	27.7%	24.1%	26.9%	26.4%	25.4%	25.0%	25.2%	24.6%	27.1%
Poor	118	181,423	8.2%	9.7%	6.7%	8.8%	8.9%	6.6%	7.8%	10.7%	7.5%	6.8%	7.9%	10.8%	7.7%	11.6%
Total	1,819	2,221,538														
g. Foreign languages									**						**	
Excellent	115	124,117	5.8%	5.6%	6.1%	5.9%	5.5%	6.0%	5.3%	5.6%	8.5%	3.7%	7.9%	6.9%	5.8%	5.4%
Good	612	736,329	34.7%	35.3%	34.1%	35.2%	33.8%	34.9%	32.4%	37.3%	43.0%	32.7%	36.2%	33.3%	34.1%	40.0%
Fair	642	775,612	36.5%	37.5%	35.7%	34.5%	36.8%	39.0%	38.0%	31.9%	34.0%	39.7%	31.5%	38.5%	38.3%	23.6%
Poor	367	486,750	22.9%	21.7%	24.1%	24.4%	23.9%	20.1%	24.4%	25.3%	14.6%	23.8%	24.4%	21.3%	21.7%	31.0%
Total	1,736	2,122,808														
h. Art																
Excellent	198	219,168	10.1%	8.1%	12.0%	10.2%	8.9%	11.3%	9.6%	14.2%	8.7%	9.4%	10.7%	10.9%	10.0%	10.8%
Good	777	887,442	41.0%	41.6%	40.5%	46.1%	36.7%	39.7%	38.8%	46.3%	46.7%	42.9%	45.2%	31.8%	40.2%	50.0%
Fair	607	812,666	37.6%	38.1%	37.1%	34.1%	39.2%	40.2%	39.2%	31.7%	35.7%	35.7%	34.4%	45.3%	38.6%	28.7%
Poor	198	243,090	11.2%	12.1%	10.4%	9.7%	15.1%	8.8%	12.4%	7.8%	8.9%	11.9%	9.7%	12.0%	11.3%	10.4%
Total	1,780	2,162,367														
i. Music									**							
Excellent	332	382,433	17.5%	14.9%	19.9%	16.9%	16.5%	19.6%	16.4%	15.2%	24.5%	16.3%	22.8%	13.5%	18.1%	12.1%
Good	805	925,033	42.4%	41.2%	43.5%	43.6%	39.7%	43.7%	40.2%	51.9%	44.1%	45.2%	40.7%	40.3%	42.0%	46.7%
Fair	481	650,142	29.8%	30.9%	28.7%	29.2%	32.4%	27.6%	31.7%	25.7%	24.4%	28.0%	29.6%	32.1%	29.9%	28.7%
Poor	173	225,603	10.3%	13.0%	7.9%	10.4%	11.4%	9.1%	11.7%	7.3%	7.0%	10.6%	6.9%	14.2%	10.0%	12.4%
Total	1,791	2,183,211														

Q10. For each of the following topics or skills that might be taught during K-12 grades, please tell me whether you think it is absolutely essential, important but not essential or is not important to learn before graduating from high school.

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Basic math							**								*	
Absolutely essential	1,696	2,062,223	88.2%	86.2%	90.1%	82.2%	89.3%	94.9%	87.5%	89.5%	90.5%	87.8%	89.7%	90.8%	89.6%	78.1%
Important but not essential	208	267,253	11.4%	13.3%	9.6%	17.3%	10.4%	4.9%	12.1%	10.1%	9.3%	12.1%	9.9%	8.8%	10.1%	21.5%
Not important	7	7,599	.3%	.4%	.2%	.5%	.3%	.2%	.3%	.3%	.2%	.1%	.4%	.5%	.3%	.4%
Total	1,911	2,337,075														
b. Basic scientific ideas and principles							**									
Absolutely essential	1,283	1,546,971	66.4%	64.0%	68.6%	52.8%	70.6%	78.3%	65.8%	67.7%	67.9%	65.6%	66.6%	70.3%	67.5%	56.3%
Important but not essential	601	742,836	31.9%	33.9%	30.0%	43.3%	28.4%	21.6%	32.1%	31.3%	31.2%	32.8%	31.8%	27.3%	30.7%	41.8%
Not important	21	41,430	1.8%	2.2%	1.4%	3.9%	1.0%	.0%	2.1%	1.0%	.9%	1.6%	1.5%	2.3%	1.8%	1.8%
Total	1,905	2,331,237														
c. Advanced sciences such as physics							**									
Absolutely essential	604	666,120	28.5%	26.2%	30.7%	25.9%	30.0%	30.3%	29.1%	28.8%	25.5%	29.2%	28.8%	28.5%	27.3%	38.9%
Important but not essential	1,181	1,506,894	64.6%	66.9%	62.4%	64.3%	63.0%	66.5%	63.5%	65.7%	68.7%	63.6%	67.0%	62.9%	65.8%	55.0%
Not important	118	160,940	6.9%	6.9%	6.9%	9.8%	7.0%	3.2%	7.4%	5.5%	5.8%	7.2%	4.2%	8.6%	6.9%	6.1%
Total	1,903	2,333,954														

d. Advanced math such as calculus						**									**	
Absolutely essential	527	578,006	25.0%	23.4%	26.4%	28.3%	24.8%	20.7%	25.1%	25.6%	23.6%	23.9%	26.9%	24.8%	23.2%	40.4%
Important but not essential	1,201	1,520,493	65.6%	66.9%	64.5%	60.6%	64.4%	73.7%	65.5%	65.8%	66.2%	65.8%	64.8%	66.4%	66.8%	56.0%
Not important	168	217,686	9.4%	9.7%	9.1%	11.2%	10.8%	5.6%	9.4%	8.6%	10.2%	10.3%	8.3%	8.8%	10.0%	3.6%
Total	1,896	2,316,186														

e. Using technology to support learning							**										
Absolutely essential	1,309	1,586,867	67.8%	63.7%	71.8%	56.7%	72.6%	76.6%	67.4%	69.4%	68.5%	66.5%	67.0%	74.3%	68.7%	61.5%
Important but not essential	558	690,877	29.5%	33.4%	25.8%	38.4%	26.5%	21.7%	29.9%	28.4%	28.8%	31.5%	29.2%	23.2%	28.6%	36.8%
Not important	37	62,033	2.7%	2.9%	2.4%	4.9%	1.0%	1.7%	2.7%	2.2%	2.7%	2.0%	3.8%	2.5%	2.8%	1.7%
Total	1,904	2,339,776														
f. Engineering and industrial technology principles																
Absolutely essential	633	735,327	31.6%	31.3%	31.9%	32.4%	34.1%	27.5%	32.9%	29.8%	26.9%	29.8%	32.9%	34.2%	30.3%	41.8%
Important but not essential	1,174	1,458,344	62.7%	63.1%	62.2%	60.1%	60.5%	68.7%	60.9%	64.7%	69.6%	63.4%	63.2%	60.1%	64.3%	50.2%
Not important	94	133,262	5.7%	5.5%	5.9%	7.5%	5.4%	3.8%	6.2%	5.4%	3.5%	6.9%	3.9%	5.6%	5.4%	8.0%
Total	1,901	2,326,934														

Q11. What do you think are the primary barriers to STEM education?

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Parents do not encourage students to study math																
Checked	47	45,654	1.9%	1.1%	2.8%	1.5%	2.1%	2.3%	2.0%	1.9%	1.6%	1.9%	1.7%	2.4%	2.0%	1.4%
b. Parents do not encourage students to study science																
Checked	47	48,612	2.1%	1.2%	2.9%	1.6%	2.0%	2.7%	1.9%	3.0%	1.8%	2.1%	2.0%	2.3%	2.2%	1.1%
c. There are not enough qualified teachers																
Checked	222	221,360	9.4%	9.0%	9.8%	7.1%	8.2%	13.6%	8.7%	10.1%	12.1%	8.9%	10.3%	9.8%	9.9%	5.6%
d. There are not enough talented teachers																
Checked	85	88736	3.8%	2.9%	4.6%	4.8%	2.8%	3.6%	4.0%	3.3%	3.3%	4.4%	4.3%	2.7%	4.0%	2.2%
e. Students think math is not relevant to their lives																
Checked	55	58,839	2.5%	2.9%	2.1%	2.5%	2.1%	2.9%	2.9%	1.4%	1.4%	1.6%	3.6%	2.9%	2.3%	3.9%
f. Students think science is not relevant to their lives																
Checked	53	50,194	2.1%	2.2%	2.1%	2.2%	1.0%	3.4%	2.3%	1.6%	1.8%	1.6%	3.0%	2.2%	2.1%	2.3%
g. Students think math is too hard																
Checked	64	81,667	3.5%	3.6%	3.3%	2.2%	3.9%	4.6%	3.5%	3.2%	3.4%	2.4%	4.5%	4.1%	3.4%	4.1%
h. Students think science is too hard																
Checked	50	61,250	2.6%	2.5%	2.7%	1.4%	3.0%	3.8%	2.4%	3.1%	3.4%	1.9%	3.0%	3.3%	2.7%	1.8%
i. Students are not willing to study enough to do well																
Checked	45	44,508	1.9%	1.5%	2.3%	1.6%	1.3%	3.0%	2.0%	1.1%	1.9%	1.6%	2.7%	1.6%	1.9%	2.0%
j. Other [SPECIFY]																
Checked	1,333	1,573,860	67.0%	68.4%	65.6%	52.7%	71.4%	80.4%	65.8%	68.6%	71.1%	64.3%	66.0%	73.8%	68.4%	54.3%
k. Don't know/Not sure																
Checked	371	558,609	23.8%	23.4%	24.1%	36.4%	21.2%	10.1%	24.7%	22.4%	20.5%	26.6%	23.7%	17.6%	22.2%	37.2%

Q12. I'm going to read some statements about STEM education. Please tell me whether you strongly agree, agree, disagree, or strongly disagree with each of the following statements.

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. It is more important for students to graduate from high school with strong skills in reading and writing than it is to have strong skills in math and science.																
							**			**						
Strongly agree	181	209,849	9.1%	8.7%	9.5%	14.3%	5.9%	5.9%	10.3%	4.7%	7.3%	8.1%	9.7%	10.1%	9.1%	8.1%
Agree	526	655,718	28.4%	30.6%	26.4%	29.7%	29.0%	26.1%	30.7%	22.5%	22.7%	28.3%	28.8%	27.0%	27.3%	38.0%
Neither agree nor disagree	100	117,408	5.1%	5.1%	5.1%	3.4%	6.0%	6.3%	3.9%	10.7%	5.9%	3.4%	7.0%	5.5%	5.3%	3.4%
Disagree	945	1,152,019	50.0%	48.2%	51.6%	47.2%	52.1%	51.3%	48.1%	53.7%	55.7%	53.2%	48.5%	47.4%	50.4%	46.3%
Strongly disagree	133	171,294	7.4%	7.5%	7.4%	5.5%	7.0%	10.5%	7.0%	8.4%	8.4%	7.0%	6.0%	10.0%	7.9%	4.2%
Total	1,885	2,306,288														
b. Advanced math and science courses teach important critical thinking skills.							**									
Strongly agree	662	795,651	34.4%	34.3%	34.5%	29.2%	30.3%	45.0%	33.4%	38.7%	35.6%	31.6%	40.9%	33.5%	34.8%	30.8%
Agree	1,144	1,409,383	60.9%	59.1%	62.6%	66.9%	64.2%	50.3%	61.4%	56.9%	62.2%	62.3%	56.2%	61.8%	60.3%	67.1%
Neither agree nor disagree	5	3,647	.2%	.2%	.1%	.2%	.1%	.2%	.2%	.1%	0.0%	.3%	0.0%	.2%	.1%	.4%
Disagree	68	101,566	4.4%	6.1%	2.7%	3.6%	5.3%	4.4%	4.9%	4.2%	2.1%	5.7%	2.9%	4.4%	4.7%	1.6%
Strongly disagree	5	2,743	.1%	.2%	.1%	.1%	.1%	.1%	.1%	0.0%	.1%	.1%	.1%	.1%	.1%	.1%
Total	1,884	2,312,990														

c. Overall, the quality of STEM education in Iowa is high.																
Strongly agree	75	60,968	3.0%	1.9%	4.1%	4.6%	1.3%	3.1%	3.0%	2.1%	4.2%	3.9%	2.3%	2.7%	2.4%	7.8%
Agree	872	1,110,124	55.5%	57.4%	53.5%	57.7%	56.6%	51.2%	57.3%	53.0%	49.3%	55.0%	59.8%	48.6%	54.9%	60.1%
Neither agree nor disagree	64	77,331	3.9%	4.2%	3.6%	3.0%	3.8%	5.1%	3.7%	5.1%	3.7%	3.9%	2.7%	5.2%	4.1%	2.0%
Disagree	592	721,202	36.0%	35.3%	36.7%	33.4%	37.4%	38.0%	34.8%	37.5%	40.1%	35.5%	34.1%	41.2%	36.8%	29.4%
Strongly disagree	35	32,069	1.6%	1.2%	2.0%	1.3%	.9%	2.6%	1.2%	2.4%	2.6%	1.6%	1.0%	2.3%	1.7%	.7%
Total	1,638	2,001,694														
d. Iowa colleges and universities are doing a good job preparing STEM teachers.															**	
Strongly agree	91	98,712	5.4%	6.2%	4.6%	6.4%	4.3%	5.6%	5.6%	5.5%	4.7%	5.6%	5.2%	5.8%	5.4%	5.9%
Agree	961	,190,866	65.4%	66.4%	64.5%	67.3%	68.3%	59.9%	65.2%	65.7%	66.3%	64.5%	63.2%	67.8%	64.6%	70.5%
Neither agree nor disagree	65	68,511	3.8%	2.9%	4.6%	1.9%	4.2%	5.6%	2.8%	7.1%	5.3%	4.3%	3.5%	3.3%	4.2%	1.1%
Disagree	323	422,599	23.2%	22.4%	24.1%	22.7%	21.4%	25.7%	24.4%	20.9%	20.1%	23.4%	25.4%	21.5%	23.3%	22.3%
Strongly disagree	33	39,284	2.2%	2.1%	2.2%	1.7%	1.7%	3.2%	2.1%	.9%	3.6%	2.2%	2.7%	1.6%	2.5%	.1%
Total	1,473	1,819,972														
e. Iowa colleges and universities are doing a good job preparing students for careers in STEM fields.																
Strongly agree	203	227,567	11.3%	10.6%	12.1%	10.1%	10.1%	14.4%	11.2%	11.6%	11.9%	9.8%	12.8%	12.7%	11.9%	7.4%
Agree	1,152	1,421,348	70.8%	70.6%	71.0%	71.7%	71.6%	68.5%	70.0%	72.9%	73.0%	70.9%	71.9%	68.2%	70.6%	72.0%
Neither agree nor disagree	38	38,121	1.9%	1.7%	2.1%	1.6%	1.4%	2.9%	1.6%	3.0%	2.3%	1.8%	1.2%	2.8%	2.0%	1.3%
Disagree	220	297,390	14.8%	16.1%	13.5%	15.5%	15.5%	13.3%	16.1%	11.9%	11.1%	16.2%	13.6%	14.8%	14.3%	18.5%
Strongly disagree	16	22,654	1.1%	1.0%	1.3%	1.1%	1.4%	.8%	1.1%	.6%	1.8%	1.4%	.5%	1.5%	1.2%	.7%
Total	1,629	2,007,079														

f. Too few racial and ethnic minority students are encouraged to study STEM topics.																
							**								**	
Strongly agree	192	185,207	9.3%	7.4%	11.1%	6.1%	7.7%	15.1%	10.0%	6.9%	8.3%	8.6%	7.8%	12.3%	8.9%	12.0%
Agree	787	960,139	48.1%	46.1%	50.0%	54.3%	46.9%	41.4%	48.9%	46.4%	46.1%	46.2%	50.6%	45.7%	47.8%	51.4%
Neither agree nor disagree	42	45,512	2.3%	2.8%	1.8%	.9%	3.0%	3.3%	1.9%	3.4%	2.8%	2.1%	1.9%	3.1%	2.5%	.6%
Disagree	559	714,839	35.8%	36.9%	34.8%	32.5%	39.0%	36.6%	33.8%	40.2%	41.2%	39.5%	33.4%	34.7%	37.7%	22.5%
Strongly disagree	51	89,613	4.5%	6.8%	2.3%	6.2%	3.4%	3.7%	5.4%	3.1%	1.5%	3.6%	6.3%	4.2%	3.2%	13.6%
Total	1,631	1,995,311														
g. Too few female students are encouraged to study STEM topics.							*						**		**	
Strongly agree	245	260,594	12.4%	10.2%	14.5%	8.9%	9.7%	19.6%	11.8%	13.9%	14.2%	10.3%	10.6%	16.5%	13.0%	7.9%
Agree	849	1,056,955	50.4%	50.3%	50.5%	55.3%	50.4%	44.2%	52.8%	44.2%	45.0%	47.1%	57.3%	48.1%	48.5%	65.2%
Neither agree nor disagree	38	35,604	1.7%	1.9%	1.5%	1.6%	1.9%	1.7%	1.6%	2.2%	1.7%	1.2%	1.4%	2.8%	1.7%	2.0%
Disagree	553	694,904	33.1%	34.4%	32.0%	32.0%	35.6%	32.0%	31.3%	38.1%	37.1%	37.4%	29.0%	31.7%	34.2%	24.6%
Strongly disagree	34	49,306	2.4%	3.3%	1.5%	2.2%	2.4%	2.5%	2.6%	1.6%	1.9%	3.9%	1.8%	.8%	2.6%	.3%
Total	1,719	2,097,363														

Q13. I am going to read a list of strategies that might impact math and science education. For each one, please tell me if you think it would or would not improve math and science education.

	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Businesses provided internships so high school students can gain practical job skills.																
				**												
Improve	1,814	2,210,692	95.6%	93.6%	97.5%	96.6%	95.7%	94.3%	95.6%	95.6%	95.7%	95.5%	96.4%	94.7%	96.0%	93.1%
Not improve	78	102,092	4.4%	6.4%	2.5%	3.4%	4.3%	5.7%	4.4%	4.4%	4.3%	4.5%	3.6%	5.3%	4.0%	6.9%
Total	1,892	2,312,784														
b. Students who are struggling with math or science were required to spend extra time after school or during the summer to catch up.																
															**	
Improve	1,505	1,820,321	79.1%	79.4%	78.8%	80.3%	79.2%	77.3%	79.5%	76.5%	79.5%	78.2%	81.0%	77.9%	77.2%	93.6%
Not improve	368	480,876	20.9%	20.6%	21.2%	19.7%	20.8%	22.7%	20.5%	23.5%	20.5%	21.8%	19.0%	22.1%	22.8%	6.4%
Total	1,873	2,301,197														
c. All high school students were required to take a science class that includes lab work.																
Improve	1,736	2,127,231	92.3%	94.2%	90.6%	91.3%	92.9%	92.9%	92.5%	93.7%	90.2%	92.6%	94.4%	90.1%	92.3%	93.1%
Not improve	144	176,417	7.7%	5.8%	9.4%	8.7%	7.1%	7.1%	7.5%	6.3%	9.8%	7.4%	5.6%	9.9%	7.7%	6.9%
Total	1,880	2,303,648														
d. We made sure that all Iowa students have the opportunity to take a full range of math courses.																
Improve	1,793	2,204,850	95.7%	95.1%	96.2%	96.1%	94.6%	96.4%	96.1%	95.1%	94.1%	95.6%	96.1%	95.6%	95.6%	96.4%
Not improve	88	99,268	4.3%	4.9%	3.8%	3.9%	5.4%	3.6%	3.9%	4.9%	5.9%	4.4%	3.9%	4.4%	4.4%	3.6%
Total	1,881	2,304,117														
e. Students were required to pass challenging tests in math and science in order to graduate from high school.																
Improve	1,350	1,628,480	71.7%	75.9%	67.8%	75.1%	73.3%	65.6%	73.3%	72.7%	63.0%	76.4%	68.9%	67.5%	72.1%	68.4%
Not improve	505	641,950	28.3%	24.1%	32.2%	24.9%	26.7%	34.4%	26.7%	27.3%	37.0%	23.6%	31.1%	32.5%	27.9%	31.6%
Total	1,855	2,270,430														

f. Fast learners were grouped together in one class and slower learners in another class.																
Improve	1,218	1,473,723	65.9%	70.0%	62.0%	66.0%	63.7%	68.1%	65.3%	66.6%	68.1%	67.6%	66.4%	63.4%	66.8%	60.4%
Not improve	614	763,112	34.1%	30.0%	38.0%	34.0%	36.3%	31.9%	34.7%	33.4%	31.9%	32.4%	33.6%	36.6%	33.2%	39.6%
Total	1,832	2,236,836														
g. We made sure that all Iowa students have the opportunity to take a full range of science courses.																
							**									
Improve	1,791	2,176,245	95.1%	94.4%	95.8%	93.0%	94.9%	98.0%	95.1%	95.8%	94.7%	95.9%	94.4%	94.7%	95.0%	96.4%
Not improve	84	112,083	4.9%	5.6%	4.2%	7.0%	5.1%	2.0%	4.9%	4.2%	5.3%	4.1%	5.6%	5.3%	5.0%	3.6%
Total	1,875	2,288,327														
h. Math and science teachers were paid more than other teachers.																
				**												
Improve	742	855,200	39.2%	44.5%	34.2%	38.2%	39.6%	39.6%	39.5%	39.9%	37.0%	35.8%	40.4%	44.4%	39.5%	38.0%
Not improve	1,038	1,326,885	60.8%	55.5%	65.8%	61.8%	60.4%	60.4%	60.5%	60.1%	63.0%	64.2%	59.6%	55.6%	60.5%	62.0%
Total	1,780	2,182,085														
i. Every school building had high-speed Internet access.																
Improve	1,592	1,900,084	83.8%	81.6%	85.9%	80.2%	84.9%	87.0%	83.6%	83.8%	85.0%	84.7%	83.2%	85.4%	84.4%	79.3%
Not improve	265	366,365	16.2%	18.4%	14.1%	19.8%	15.1%	13.0%	16.4%	16.2%	15.0%	15.3%	16.8%	14.6%	15.6%	20.7%
Total	1,857	2,266,449														
j. More hands-on science and technology activities were available to elementary students.																
Improve	1,825	2,230,859	96.0%	95.7%	96.3%	94.0%	97.1%	97.4%	95.5%	98.7%	96.4%	94.5%	97.6%	96.5%	95.8%	97.7%
Not improve	68	91,803	4.0%	4.3%	3.7%	6.0%	2.9%	2.6%	4.5%	1.3%	3.6%	5.5%	2.4%	3.5%	4.2%	2.3%
Total	1,893	2,322,662														

Q13_1. Would you say that would make a major or moderate improvement? (Among respondents who answered 'Improve…' to preceding question)	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a1. Businesses provided internships so high school students can gain practical job skills.																
Major improvement	1,287	1,568,519	71.3%	69.1%	73.4%	72.3%	71.7%	69.9%	71.7%	69.1%	71.5%	67.9%	73.5%	73.5%	70.7%	76.5%
Moderate improvement	516	63,0299	28.7%	30.9%	26.6%	27.7%	28.3%	30.1%	28.3%	30.9%	28.5%	32.1%	26.5%	26.5%	29.3%	23.5%
Total	1,803	2,198,818														
b1. Students who are struggling with math or science were required to spend extra time after school or during the summer to catch up.																
Major improvement	855	1,015,619	56.0%	53.7%	58.3%	65.2%	51.7%	48.6%	55.5%	59.4%	55.7%	52.7%	56.4%	58.9%	54.0%	68.5%
Moderate improvement	640	796,823	44.0%	46.3%	41.7%	34.8%	48.3%	51.4%	44.5%	40.6%	44.3%	47.3%	43.6%	41.1%	46.0%	31.5%
Total	1,495	1,812,442														
c1. All high school students were required to take a science class that includes lab work.																
Major improvement	951	1,149,155	54.2%	54.7%	53.8%	53.9%	51.4%	57.5%	54.7%	54.0%	52.2%	51.2%	54.5%	59.2%	52.1%	72.0%
Moderate improvement	778	970,120	45.8%	45.3%	46.2%	46.1%	48.6%	42.5%	45.3%	46.0%	47.8%	48.8%	45.5%	40.8%	47.9%	28.0%
Total	1,729	,2119,275														
d1. We made sure that all Iowa students have the opportunity to take a full range of math courses.																
Major improvement	1,117	1,356,313	61.8%	60.3%	63.2%	59.6%	63.8%	62.3%	63.2%	59.5%	57.0%	58.9%	62.4%	64.0%	59.9%	77.0%
Moderate improvement	666	837,449	38.2%	39.7%	36.8%	40.4%	36.2%	37.7%	36.8%	40.5%	43.0%	41.1%	37.6%	36.0%	40.1%	23.0%
Total	1,783	2,193,762														

e1. Students were required to pass challenging tests in math and science in order to graduate from high school.

Major improvement	714	837,135	51.7%	51.7%	51.7%	51.3%	54.5%	48.6%	53.1%	52.5%	42.8%	49.5%	51.3%	54.0%	49.7%	68.0%
Moderate improvement	630	783,108	48.3%	48.3%	48.3%	48.7%	45.5%	51.4%	46.9%	47.5%	57.2%	50.5%	48.7%	46.0%	50.3%	32.0%
Total	1,344	1,620,243														

f1. Fast learners were grouped together in one class and slower learners in another class.																
Major improvement	709	829,579	56.5%	57.7%	55.4%	54.2%	59.4%	56.5%	56.6%	58.4%	54.8%	57.7%	56.3%	56.1%	56.7%	54.0%
Moderate improvement	504	637,601	43.5%	42.3%	44.6%	45.8%	40.6%	43.5%	43.4%	41.6%	45.2%	42.3%	43.7%	43.9%	43.3%	46.0%
Total	1,213	1,467,180														
g1. We made sure that all Iowa students have the opportunity to take a full range of science courses.																
Major improvement	1,076	1,270,949	58.7%	58.3%	59.1%	58.7%	57.4%	60.0%	58.4%	62.7%	56.6%	54.8%	59.8%	62.0%	56.7%	74.6%
Moderate improvement	706	894,684	41.3%	41.7%	40.9%	41.3%	42.6%	40.0%	41.6%	37.3%	43.4%	45.2%	40.2%	38.0%	43.3%	25.4%
Total	1,782	2,165,633														
h1. Math and science teachers were paid more than other teachers.																
Major improvement	322	320,912	37.8%	35.0%	41.1%	37.4%	32.9%	42.7%	38.2%	40.5%	32.9%	34.5%	36.9%	42.3%	35.4%	59.9%
Moderate improvement	417	529,088	62.2%	65.0%	58.9%	62.6%	67.1%	57.3%	61.8%	59.5%	67.1%	65.5%	63.1%	57.7%	64.6%	40.1%
Total	739	850,000														
i1. Every school building had high-speed Internet access.																
Major improvement	1,073	1,245,735	66.1%	65.9%	66.2%	66.7%	68.3%	62.7%	66.7%	66.4%	63.0%	63.7%	68.1%	66.9%	64.2%	82.9%
Moderate improvement	511	639,733	33.9%	34.1%	33.8%	33.3%	31.7%	37.3%	33.3%	33.6%	37.0%	36.3%	31.9%	33.1%	35.8%	17.1%
Total	1,584	1,885,468														
j1. More hands-on science and technology activities were available to elementary students.																
Major improvement	1,375	1,656,769	74.5%	71.3%	77.5%	72.1%	75.5%	76.6%	73.5%	80.3%	73.8%	70.8%	78.4%	75.5%	74.2%	77.8%
Moderate improvement	445	567,898	25.5%	28.7%	22.5%	27.9%	24.5%	23.4%	26.5%	19.7%	26.2%	29.2%	21.6%	24.5%	25.8%	22.2%
Total	1,820	2,2246,67														

Q13z. Overall, how supportive, if at all, are you of state efforts to devote resources and develop initiatives to promote STEM education in Iowa?																
	Total			Gender		Education			Parent Status			Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS/ Less	Some College	BA or More	No children/ no school aged children	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
							**						**			
Very supportive	905	1,026,341	44.4%	42.1%	46.7%	33.9%	46.0%	56.2%	44.4%	43.8%	45.2%	39.6%	44.2%	52.6%	44.0%	48.4%
Somewhat supportive	759	1,000,702	43.3%	45.3%	41.4%	48.5%	43.4%	36.5%	43.4%	44.2%	41.9%	44.1%	46.7%	38.3%	43.7%	40.0%
Neither supportive or opposed	150	196,226	8.5%	7.7%	9.3%	10.3%	9.0%	5.8%	7.8%	10.3%	10.3%	10.7%	5.2%	7.8%	8.7%	7.3%
Somewhat opposed,	43	40,579	1.8%	1.5%	2.0%	2.8%	1.2%	.9%	2.0%	.8%	1.3%	2.7%	1.9%	.4%	1.7%	2.5%
Very opposed	26	47,061	2.0%	3.5%	.7%	4.6%	.5%	.6%	2.4%	.8%	1.3%	2.9%	2.0%	.9%	2.1%	1.8%
Total	1,883	2,310,908														

Questionnaire items 14-17 not reported. These items were used to randomly select a target child for questions in the parent module.

Q14 (recoded). Final Classification of Parent Status

	n	Pop. est. n	Valid %
No children/no school aged children	1,115	1,695,984	72.1%
Child 3-11	351	311,014	13.2%
Child 12-19	450	343,678	14.6%
Total	1,916	2,350,676	100.0%

Parent module: Items 18-33 were only answered by respondents who were parents of a child 3-19 years old

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
Q18a . Has this child started pre-school or school?															
Yes	89	86,941	76.2%	75.9%	76.3%	77.8%	73.8%	76.5%	76.2%	0.0%	68.0%	78.0%	95.9%	79.7%	53.1%
No	28	27,209	23.8%	24.1%	23.7%	22.2%	26.2%	23.5%	23.8%	0.0%	32.0%	22.0%	4.1%	20.3%	46.9%
Total	117	114,150								0.0%					
Q18. Which of the following best describes this child's education situation?							**		**						
Has been or will be attending a public school	549	419,211	78.8%	78.1%	79.5%	84.2%	79.6%	74.0%	84.4%	73.4%	79.9%	81.9%	74.1%	77.5%	90.1%
Has been or will be attending a private school	47	31,649	6.0%	4.5%	7.2%	1.4%	3.5%	11.3%	8.0%	4.0%	3.3%	5.0%	10.4%	6.2%	3.8%
Has been or will be attending a charter school	3	2,068	.4%	.4%	.4%	.5%	0.0%	.6%	.5%	.3%	.2%	0.0%	.6%	.4%	0.0%
Is home-schooled	20	21,161	4.0%	5.7%	2.5%	3.7%	5.5%	3.1%	7.2%	.9%	5.2%	2.5%	4.0%	4.1%	2.8%
Has graduated from high school or has their GED	68	57,727	10.9%	11.4%	10.4%	10.2%	11.4%	11.0%	0.0%	21.5%	11.4%	10.6%	10.8%	11.8%	3.3%
Total	687	531,815													

Q18b. Has your child used, or have you used, the internet or a smartphone to help them complete their homework or school assignments?															
									**						
Yes	494	358,749	75.8%	76.5%	75.3%	67.2%	81.6%	78.4%	60.9%	94.3%	78.4%	69.4%	81.8%	77.0%	65.8%
No	126	114,410	24.2%	23.5%	24.7%	32.8%	18.4%	21.6%	39.1%	5.7%	21.6%	30.6%	18.2%	23.0%	34.2%
Total	620	473,160													
Q18c. Does your child have a school-issued iPad, tablet, or laptop computer?									**						
Yes	165	119,009	25.2%	27.8%	22.9%	21.6%	28.2%	25.9%	13.7%	39.3%	29.6%	27.0%	15.4%	24.3%	29.2%
No	454	353,436	74.8%	72.2%	77.1%	78.4%	71.8%	74.1%	86.3%	60.7%	70.4%	73.0%	84.6%	75.7%	70.8%
Total	619	472,445													

Q19. Thinking about your child, please tell me how much your child enjoys or does not enjoy each of the following activities.

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Building or constructing things									**						
Definitely does not enjoy	44	29,578	6.3%	7.3%	5.4%	9.3%	4.0%	5.6%	5.0%	7.8%	7.3%	5.8%	5.2%	5.9%	9.4%
2	74	59,376	12.6%	14.3%	11.0%	11.3%	12.3%	13.8%	5.7%	21.0%	12.4%	15.0%	10.3%	13.2%	8.3%
3	118	87,731	18.5%	21.2%	16.2%	17.8%	19.6%	18.2%	17.9%	19.4%	19.6%	18.6%	17.9%	18.6%	16.4%
4	129	98,289	20.8%	22.5%	19.3%	18.6%	18.7%	24.1%	21.7%	19.6%	21.5%	15.0%	27.6%	22.1%	11.1%
Definitely enjoys	254	198,037	41.9%	34.7%	48.0%	43.1%	45.5%	38.2%	49.7%	32.2%	39.2%	45.5%	39.0%	40.2%	54.8%
Total	619	473,012													
b. Repairing things that are broken															
Definitely does not enjoy	120	99,421	21.0%	20.9%	21.1%	25.0%	12.2%	24.3%	18.9%	23.6%	18.6%	25.2%	20.9%	21.4%	18.5%
2	128	99,800	21.1%	26.4%	16.6%	21.5%	18.3%	22.9%	17.8%	25.2%	17.1%	22.2%	25.3%	20.4%	27.7%
3	143	100,621	21.3%	21.9%	20.7%	18.5%	26.7%	19.5%	23.1%	19.0%	27.5%	15.1%	19.2%	22.3%	12.7%
4	110	86,357	18.3%	16.0%	20.2%	18.8%	19.0%	17.4%	18.1%	18.5%	17.5%	17.6%	19.5%	18.3%	18.7%
Definitely enjoys	118	86,731	18.3%	14.7%	21.4%	16.2%	23.8%	15.9%	22.1%	13.7%	19.3%	20.0%	15.1%	17.6%	22.4%
Total	619	472,930													
c. Cooking in the kitchen or mixing things together outdoors															
Definitely does not enjoy	51	39,075	8.3%	10.4%	6.4%	13.5%	5.9%	6.0%	5.9%	11.1%	6.8%	11.4%	7.0%	7.5%	12.8%
2	74	54,877	11.6%	13.0%	10.4%	11.7%	13.8%	9.9%	10.2%	13.3%	13.6%	10.9%	7.0%	10.4%	18.9%
3	143	109,541	23.2%	26.3%	20.4%	23.4%	20.4%	24.9%	18.7%	28.6%	19.4%	29.3%	22.6%	22.8%	27.3%
4	149	105,943	22.4%	22.5%	22.3%	14.2%	26.8%	25.6%	24.7%	19.5%	28.4%	15.4%	22.3%	23.2%	17.1%
Definitely enjoys	203	163,723	34.6%	27.9%	40.4%	37.2%	33.1%	33.6%	40.4%	27.4%	31.8%	33.0%	41.1%	36.1%	23.9%
Total	620	473,160													

d. Playing music				*					**			**			
Definitely does not enjoy	59	39,054	8.3%	9.7%	7.1%	9.5%	8.2%	7.5%	4.6%	12.9%	7.7%	11.0%	6.0%	7.4%	16.1%
2	53	44,449	9.5%	11.8%	7.4%	11.2%	9.4%	8.2%	9.5%	9.4%	8.8%	13.0%	5.0%	8.8%	15.4%
3	105	76,767	16.3%	19.6%	13.5%	16.3%	14.6%	17.6%	18.3%	14.0%	19.8%	14.7%	14.0%	16.6%	14.9%
4	137	110,209	23.4%	26.3%	21.0%	20.8%	28.4%	22.1%	30.2%	15.2%	30.0%	14.0%	24.2%	24.5%	16.3%
Definitely enjoys	265	199,578	42.5%	32.5%	50.9%	42.2%	39.4%	44.5%	37.4%	48.6%	33.8%	47.3%	50.8%	42.7%	37.3%
Total	619	470,057													
e. Playing computer games							*								
Definitely does not enjoy	37	30,303	6.4%	6.0%	6.8%	9.2%	3.5%	6.4%	5.6%	7.4%	4.1%	7.3%	6.5%	5.1%	16.8%
2	45	30,188	6.4%	7.8%	5.1%	7.7%	2.9%	7.9%	4.8%	8.4%	6.8%	3.8%	8.8%	6.4%	6.5%
3	86	66,820	14.1%	14.1%	14.2%	17.8%	10.8%	13.3%	11.2%	17.7%	16.9%	17.1%	7.2%	14.6%	10.4%
4	79	60,360	12.8%	14.3%	11.4%	7.5%	17.0%	13.8%	11.6%	14.2%	12.8%	10.5%	15.3%	13.3%	7.3%
Definitely enjoys	373	285,490	60.3%	57.8%	62.5%	57.8%	65.8%	58.6%	66.9%	52.3%	59.4%	61.3%	62.2%	60.7%	59.0%
Total	620	473,160													
f. Creating pictures, crafts or other art projects									**						
Definitely does not enjoy	44	32,802	6.9%	6.7%	7.1%	5.5%	7.7%	7.5%	3.4%	11.3%	5.2%	6.4%	10.5%	7.1%	3.3%
2	50	34,349	7.3%	6.6%	7.8%	4.4%	6.0%	10.2%	5.4%	9.6%	8.3%	5.5%	8.3%	6.7%	12.4%
3	109	82,447	17.4%	19.6%	15.5%	18.1%	17.6%	16.9%	13.5%	22.3%	17.4%	24.9%	9.5%	18.4%	9.2%
4	145	114,637	24.2%	26.6%	22.2%	25.0%	24.3%	23.7%	23.7%	24.9%	28.2%	21.3%	22.9%	25.4%	15.9%
Definitely enjoys	272	208,925	44.2%	40.4%	47.4%	47.0%	44.3%	41.8%	54.1%	31.9%	40.9%	41.8%	48.8%	42.3%	59.2%
Total	620	473,160													

g. Writing/Poetry															
Definitely does not enjoy	150	119,805	25.5%	22.7%	27.9%	25.9%	28.8%	22.8%	22.3%	29.4%	27.4%	25.9%	23.5%	26.5%	17.7%
2	105	84,252	18.0%	19.6%	16.6%	18.6%	17.0%	18.0%	17.6%	18.4%	16.8%	21.8%	16.3%	18.8%	12.1%
3	163	123,782	26.4%	28.4%	24.7%	27.7%	25.0%	26.5%	29.3%	22.8%	27.9%	25.1%	25.5%	26.7%	25.6%
4	100	68,809	14.7%	16.4%	13.2%	9.1%	17.9%	16.8%	16.0%	13.0%	16.8%	10.8%	15.5%	14.8%	11.5%
Definitely enjoys	98	72,367	15.4%	12.8%	17.6%	18.7%	11.3%	16.0%	14.7%	16.3%	11.1%	16.3%	19.2%	13.2%	33.1%
Total	616	469,015													

Q20. Outside of school, has your child taken classes or attended camps focusing on any of the following?

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Music							**					**			
Yes	195	134,135	28.2%	28.5%	28.1%	19.6%	25.6%	36.9%	24.3%	33.2%	23.0%	21.1%	44.0%	27.4%	32.5%
No	426	340,715	71.8%	71.5%	71.9%	80.4%	74.4%	63.1%	75.7%	66.8%	77.0%	78.9%	56.0%	72.6%	67.5%
Total	621	474,849													
b. Arts/crafts							**		**						
Yes	226	165,349	34.8%	35.8%	34.0%	23.7%	35.9%	42.6%	41.1%	27.0%	37.4%	30.5%	35.0%	34.5%	38.0%
No	395	309,500	65.2%	64.2%	66.0%	76.3%	64.1%	57.4%	58.9%	73.0%	62.6%	69.5%	65.0%	65.5%	62.0%
Total	621	474,849													
c. Cooking															
Yes	70	48,711	10.3%	8.5%	11.7%	9.3%	8.9%	12.1%	10.1%	10.5%	11.5%	9.6%	9.3%	9.8%	14.8%
No	551	426,138	89.7%	91.5%	88.3%	90.7%	91.1%	87.9%	89.9%	89.5%	88.5%	90.4%	90.7%	90.2%	85.2%
Total	621	474,849													
d. Drama/theater							**					**			
Yes	103	73,201	15.4%	16.3%	14.7%	8.0%	9.4%	25.5%	13.1%	18.3%	8.4%	14.5%	26.7%	15.3%	17.1%
No	517	401,238	84.6%	83.7%	85.3%	92.0%	90.6%	74.5%	86.9%	81.7%	91.6%	85.5%	73.3%	84.7%	82.9%
Total	620	474,438													
e. Robotics							**		**						
Yes	60	34,611	7.3%	6.9%	7.6%	1.1%	6.9%	12.4%	4.3%	11.0%	8.3%	3.6%	10.7%	7.8%	3.7%
No	561	440,238	92.7%	93.1%	92.4%	98.9%	93.1%	87.6%	95.7%	89.0%	91.7%	96.4%	89.3%	92.2%	96.3%
Total	621	474,849													
f. Wildlife/Nature Study							**								
Yes	204	151,841	32.0%	35.1%	29.3%	23.2%	29.0%	41.0%	32.9%	30.8%	29.2%	27.2%	41.7%	32.5%	28.1%
No	417	323,008	68.0%	64.9%	70.7%	76.8%	71.0%	59.0%	67.1%	69.2%	70.8%	72.8%	58.3%	67.5%	71.9%
Total	621	474,849													

g. Foreign Language(s)									**					**	
Yes	55	26,683	5.6%	4.8%	6.3%	3.2%	5.3%	7.7%	3.3%	8.5%	3.7%	4.1%	10.1%	4.2%	16.1%
No	566	448,167	94.4%	95.2%	93.7%	96.8%	94.7%	92.3%	96.7%	91.5%	96.3%	95.9%	89.9%	95.8%	83.9%
Total	621	474,849													
h. Writing/Storytelling															
Yes	111	84,962	17.9%	19.1%	16.9%	15.8%	18.6%	19.2%	18.3%	17.5%	19.3%	17.4%	16.5%	16.7%	25.9%
No	508	389,009	82.1%	80.9%	83.1%	84.2%	81.4%	80.8%	81.7%	82.5%	80.7%	82.6%	83.5%	83.3%	74.1%
Total	619	473,970													
i. Computer Programming/Gaming									**						
Yes	78	49,706	10.5%	12.0%	9.1%	5.7%	14.5%	11.2%	6.8%	15.0%	9.2%	12.4%	10.6%	9.7%	16.3%
No	542	424,698	89.5%	88.0%	90.9%	94.3%	85.5%	88.8%	93.2%	85.0%	90.8%	87.6%	89.4%	90.3%	83.7%
Total	620	474,404													
j. Other? [SPECIFY]							**								
Yes	201	148,131	31.3%	32.6%	30.2%	18.7%	27.5%	43.5%	32.4%	29.9%	26.4%	30.1%	41.4%	32.8%	20.4%
No	419	325,086	68.7%	67.4%	69.8%	81.3%	72.5%	56.5%	67.6%	70.1%	73.6%	69.9%	58.6%	67.2%	79.6%
Total	620	473,216													

Q21. In general, how much interest, if any, does this child show in these subjects?

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Science							**								
A lot of interest	291	213,720	45.7%	44.1%	47.2%	41.7%	41.9%	51.9%	44.8%	46.8%	42.6%	43.8%	52.3%	46.5%	39.7%
Some interest	219	171,660	36.7%	38.3%	35.3%	28.0%	42.5%	38.8%	37.6%	35.7%	37.9%	38.8%	34.1%	37.7%	31.1%
Little or no interest	107	81,921	17.5%	17.6%	17.5%	30.3%	15.7%	9.4%	17.5%	17.5%	19.5%	17.5%	13.6%	15.8%	29.2%
Total	617	467,301													
b. Computers and technology															
A lot of interest	375	273,558	57.8%	53.8%	61.3%	58.7%	65.5%	51.8%	60.3%	54.8%	57.8%	55.2%	58.8%	56.9%	65.6%
Some interest	192	156,440	33.1%	36.8%	29.9%	32.2%	24.3%	40.0%	31.5%	35.0%	34.0%	33.7%	32.6%	34.3%	22.6%
Little or no interest	52	42,930	9.1%	9.4%	8.8%	9.1%	10.2%	8.3%	8.2%	10.2%	8.2%	11.1%	8.7%	8.8%	11.8%
Total	619	472,928													
c. Designing, creating, and building machines and devices, also called engineering							**							**	
A lot of interest	191	137,489	29.4%	23.8%	34.2%	27.4%	27.2%	32.9%	33.2%	24.9%	29.2%	27.8%	32.7%	29.3%	31.7%
Some interest	193	153,410	32.8%	33.0%	32.7%	21.0%	45.5%	32.5%	34.2%	31.2%	36.4%	31.6%	30.3%	35.1%	15.9%
Little or no interest	230	176,135	37.7%	43.2%	33.1%	51.6%	27.3%	34.7%	32.6%	43.9%	34.3%	40.6%	37.0%	35.6%	52.4%
Total	614	467,034													
d. Math														**	
A lot of interest	242	171,891	36.3%	34.9%	37.6%	33.5%	35.0%	39.5%	36.2%	36.5%	33.4%	40.0%	35.3%	34.9%	50.2%
Some interest	231	176,420	37.3%	43.2%	32.3%	35.5%	43.6%	33.9%	35.4%	39.6%	41.1%	31.3%	39.9%	39.4%	21.5%
Little or no interest	146	124,708	26.4%	22.0%	30.1%	31.0%	21.4%	26.6%	28.3%	23.9%	25.6%	28.7%	24.8%	25.8%	28.3%
Total	619	473,019													

Q22. In general, how well is this child doing in these subjects?

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Science							**		**					**	
Very well	361	283,178	59.9%	62.4%	57.7%	44.1%	59.8%	72.2%	56.3%	64.3%	60.3%	53.8%	66.8%	63.1%	34.1%
Ok	195	139,247	29.4%	30.9%	28.2%	41.5%	33.5%	16.9%	27.7%	31.6%	28.5%	35.4%	23.9%	26.1%	55.7%
Not very well	23	9,734	2.1%	1.2%	2.8%	2.9%	1.5%	1.8%	.9%	3.5%	3.1%	.9%	1.2%	1.6%	6.1%
Does not apply	40	40,852	8.6%	5.5%	11.4%	11.5%	5.1%	9.1%	15.1%	.6%	8.1%	9.9%	8.1%	9.2%	4.2%
Total	619	473,012													
b. Computers and technology									*					**	
Very well	362	278,845	59.2%	64.3%	54.8%	52.2%	64.3%	60.9%	54.1%	65.4%	57.5%	64.0%	57.6%	61.6%	40.6%
Ok	167	117,770	25.0%	20.9%	28.6%	30.8%	22.3%	22.4%	25.1%	24.8%	27.1%	19.2%	27.5%	23.0%	39.8%
Not very well	14	9,930	2.1%	2.6%	1.7%	3.0%	2.9%	.8%	1.7%	2.7%	.9%	4.5%	.9%	1.4%	8.0%
Does not apply	73	64,479	13.7%	12.3%	14.9%	14.0%	10.5%	15.9%	19.0%	7.1%	14.5%	12.3%	14.0%	14.0%	11.5%
Total	616	471,025													
c. Designing, creating, and building machines and devices, also called engineering							**							**	
Very well	144	94,609	20.1%	19.3%	20.8%	9.3%	24.8%	24.8%	18.4%	22.2%	21.0%	19.1%	20.6%	20.1%	20.2%
Ok	144	121,330	25.8%	25.6%	25.9%	30.7%	29.9%	19.1%	28.7%	22.2%	23.1%	31.8%	22.4%	25.2%	30.0%
Not very well	42	25,033	5.3%	6.4%	4.4%	12.2%	1.8%	2.4%	4.7%	6.0%	5.9%	4.8%	2.8%	3.3%	22.4%
Does not apply	286	229,645	48.8%	48.6%	48.9%	47.8%	43.5%	53.7%	48.2%	49.5%	49.9%	44.2%	54.2%	51.4%	27.4%
Total	616	470,617													

d. Math									**							
Very well	354	265,932	56.2%	59.8%	53.1%	46.7%	57.5%	62.4%	53.6%	59.4%	57.8%	60.0%	52.5%	58.2%	42.1%
Ok	197	152,572	32.2%	30.3%	34.0%	42.4%	31.4%	25.2%	35.0%	28.8%	32.1%	26.7%	38.4%	31.3%	41.7%
Not very well	49	34,809	7.4%	6.2%	8.4%	7.8%	7.9%	6.6%	4.2%	11.3%	6.8%	8.1%	5.0%	6.1%	13.7%
Does not apply	20	19,846	4.2%	3.7%	4.6%	3.1%	3.2%	5.8%	7.2%	.5%	3.3%	5.2%	4.1%	4.4%	2.6%
Total	620	473,160													

Q23b. Thinking about the past school year and this summer, has your child participated, enrolled, or plan to enroll in any of the following activities?															
	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Day program or summer camp related to science, technology, engineering, or math															
Yes	83	61,120	12.9%	9.6%	15.7%	8.9%	8.8%	19.0%	15.1%	10.1%	10.1%	14.1%	15.3%	13.1%	11.5%
No	536	413,427	87.1%	90.4%	84.3%	91.1%	91.2%	81.0%	84.9%	89.9%	89.9%	85.9%	84.7%	86.9%	88.5%
Total	619	474,547													
b. After-school program for enriched learning about science, technology, engineering or math														*	
Yes	77	51,949	11.0%	11.7%	10.3%	11.1%	6.5%	14.0%	11.0%	10.9%	10.6%	9.9%	11.0%	9.4%	24.1%
No	543	422,186	89.0%	88.3%	89.7%	88.9%	93.5%	86.0%	89.0%	89.1%	89.4%	90.1%	89.0%	90.6%	75.9%
Total	620	474,135													
c. Boy/girl scouts									**						
Yes	82	64,633	13.7%	11.5%	15.5%	7.4%	14.5%	18.0%	18.7%	7.4%	16.7%	8.6%	16.0%	14.3%	8.2%
No	536	408,220	86.3%	88.5%	84.5%	92.6%	85.5%	82.0%	81.3%	92.6%	83.3%	91.4%	84.0%	85.7%	91.8%
Total	618	472,853													
d. 4-H												**			
Yes	65	51,053	10.8%	9.3%	12.0%	10.8%	8.7%	12.4%	12.3%	8.9%	18.8%	6.3%	4.2%	11.4%	6.3%
No	554	423,355	89.2%	90.7%	88.0%	89.2%	91.3%	87.6%	87.7%	91.1%	81.2%	93.7%	95.8%	88.6%	93.7%
Total	619	474,408													
e. Any other structured activity related to science, technology, engineering or math															
Yes	61	36,993	7.8%	8.7%	7.1%	3.1%	7.1%	12.0%	7.3%	8.4%	8.3%	5.8%	10.0%	7.9%	7.2%
No	558	436,956	92.2%	91.3%	92.9%	96.9%	92.9%	88.0%	92.7%	91.6%	91.7%	94.2%	90.0%	92.1%	92.8%
Total	619	473,949													

Q24. Which of the following do you think this child will most likely do after high school graduation? (Respondents who were a parent of a 12-19 year old only)

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
							**								
Attend a 4-year college or university	206	133,263	64.2%	67.8%	61.0%	43.6%	56.5%	83.0%		64.2%	61.0%	65.2%	67.4%	65.2%	60.7%
Attend a 2-year community college	54	41,035	19.8%	19.4%	20.1%	28.7%	27.5%	8.2%		19.8%	23.5%	19.2%	17.4%	19.4%	21.6%
Attend a vocational or training school	16	10,901	5.3%	6.9%	3.8%	5.5%	5.5%	5.0%		5.3%	5.2%	5.8%	5.2%	5.4%	4.4%
Enlist in the military	15	10,094	4.9%	4.9%	4.8%	12.0%	2.7%	2.0%		4.9%	4.6%	5.5%	4.8%	4.2%	10.4%
Begin work immediately	8	6,149	3.0%	.5%	5.1%	9.0%	.5%	.9%		3.0%	3.6%	3.6%	.3%	3.4%	0.0%
Something else	11	6,056	2.9%	.3%	5.2%	1.3%	7.3%	.8%		2.9%	2.2%	.8%	4.8%	2.4%	2.9%
Total	310	207,498													

Q25. How likely is it, if at all, that your child will pursue a career in a field related to science, technology, engineering, or math? (Respondents who were a parent of a 12-19 year old only)

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
							**								
Very likely	126	78,617	37.4%	32.2%	42.0%	18.1%	45.0%	44.9%		37.4%	42.5%	27.7%	44.6%	38.9%	28.6%
Somewhat likely	99	65,683	31.2%	32.3%	30.3%	40.5%	33.5%	23.7%		31.2%	31.7%	34.1%	29.4%	30.7%	37.3%
Somewhat unlikely	56	38,878	18.5%	22.0%	15.4%	23.4%	10.4%	20.6%		18.5%	9.7%	23.8%	18.8%	17.3%	21.7%
Very unlikely	34	27,125	12.9%	13.5%	12.4%	17.9%	11.1%	10.9%		12.9%	16.0%	14.4%	7.2%	13.1%	12.4%
Total	315	210,303													

Q28. How important is it to you that your child… (Respondents who were a parent of a 3-11 year old only)

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Does well in math															
Very important	217	186,531	71.5%	72.8%	70.4%	60.3%	77.7%	76.3%	71.5%		70.9%	62.5%	84.8%	72.2%	63.0%
Important	75	69,850	26.8%	26.8%	26.7%	39.0%	19.4%	21.8%	26.8%		27.3%	34.4%	15.2%	26.2%	32.8%
Somewhat important	7	4,622	1.8%	.3%	3.0%	.7%	2.8%	1.9%	1.8%		1.8%	3.2%	0.0%	1.5%	4.2%
Not important at all	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
Total	299	261,003													
b. Does well in science							**								
Very important	191	153,857	58.9%	60.2%	57.9%	34.0%	69.7%	72.8%	58.9%		52.3%	61.2%	68.8%	59.4%	53.1%
Important	92	92,282	35.4%	35.6%	35.2%	57.7%	23.8%	24.3%	35.4%		40.1%	37.6%	23.1%	34.6%	44.1%
Somewhat important	15	14,458	5.5%	4.2%	6.6%	8.3%	6.4%	2.5%	5.5%		7.2%	1.2%	8.1%	5.8%	2.8%
Not important at all	1	406	.2%	0.0%	.3%	0.0%	0.0%	.4%	.2%		.3%	0.0%	0.0%	.2%	0.0%
Total	299	261,003													
c. Has good computer and technology skills							*								
Very important	198	164,090	62.9%	59.7%	65.5%	44.1%	79.8%	66.7%	62.9%		54.6%	64.9%	75.9%	61.7%	74.1%
Important	84	79,536	30.5%	33.4%	28.0%	44.9%	18.6%	26.6%	30.5%		37.9%	28.6%	18.6%	31.1%	24.3%
Somewhat important	16	16,572	6.3%	6.9%	5.9%	10.1%	1.6%	6.7%	6.3%		6.9%	6.5%	5.5%	6.8%	1.6%
Not important at all	1	805	.3%	0.0%	.6%	.9%	0.0%	0.0%	.3%		.7%	0.0%	0.0%	.3%	0.0%
Total	299	261,003													

d. Has some exposure to engineering concepts							**								
Very important	134	117,491	45.0%	48.3%	42.3%	23.4%	62.5%	50.8%	45.0%		40.3%	48.3%	49.0%	45.1%	45.3%
Important	112	100,156	38.4%	34.9%	41.2%	50.4%	23.7%	38.8%	38.4%		35.9%	40.8%	40.1%	38.3%	39.9%
Somewhat important	46	40,110	15.4%	15.4%	15.3%	24.4%	12.0%	10.1%	15.4%		21.5%	10.9%	10.1%	15.6%	13.3%
Not important at all	7	3,246	1.2%	1.3%	1.2%	1.8%	1.8%	.3%	1.2%		2.3%	0.0%	.8%	1.0%	1.6%
Total	299	261,003													

Q30. How important is it to you that your child... (Respondents who were a parent of a 12-19 year old only)

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
a. Has some advanced math skills															
Very important	178	109,535	51.7%	53.2%	50.4%	39.6%	54.5%	57.6%		51.7%	49.5%	56.0%	49.6%	50.6%	59.2%
Important	84	62,948	29.7%	30.5%	29.1%	39.1%	25.8%	26.4%		29.7%	32.2%	28.2%	28.8%	29.8%	27.9%
Somewhat important	48	30,378	14.3%	13.4%	15.2%	12.0%	16.7%	14.3%		14.3%	12.4%	14.8%	15.5%	16.0%	4.7%
Not important at all	10	8,918	4.2%	2.9%	5.4%	9.2%	3.1%	1.7%		4.2%	5.9%	1.0%	6.1%	3.6%	8.3%
Total	320	211,780													
b. Has some advanced science skills															
Very important	161	100,478	47.4%	47.4%	47.5%	34.3%	49.9%	54.2%		47.4%	44.5%	49.3%	48.5%	45.9%	57.1%
Important	93	64,746	30.6%	30.9%	30.2%	33.9%	29.3%	29.4%		30.6%	33.5%	33.3%	25.8%	31.6%	26.1%
Somewhat important	56	38,815	18.3%	17.5%	19.0%	24.4%	16.4%	15.7%		18.3%	15.9%	15.7%	23.0%	19.3%	9.6%
Not important at all	10	7,740	3.7%	4.2%	3.2%	7.5%	4.3%	.7%		3.7%	6.2%	1.7%	2.6%	3.2%	7.2%
Total	320	211,780													
c. Has some advanced technology skills															
Very important	155	99,090	46.8%	45.0%	48.4%	35.7%	44.2%	55.7%		46.8%	40.7%	51.0%	52.7%	47.1%	46.0%
Important	107	69,052	32.6%	32.2%	33.0%	39.8%	35.4%	26.0%		32.6%	38.4%	26.4%	30.4%	31.2%	42.5%
Somewhat important	52	36,716	17.3%	19.0%	15.8%	15.9%	18.4%	17.6%		17.3%	14.3%	19.9%	16.9%	18.2%	9.1%
Not important at all	6	6,921	3.3%	3.8%	2.8%	8.6%	1.9%	.7%		3.3%	6.7%	2.7%	0.0%	3.4%	2.4%
Total	320	211,780													

d. Has some exposure to advanced engineering concepts

Very important	123	72,624	34.5%	32.6%	36.2%	28.0%	33.8%	39.1%	34.5%	29.4%	32.7%	45.1%	33.7%	42.8%
Important	101	64,019	30.4%	28.6%	32.1%	35.5%	28.2%	28.7%	30.4%	31.3%	29.1%	30.6%	28.5%	41.8%
Somewhat important	72	55,918	26.6%	31.6%	22.1%	28.1%	25.3%	26.6%	26.6%	24.5%	32.9%	19.2%	28.5%	11.8%
Not important at all	22	17,900	8.5%	7.2%	9.7%	8.4%	12.7%	5.6%	8.5%	14.8%	5.3%	5.2%	9.4%	3.5%
Total	318	210,461												

Q37. Do you have a degree or some form of advanced training in a field related to science, technology, engineering, or math? (Parents only)

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
				**			**								
Yes	259	194,821	45.4%	51.1%	40.0%	0.0%	34.4%	55.1%	52.0%	39.3%	48.8%	39.7%	47.2%	45.5%	44.6%
No	316	234,508	54.6%	48.9%	60.0%	0.0%	65.6%	44.9%	48.0%	60.7%	51.2%	60.3%	52.8%	54.5%	55.4%
Total	575	429,329													

Q40. Are you or were you recently employed in a career that significantly uses skills in science, technology, engineering, or math?

	Total			Gender		Education			Parent Status		Location			Race	
	Sample size (n)	Pop. Est.	Valid %	Male	Female	HS or less	Some College	BA or More	Child 3-11	Child 12-19	Farm/ Small Town	Large Town/ Small City	Large City	White	All other races
				**			**								
Yes	367	293,526	54.6%	62.9%	45.3%	42.0%	54.7%	65.7%	56.9%	52.4%	58.2%	50.8%	54.0%	56.7%	32.8%
No	297	244,544	45.4%	37.1%	54.7%	58.0%	45.3%	34.3%	43.1%	47.6%	41.8%	49.2%	46.0%	43.3%	67.2%
Total	664	538,070													

Demographics

Q34. Are you male or female?

	n	Pop. est. n	Valid %
Male	783	1,143,583	48.6%
Female	1,133	1,207,093	51.4%
Total	1,916	2,350,676	100.0%

Q35 (recoded). What is your current age?

	n	Pop. est. n	Valid %
18-24 years old	131	348,899	14.8%
25-34 years old	201	400,805	17.1%
35-44 years old	344	317,529	13.5%
45-54 years old	396	405,464	17.2%
55-64 years old	375	474,181	20.2%
65 years or older	469	403,798	17.2%
Total	1,916	2,350,676	100.0%

Q36. What is the highest level of education you have completed?

	n	Pop. est. n	Valid %
Less than high school graduate	119	179,165	7.6%
Grade 12 or GED (high school graduate)	460	701,794	29.9%
One or more years of college but no degree	341	414,710	17.7%
Associate's or other 2-year degree	285	357,418	15.2%
College graduate with a 4 year degree such as a BA or BS	473	508,924	21.7%
Graduate degree completed (MA, MS, MFA, MBA, MD, PhD, EdD, etc.)	231	182,119	7.8%
Total	1,909	2,344,130	100.0%

Q36 (recoded). Final Classification of Education

	n	Pop. est. n	Valid %
High School or less	579	880,959	37.6%
Some College	626	772,129	32.9%
BA or More	704	691,043	29.5%
Total	1,909	2,344,130	100.0%

Q37. Do you have a degree or some form of advanced training in a field related to science, technology, engineering, or math?

	n	Pop. est. n	Valid %
Yes	579	660,037	45.1%
No	754	802,104	54.9%
Total	1,333	1,462,141	100.0%

Q38. Which of the following best describes where you live?

	n	Pop. est. n	Valid %
On a farm or in an open rural area	363	477,017	20.8%
In a small town of less than 5,000 people	439	481,999	21.0%
In a large town of 5,000 to less than 25,000 people	312	441,585	19.2%
In a city of 25,000 to less than 50,000 people	233	227,356	9.9%
In a city of 50,000 or more people	524	667,503	29.1%
Total	1,871	2,295,460	100.0%

Q38 (recoded). Final Location Size Classification

	n	Pop. est. n	Valid %
Lives on a Farm/Small Town	802	959,017	41.8%
Large Town/Small City	545	668,940	29.1%
Large City	524	667,503	29.1%
Total	1,871	2,295,460	100.0%

Q39. What is your employment status?

	n	Pop. est. n	Valid %
Employed for wages	999	1,237,205	52.7%
Self-employed	173	225,719	9.6%
Out of work for more than 1 year	19	41,245	1.8%
Out of work for less than 1 year	27	44,581	1.9%
A Homemaker	115	116,766	5.0%
A Student	61	141,833	6.0%
Retired	444	442,282	18.9%
Unable to work	72	96,581	4.1%
Total	1,910	2,346,213	100.0%

Q40. Are you or were you recently employed in a career that significantly uses skills in science, technology, engineering, or math?

	n	Pop. est. n	Valid %
Yes	913	1,126,977	56.6%
No	750	865,496	43.4%
Total	1,663	1,992,472	100.0%

Q41. What is your annual gross household income from all sources before taxes?

	n	Pop. est. n	Valid %
Less than $15,000	151	192,253	9.7%
$15,000 to less than $25,000	153	183,347	9.2%
$25,000 to less than $35,000	177	211,400	10.6%
$35,000 to less than $50,000	249	316,140	15.9%
$50,000 to less than $75,000	307	363,436	18.3%
$75,000 to less than $100,000	248	286,961	14.4%
$100,000 to less than $150,000	238	271,490	13.6%
$150,000 or more	139	164,639	8.3%
Total	1,662	1,989,666	100.0%

b. Can you tell me if your annual gross household income is less than, equal to, or greater than $50,000? (If Don't Know/Refused Q41.)

	n	Pop. est. n	Valid %
Less than $50,000	62	85,197	37.6%
Equal to $50,000	15	20,083	8.9%
More than $50,000	73	121,294	53.5%
Total	150	226,574	100.0%

Q42. Are you of Hispanic, Latino, or Spanish origin?

	n	Pop. est. n	Valid %
Yes	219	102,471	4.4%
No	1,682	2,237,423	95.6%
Total	1,901	2,339,894	100.0%

Q43. What is your race? (Check all that apply)

a. White	1,619	2,139,877	91.0%
b. Black or African American	120	74,651	3.2%
c. Asian	4	32,108	1.4%
d. Native Hawaiian or Other Pacific Islander	1	493	.0%
e. American Indian or Alaska Native	13	30,709	1.3%
f. Other [SPECIFY]	164	108,272	4.6%
g. Don't know / Not sure	2	2,691	.1%
h. Refused	12	9,456	.4%

Q44 (recoded). Respondent's Race/Ethnicity

	n	Pop. est. n	Valid %
Whites	1,542	2,080,402	89.0%
All other races	360	258,127	11.0%
Total	1,902	2,338,530	100.0%

Q44. Which one of these groups would you say best represents your race? (If more than one response to Q43)

	n	Pop. est. n	Valid %
White	9	8,734	18.4%
Black or African American	4	1,957	4.1%
Asian	0	0	0.0%
Native Hawaiian or Other Pacific Islander	0	0	0.0%
American Indian or Alaska Native	1	21,471	45.1%
Other	5	15,420	32.4%
Total	19	47,581	100.0%

Q48a. Can you also be reached via cell phone?

	n	Pop. est. n	Valid %
Yes	839	624,813	53.8%
No	417	537,548	46.2%
Total	1,256	1,162,361	100.0%

Q48b. Does the house you live in also have a landline telephone?

	n	Pop. est. n	Valid %
Yes	286	567,205	47.9%
No	369	615,877	52.1%
Total	655	1,183,082	100.0%

Q49 (recoded). Phone Status of Respondent

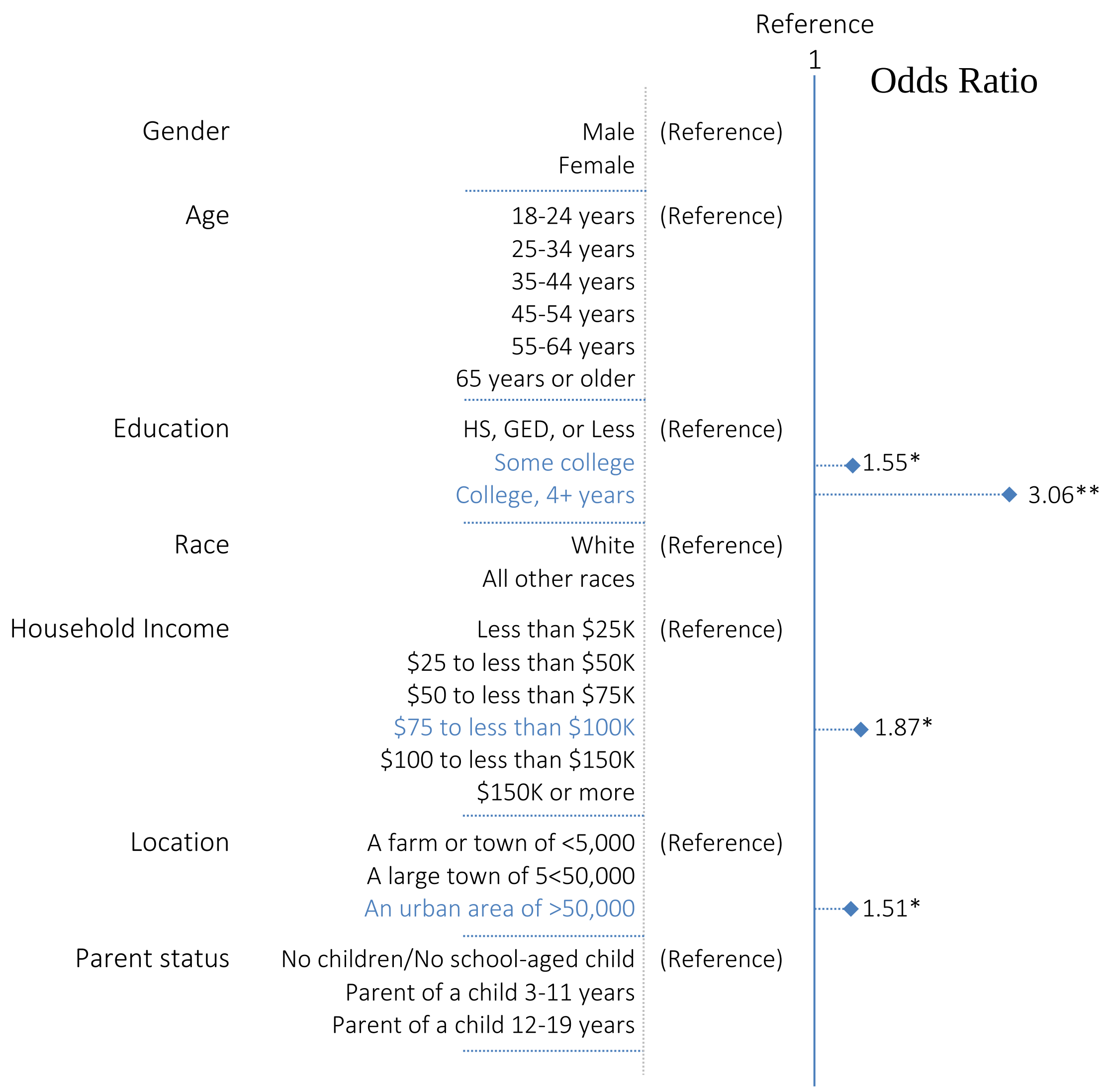
	n	Pop. est. n	Valid %
Landline only	417	537,548	22.9%
Cellphone only	369	615,877	26.2%
Landline AND cellphone household	1,125	1,192,018	50.7%
Reached by landline / No answer about the cell	4	4,526	.2%
Reached by cell / No answer about the landline	1	707	.0%
Total	1,916	2,350,676	100.0%

Appendix G: Statewide Survey o f Public Attitudes Toward STEM_Multivariate Logistic Regression

This figure shows a representation of the multi-variate findings for those covariates with a p-value less than .05. The complete set of tables with SUDAAN outputs follow. These tables show estimated regression coefficients, standard errors, 95% confidence intervals, t-test and p-values. The reference subgroup for all covariates in the model is the first subgroup (as indicated in the figure). It is important to remember that caution should be used in generalizing the findings where confidence intervals are wide.

MULTIVARIATE ANALYSIS OF AWARENESS OF STEM

After controlling for other factors, Iowans with some college education or college degree, an annual gross income of $75,000 to less than $100,000, and/or who live in a large city of greater than 50,000 population were significantly more likely to have awareness of STEM.



Variance Estimation Method: Taylor Series (WR)
SE Method: Robust (Binder, 1983)
Working Correlations: Independent
Link Function: Logit
Response variable Q4B: STEM stands for 'science, technology, engineering, and mathematics.' Have you read, seen or heard of this before?
LOGISTIC REGRESSION - stem awareness - YEAR 2014

Independent Variables and Effects		Beta Coeff.	SE Beta	Lower 95% Limit Beta	Upper 95% Limit Beta	T-Test B=0	P-value T-Test B=0
Intercept		-1.12	0.40	-1.91	-0.33	-2.78	0.0055
Gender of Respondent	Male	0.00	0.00	0.00	0.00	.	.
	Female	0.15	0.15	-0.14	0.44	1.02	0.3074
Age Group of Respondent	18-24 years old	0.00	0.00	0.00	0.00	.	.
	25-34 years old	-0.57	0.41	-1.37	0.22	-1.41	0.1591
	35-44 years old	-0.14	0.36	-0.86	0.57	-0.40	0.6924
	45-54 years old	-0.34	0.38	-1.08	0.40	-0.90	0.3703
	55-64 years old	-0.21	0.35	-0.89	0.47	-0.60	0.5483
	65 years or older	-0.16	0.35	-0.85	0.53	-0.45	0.6528
Final Classification of Education	High School or less	0.00	0.00	0.00	0.00	.	.
	Some College	0.44	0.20	0.04	0.84	2.15	0.0316
	BA or More	1.12	0.21	0.70	1.54	5.24	0.0000
Respondent's race/ethnicity	Whites	0.00	0.00	0.00	0.00	.	.
	All other races	0.06	0.34	-0.60	0.72	0.19	0.8516
Annual Gross Income of Respondents Household	Less than $25K	0.00	0.00	0.00	0.00	.	.
	$25 to less than $50K	-0.10	0.27	-0.63	0.43	-0.36	0.7214
	$50 to less than $75K	0.20	0.30	-0.39	0.78	0.67	0.5051
	$75 to less than $100K	0.62	0.31	0.03	1.22	2.05	0.0408
	$100 to less than $150K	0.61	0.32	-0.02	1.23	1.91	0.0566
	$150K or more	0.01	0.33	-0.63	0.65	0.04	0.9660
Final Location Size Classification	Lives on a Farm/Small Town	0.00	0.00	0.00	0.00	.	.
	Large Town/Small City	0.12	0.18	-0.23	0.47	0.66	0.5066
	Large City	0.41	0.18	0.05	0.77	2.26	0.0240
Final Classification of Parent Status	No children/no school aged children	0.00	0.00	0.00	0.00	.	.
	Child 3-11	0.08	0.22	-0.36	0.52	0.37	0.7135
	Child 12-19	0.27	0.20	-0.13	0.66	1.33	0.1851

STEM-state wide survey, 2014, CSBR, Iowa adults (18+)

Response variable Q4B: STEM stands for 'science, technology, engineering, and mathematics.' Have you read, seen or heard of this before?
LOGISTIC REGRESSION - stem awareness - YEAR 2014
by: Contrast.

Contrast	Degrees of Freedom	Wald F	P-value Wald F
OVERALL MODEL	19	4.92	0.0000
MODEL MINUS INTERCEPT	18	4.30	0.0000
INTERCEPT	.	.	.
GENDER	1	1.04	0.3074
AGE_GRP	5	0.74	0.5965
EDUC_3CAT	2	15.42	0.0000
RACE_CAT	1	0.04	0.8516
INCOME	5	2.84	0.0146
PLACE_CAT	2	2.57	0.0771
PARENT_TYPE	2	0.92	0.3993

STEM-state wide survey, 2014, CSBR, Iowa adults (18+)

Response variable Q4B: STEM stands for 'science, technology, engineering, and mathematics.' Have you read, seen or heard of this before?
LOGISTIC REGRESSION - stem awareness - YEAR 2014

Independent Variables and Effects		Odds Ratio	Lower 95% Limit OR	Upper 95% Limit OR
Intercept		0.33	0.15	0.72
Gender of Respondent	Male	1.00	1.00	1.00
	Female	1.16	0.87	1.56
Age Group of Respondent	18-24 years old	1.00	1.00	1.00
	25-34 years old	0.56	0.25	1.25
	35-44 years old	0.87	0.42	1.77
	45-54 years old	0.71	0.34	1.49
	55-64 years old	0.81	0.41	1.61
	65 years or older	0.85	0.43	1.70
Final Classification of Education	High School or less	1.00	1.00	1.00
	Some College	1.55	1.04	2.31
	BA or More	3.06	2.01	4.65
Respondent's race/ethnicity	Whites	1.00	1.00	1.00
	All other races	1.06	0.55	2.06
Annual Gross Income of Respondents Household	Less than $25K	1.00	1.00	1.00
	$25 to less than $50K	0.91	0.53	1.54
	$50 to less than $75K	1.22	0.68	2.19
	$75 to less than $100K	1.87	1.03	3.40
	$100 to less than $150K	1.83	0.98	3.43
	$150K or more	1.01	0.53	1.93
Final Location Size Classification	Lives on a Farm/Small Town	1.00	1.00	1.00
	Large Town/Small City	1.13	0.79	1.60
	Large City	1.51	1.06	2.16
Final Classification of Parent Status	No children/no school aged children	1.00	1.00	1.00
	Child 3-11	1.09	0.70	1.69
	Child 12-19	1.31	0.88	1.94

STEM-state wide survey, 2014, CSBR, Iowa adults (18+)

Appendix H: Statewide Student Interest Inventory_Item frequencies

ITEM 1: Engineering

E1. **How much do you like to create and build things?**

MS/HS1. **How interested are you in designing, creating, and building machines and devices (also called engineering)?**

Response Options			Scale-Up Students					All Students Statewide			
Grades 3-5	Grades 6-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12
I like it a lot	Very interested	4,450	51%	67%	36%	42%	86,701	40%	64%	32%	21%
It's okay	Somewhat interested	3,037	35%	28%	40%	37%	78,207	36%	30%	42%	37%
I don't like it very much	Not very interested	1,283	15%	5%	23%	21%	49,793	23%	5%	26%	41%
Total		8,770					214,701				

ITEM 2: MATH

E2. **How much do you like math?**

MS/HS2. **How interested are you in math?**

Response Options			Scale-Up Students					All Students Statewide			
Grades 3-5	Grades 6-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12
I like it a lot	Very interested	3,015	34%	41%	30%	26%	62,061	29%	39%	27%	19%
It's okay	Somewhat interested	3,803	43%	43%	44%	45%	92,498	43%	43%	45%	42%
I don't like it very much	Not very interested	1,944	22%	17%	26%	29%	60,012	28%	18%	28%	40%
Total		8,762					214,571				

ITEM 3: SCIENCE

E3. **How much do you like science?**
MS/HS3. **How interested are you in science?**

Response Options		Scale-Up Students					All Students Statewide				
Grades 3-5	Grades 6-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12
I like it a lot	Very interested	3,565	41%	48%	34%	39%	79,435	37%	48%	33%	29%
It's okay	Somewhat interested	3,761	43%	40%	46%	43%	93,979	44%	40%	47%	45%
I don't like it very much	Not very interested	1,432	16%	12%	20%	18%	40,979	19%	12%	20%	26%
Total		8,758					214,393				

ITEM 4: ART

E3. **How much do you like science?**
MS/HS3. **How interested are you in science?**

Response Options		Scale-Up Students					All Students Statewide				
Grades 3-5	Grades 6-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12
I like it a lot	Very interested	4,197	48%	65%	37%	22%	95,032	44%	64%	39%	27%
It's okay	Somewhat interested	2,661	30%	26%	34%	34%	66,652	31%	26%	34%	34%
I don't like it very much	Not very interested	1,910	22%	10%	29%	44%	52,709	25%	10%	28%	39%
Total		8,768					214,393				

ITEM 5: READING

E3.	How much do you like science?											
MS/HS3.	How interested are you in science?											
Response Options			Scale-Up Students					All Students Statewide				
Grades 3-5	Grades 6-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	
I like it a lot	Very interested	2,843	32%	53%	17%	12%	65,635	31%	54%	19%	17%	
It's okay	Somewhat interested	3,473	40%	36%	44%	36%	85,123	40%	36%	44%	39%	
I don't like it very much	Not very interested	2,451	28%	12%	39%	52%	63,678	30%	11%	37%	44%	
Total		8,767					214,436					

ITEM 6: COMPUTERS & TECHNOLOGY

E6.	How much do you like using computers and technology?											
MS/HS6.	How interested are you in computers and technology?											
Response Options			Scale-Up Students					All Students Statewide				
Grades 3-5	Grades 6-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	
I like it a lot	Very interested	4,930	56%	69%	46%	44%	105,366	49%	73%	43%	28%	
It's okay	Somewhat interested	2,761	31%	25%	36%	38%	73,647	34%	22%	38%	44%	
I don't like it very much	Not very interested	1,076	12%	5%	18%	18%	35,270	16%	5%	18%	28%	
Total		8,767					214,283					

ITEM 7: SOCIAL STUDIES

E7. **How much do you like social studies?**
MS/HS7. **How interested are you in social studies (such as history, American studies, or government)?**

Response Options			Scale-Up Students					All Students Statewide			
Grades 3-5	Grades 6-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12
I like it a lot	Very interested	2,505	29%	32%	27%	22%	54,197	25%	28%	26%	22%
It's okay	Somewhat interested	3,966	45%	48%	44%	42%	93,044	43%	49%	42%	39%
I don't like it very much	Not very interested	2,283	26%	21%	30%	35%	67,004	31%	24%	33%	39%
Total		8,754					214,245				

ITEM 8: STEM CAREERS

E8. **When you grow up, how much would you like to have a job where you use science, computers, or math?**
MS/HS8. **As an adult, how interested would you be in having a job that uses skills in science, technology, math, or engineering?**

Response Options			Scale-Up Students					All Students Statewide			
Grades 3-5	Grades 6-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12	Total n	Subtotal %	Grades 3-5	Grades 6-8	Grades 9-12
I like it a lot	Very interested	3,875	45%	43%	44%	55%	89,312	42%	44%	43%	38%
It's okay	Somewhat interested	3,522	41%	41%	41%	37%	87,582	41%	40%	43%	42%
I don't like it very much	Not very interested	1,272	15%	16%	14%	8%	34,283	16%	16%	14%	19%
Total		8,669					211,177				

Appendix I: Regional Scale-Up Program_Teacher/Leader questionnaire

Scale-Up Teacher/Leader Survey 2014-2015

The purpose of this survey is to inform the Iowa STEM Monitoring Project by providing the Monitoring Team with consistent information about all Scale-up programs implemented in the six Hub Regions. This survey should be completed by the teacher or leader who implemented the STEM Scale-Up program.

The following questions will provide summative data regarding participation in your Scale-up, information about its implementation and working with the service provider, and outcomes of implementing a Scale-up program. Your responses to these questions will enable us to provide a detailed story about Iowa's STEM Scale-up programs in 2014-2015.

Please complete this survey as soon as possible after you have completed your Scale-Up program. The link will remain open until June 8, 2015. If you have questions about gathering or completing this information, please contact Mari Kemis (mrkemis@iastate.edu) or your regional hub manager.

Please enter your name.____

Please enter your school district name.________________________________

Please enter your school building name.______________________________

Please enter your email address.____________________________________

Are you . . .

- ❍ Male
- ❍ Female

Which subject(s) do you teach?______________________________________

Which grade level(s) do you teach?__________________________________

Please specify the STEM region in which you are located.

- ❍ NW--Northwest
- ❍ NC--North Central
- ❍ NE--Northeast
- ❍ SW--Southwest
- ❍ SC--South Central
- ❍ SE--Southeast

Please select your Scale-Up program.

- A World in Motion (AWIM)
- CASE--The Case for Agricultural STEM Education in Iowa
- Defined STEM
- Engineering is Elementary in Iowa (EiE)
- First Tech Challenge
- HyperStream
- KidWind Renewable Energy STEM
- SCI Pint Size Science
- Project Lead the Way: Engineering
- Project Lead the Way: Gateway

Participant Demographics

Please indicate the participants in your Scale-Up program. (Check all that apply.)

- ☐ Pre-school students
- ☐ Grades K-5 students
- ☐ Grades 6-8 students
- ☐ Grades 9-12 students
- ☐ Parents
- ☐ Other (Please describe) ____________________

Please indicate the number of student participants in your program.

Total number of pre-school students	
Total number of students in grades K-5	
Total number of students in grades 6-8	
Total number of students in grades 9-12	

Please indicate the number of parent volunteers who participated in your program. Leave blank if no parents volunteered in your program.

Total number of individual parent volunteers	

Please indicate the number of other participants in your program. Leave blank if no others participated in your program.

Total number of individual other participants	

Implementation

Did you implement your Scale-Up program. . .

- ❍ as intended
- ❍ with minor changes (please describe) ____________________
- ❍ with major changes (please describe) ____________________
- ❍ did not implement (why?)______________________________

Please give us your opinions about working with your service provider. To what extent...

	Not at all	Some of the time	Most of the time	All of the time
did you have adequate contact with the service provider?	❍	❍	❍	❍
did you receive materials and resources in a timely manner?	❍	❍	❍	❍
was the service provider responsive to your questions and needs?	❍	❍	❍	❍
did your partnership with the service provider meet your overall expectations?	❍	❍	❍	❍

Describe any challenges or barriers you faced in working with your service provider.

Describe any challenges or barriers you faced in implementing the Scale-Up program.

What did you find helpful during the implementation and would recommend to others? This might include helpful partners, administrative support, training, or unique local circumstances.

What groups did you collaborate with in the implementation of the Scale-Up program? Please be specific and do not use acronyms.

- ❑ In-school ____
- ❑ Out-of-school ____
- ❑ Community ____
- ❑ Volunteer ____
- ❑ Other (please describe) ________________________________

Outcomes, Dissemination, and Sustainability

We are interested to know if you, as a teacher/leader of a Scale-Up program, have gained skills or confidence as a result of your participation. Please indicate your level of agreement with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree	N/A
I have more confidence to teach STEM topics.	❍	❍	❍	❍	❍	❍	❍
I have increased my knowledge of STEM topics.	❍	❍	❍	❍	❍	❍	❍
I am better prepared to answer students' questions about STEM topics.	❍	❍	❍	❍	❍	❍	❍
I have learned effective methods for teaching STEM topics.	❍	❍	❍	❍	❍	❍	❍

For your Scale-Up, did you... (check all that apply)

- ❑ Utilize a previously established school-business partnership in your area
- ❑ Develop a new school-business partnership in your area to implement your Scale-Up program
- ❑ I was unable to find either a new or existing school-business partnership to use with my Scale-Up program.
- ❑ My Scale-Up program did not require a school-business partnership.

Please indicate how many school-business partnerships you and/or your school or organization have with businesses in your area.

Total number of school-business partnerships______________________________
Number of NEW school-business partnership this school year__________________

Please describe the school-business partnership you used the most for your Scale-Up program (e.g., type of business, any activities that were the result of the partnership (field trips, guest speaker, etc.), successes/challenges/barriers of the partnership).

Which of the following outcomes, if any, did you observe as a result of your program? (Check all that apply.)

- ❑ Increased student awareness in STEM topics
- ❑ Increased student interest in STEM topics
- ❑ Increased student awareness in STEM career opportunities
- ❑ Increased student interest in STEM career opportunities
- ❑ Increased student achievement in STEM topics
- ❑ Increased student interest in STEM educational opportunities in college
- ❑ Utilized an existing school-business partnership
- ❑ Developed a new school-business partnership
- ❑ Other (please describe) ____________________

Please provide one or two examples of the impact the program has had on participants.

Did the outcomes you observed meet your expectations?

- ❑ Yes (how?) ____
- ❑ No (why not?) ____

Please describe anything unexpected that happened during implementation or any unexpected results (positive or negative).

At the local level, was there.....(Check all that apply.)

- ❑ Media coverage for your program
- ❑ Community support
- ❑ Support from business and industry
- ❑ Additional funding or other resources from partners
- ❑ Local interest in continuing STEM programming

Thank you so much for your responses. Please click on the >> to submit your responses.

Appendix J: Regional Scale-Up Program_Description of 2014-2015 Scale-Up Programs

Prepared by Research Institute for Studies in Education (RISE), Iowa State University

A World in Motion (AWIM)

Description: AWIM provides science, technology, engineering and math education through inquiry based real world engineering challenges designed for primary, elementary and middle school students.
Grade Level: K- 8
Contact: Chris Ciuca, SAE International, cciuca@sae.org
For More Information: www.awim.org

The "CASE" for Agricultural STEM Education in Iowa: Preparing Tomorrow's Leaders, Today (CASE)

Description: Curriculum for Agricultural Science Education, CASE, curricular materials provide a high level of STEM educational experiences to students to enhance the rigor and relevance of agriculture, food, and natural resources (AFNR) subject matter.
Grade Level: 9 -12
Contact: Joshua Remington, Iowa FFA Foundation – joshua.remington@iowaffafoundation.org
For More Information: www.iowaffafoundation.org

Defined STEM

Description: Defined STEM is a web-based content resource that brings the core fundamentals of STEM education to life for all teachers and students within a school.
Grade Level: K -12
Contact: Johnjoe Farragher, Defined Learning, LLC – johnjoe@definedlearning.com
For More Information: www.definedstem.com

Engineering is Elementary in Iowa (EiE)

Description: Engineering is Elementary is a research-based, standards-driven, and classroom-tested curriculum that integrates engineering and technology concepts and skills with elementary science topics.
Grade Level: 1-6
Contact: Christopher Soldat, Grant Wood AEA Van Allen Science Teaching Center – csoldat@gwaea.org
For More Information: www.aea10.k12.ia.us/vastscience/curriculumnew.html

FIRST Tech Challenge (FTC)

Description: FIRST Tech Challenge (FTC) is a community-focused robotics program while teaching students the value of hard work, innovation and creativity while going beyond the robotics competition by teaching teenagers the importance of working together, sharing ideas and treating each other with respect and dignity.
Grade Level: 7-12
Contact: Rebecca Whitaker, University of Iowa, rwhitake@engineering.uiowa.edu
For More Information: http://www.usfirst.org/roboticsprograms/ftc

HyperStream - Technology Hub for Iowa Students

Description: HyperStream/IT-Adventures and VREP, either independently or in combination, fosters real-world learning for 5th-12th graders through hands-on technology projects, competitions, showcases and engaging presentations through after-school clubs or integrated into curriculum, combined with the opportunity to work with technology mentors.

Grade Level: 5-12

Contact: Tamara Kenworthy, Program Manager, Technology Association of Iowa (TAI) – tamara@technologyiowa.org

For More Information: http://hyperstream.org or click here

KidWind Renewable Energy STEM*

Description: KidWind's program introduces teachers and students to renewable energy STEM concepts: our REcharge Labs will bring effective training and resources to teachers across Iowa, while the KidWind Renewable Energy Festival and the Online Renewable Energy Challenge give students a hands-on application for the concepts they learn.

Grade Level: 3-12

Contact: Michael Arquin, KidWind, michael@kidwind.org

For More Information: http://learn.kidwind.org/

SCI Pint Size Science*

Description: The Science Center of Iowa's *Pint Size Science* program provides a platform for young children ages 3 to 5 to explore science in a highly-engaging, interactive, and safe manner.

Grade Level: preK-K (ages 3-5)

Contact: Kay Murphy, Science Center of Iowa, kay.murphy@sciowa.org

For More Information: http://www.sciowa.org/learn/pint-size-science/

Project Lead The Way: Engineering (PLTW)*

Description: Funding will assist Iowa schools in implementing and expanding Project Lead The Way's Engineering program by providing tuition for Principles Of Engineering (POE) Core Training for one teacher as well as six VEX PLTW Engineering Robotics Kits.

Grade Level: 9-12

Contact: Kim Glenn, PLTW Director of School Engagement, kglenn@pltw.org

For More Information: www.pltw.org or click here.

Project Lead The Way: Gateway (PLTW)

Description: Funding will assist Iowa schools in implementing Project Lead The Way's Gateway program by providing tuition for Design & Modeling and Automation & Robotics Core Training for teachers and five VEX PLTW Gateway Robotics Kits.

Grade Level: 6 - 8

Contact: Kim Glenn, PLTW Director of School Engagement, kglenn@pltw.org

For More Information: www.pltw.org or click here.

**** New STEM Scale-Up Programs for 2014-2015***

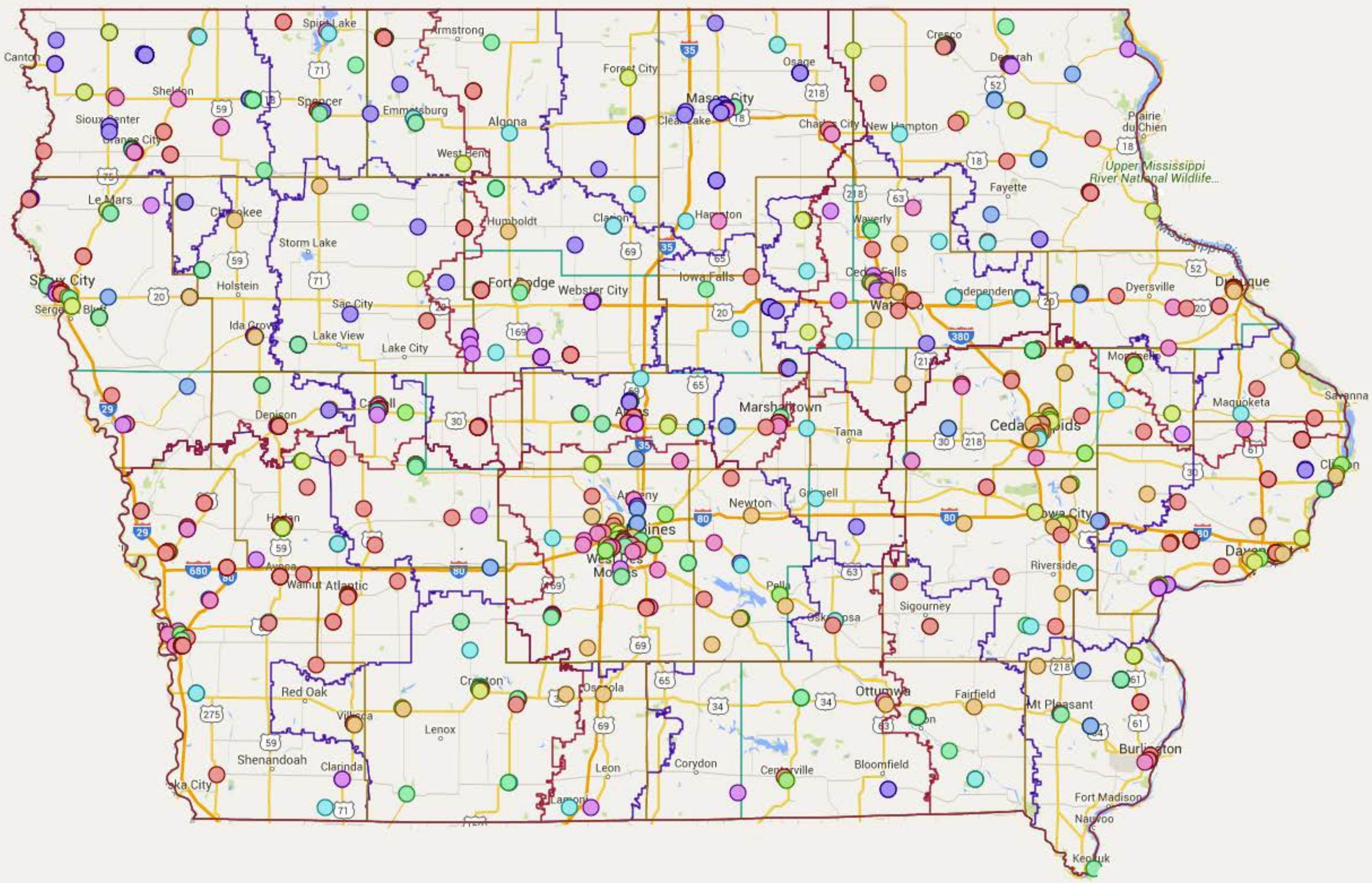
Appendix K: Regional Scale-Up Program_Map of 2014-2015 Scale-Up program awards

Prepared by Research Institute for Studies in Education (RISE), Iowa State University

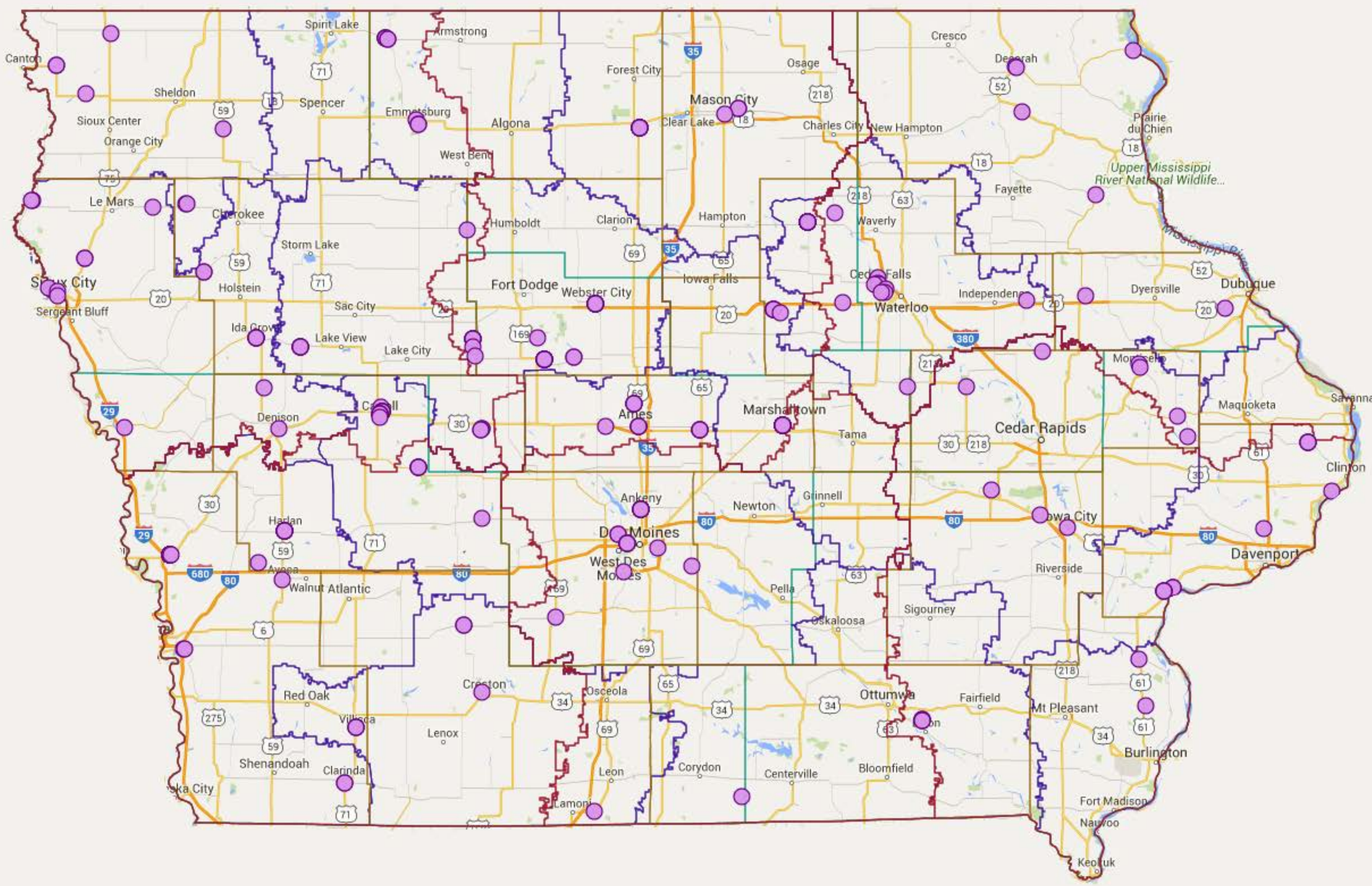
Source: http://www.iowastem.gov/educators/scale-up-programs/map-stem-scale-ups-by-region (Retrieved July 2015)

2014-15 Scale-Up Programs

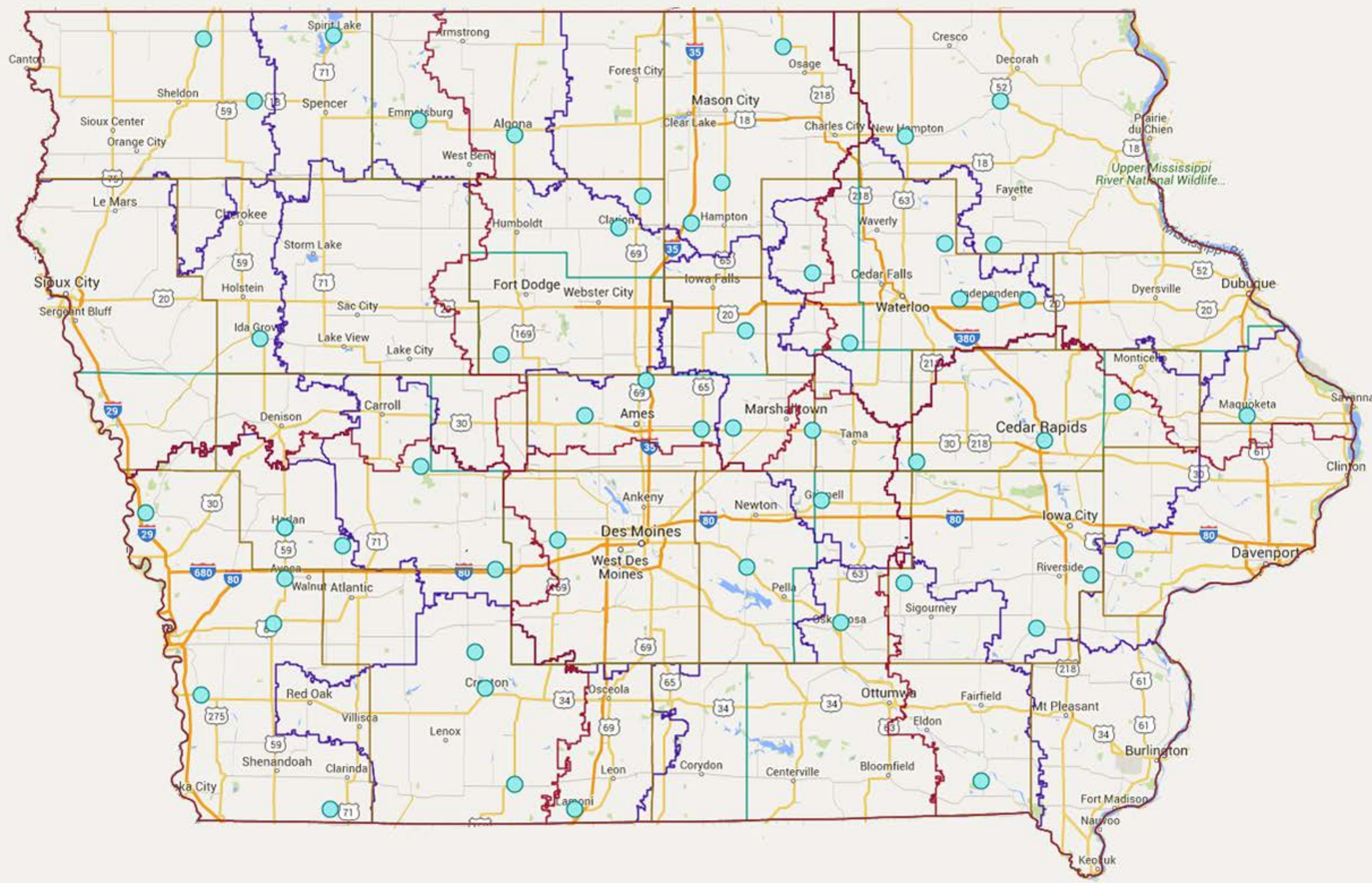
2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
All



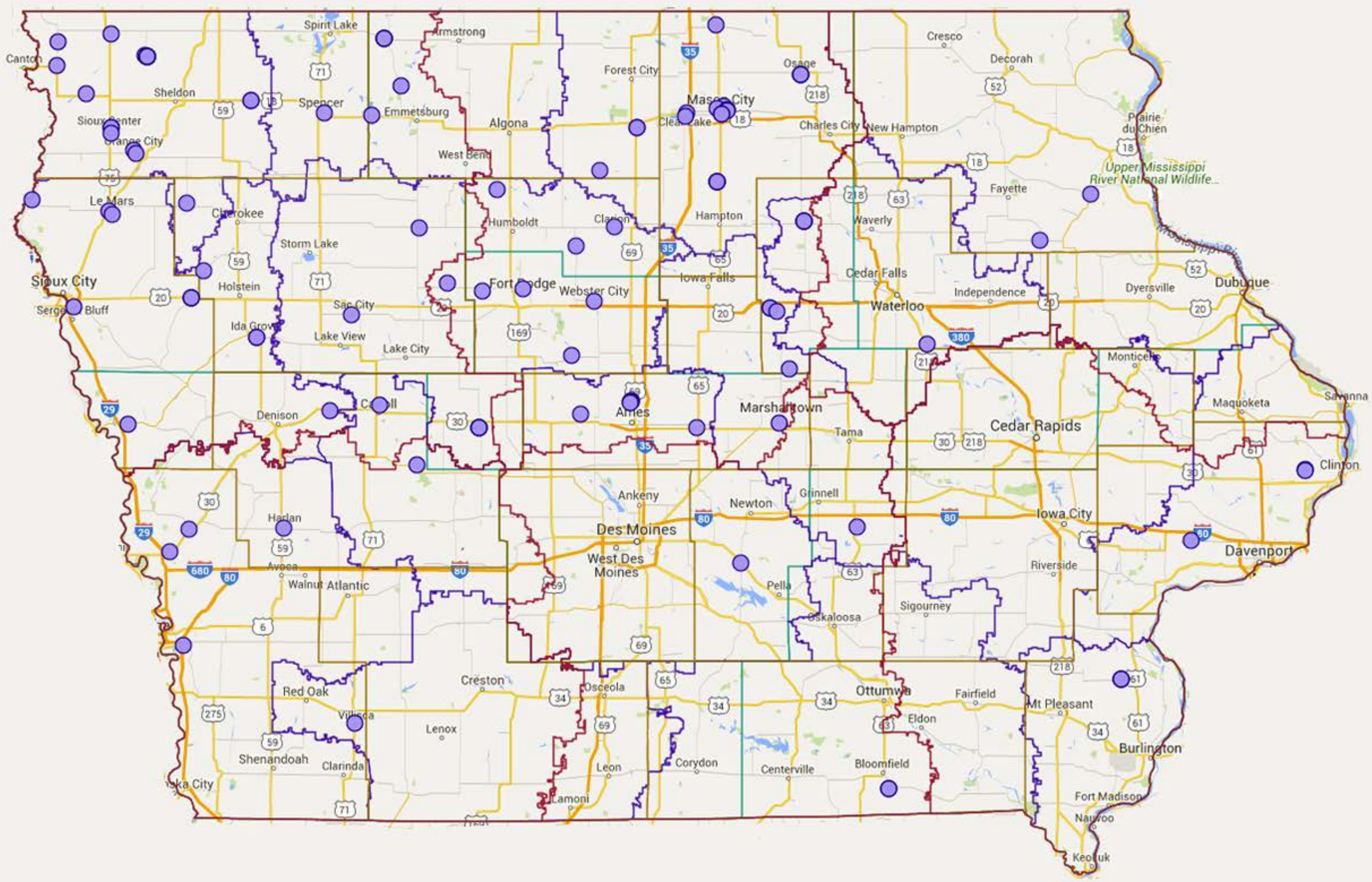
2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
A World in Motion



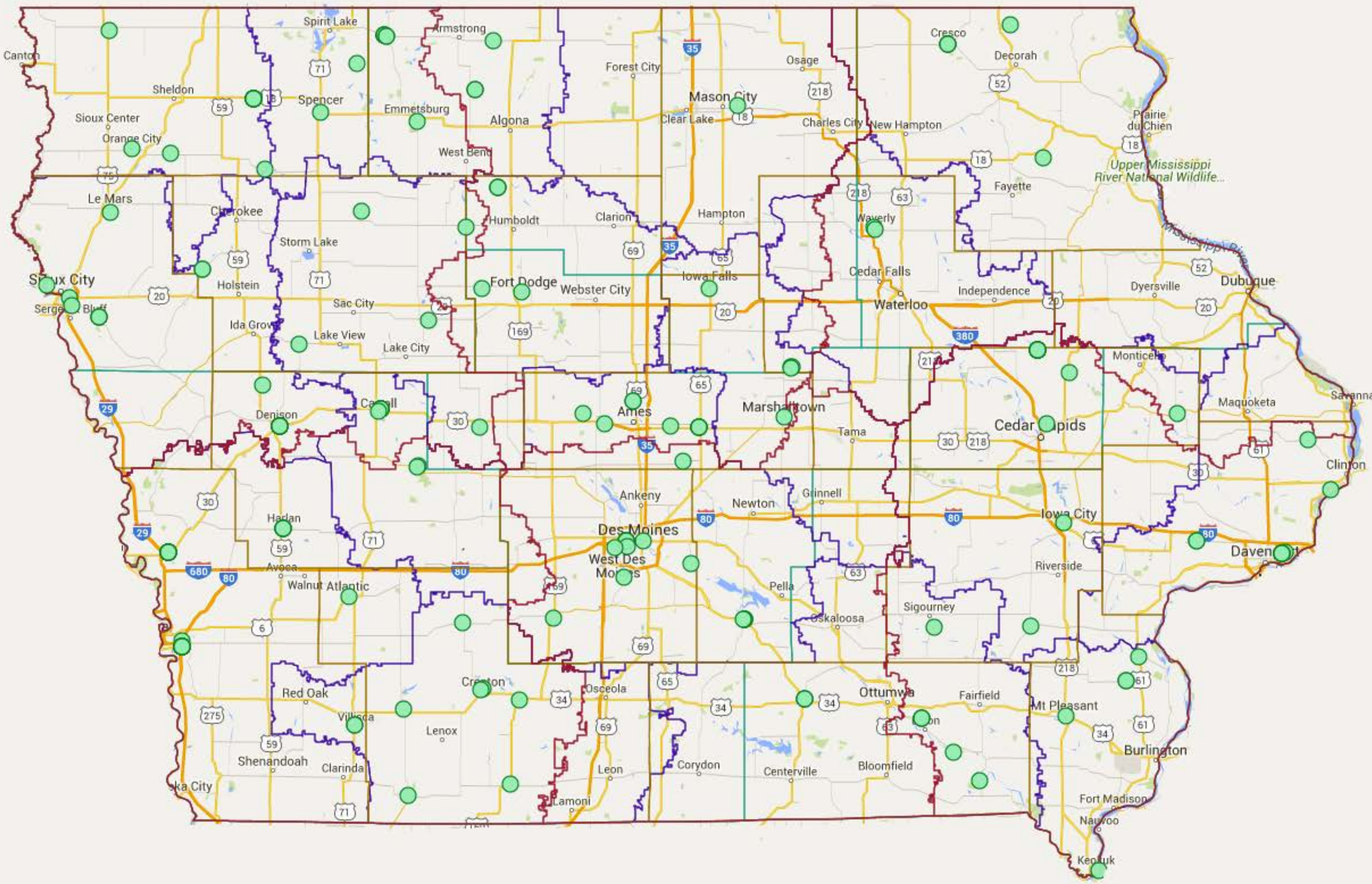
2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
CASE



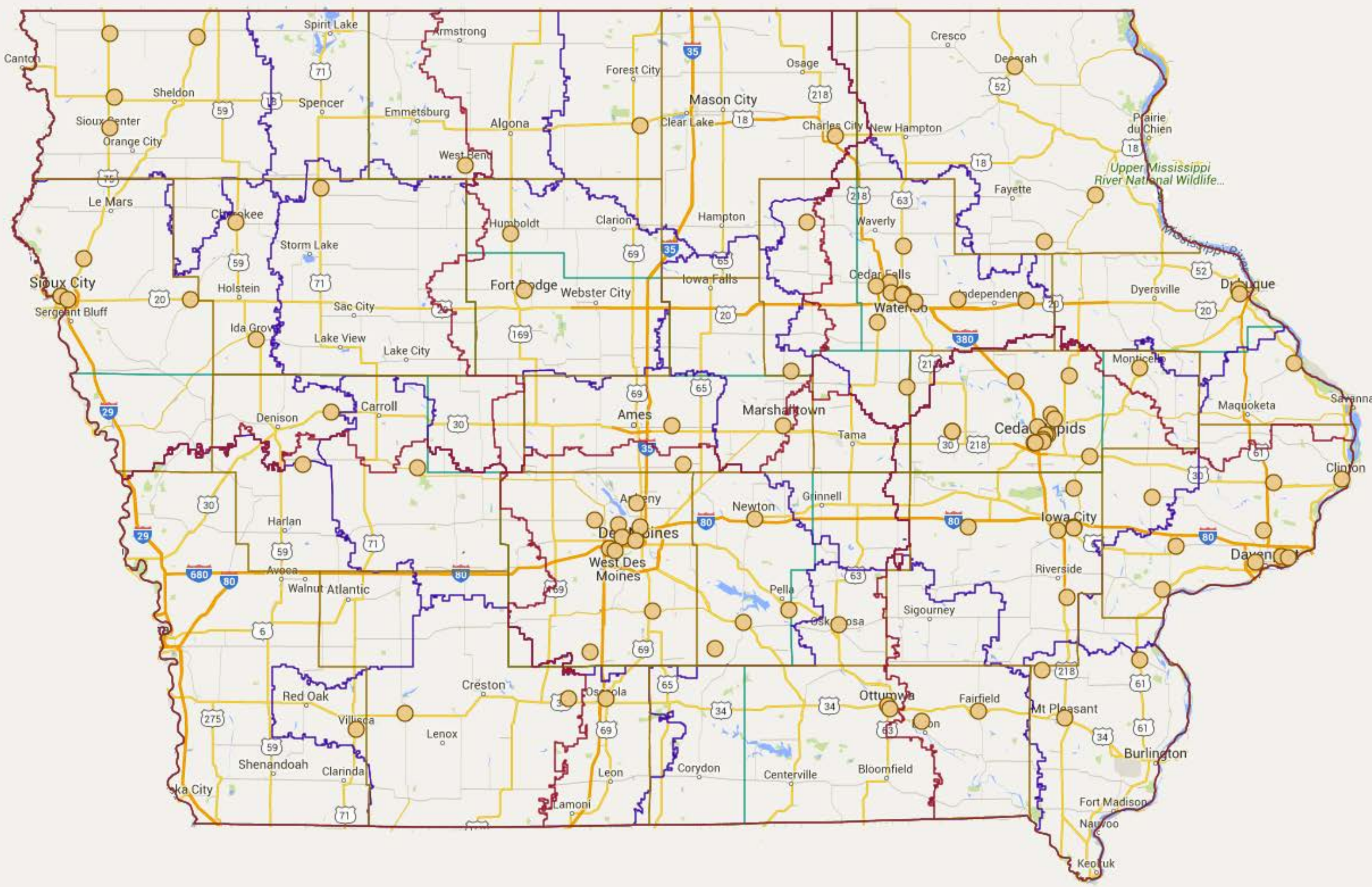
2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
Defined STEM



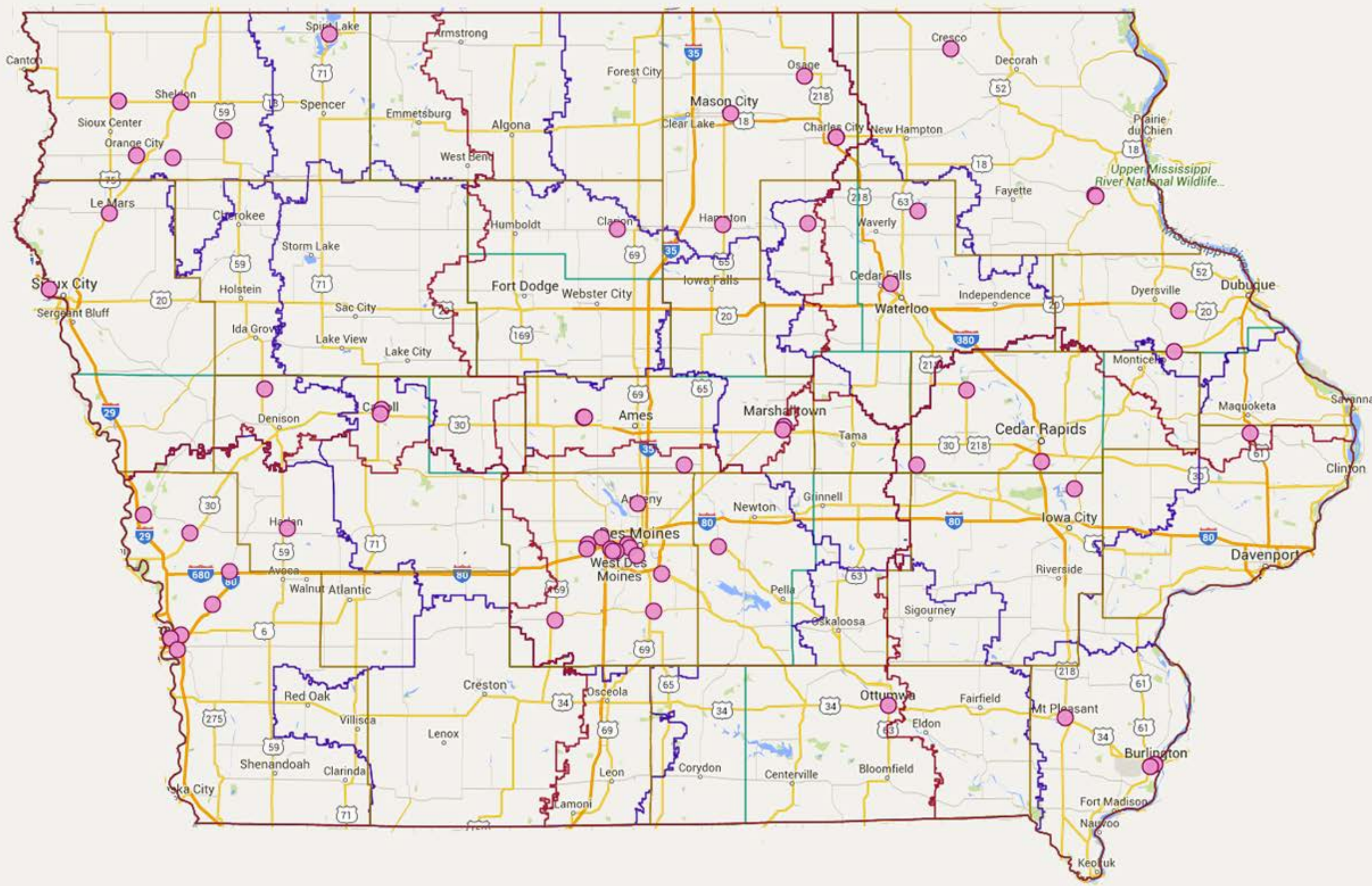
2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
Engineering is Elementary



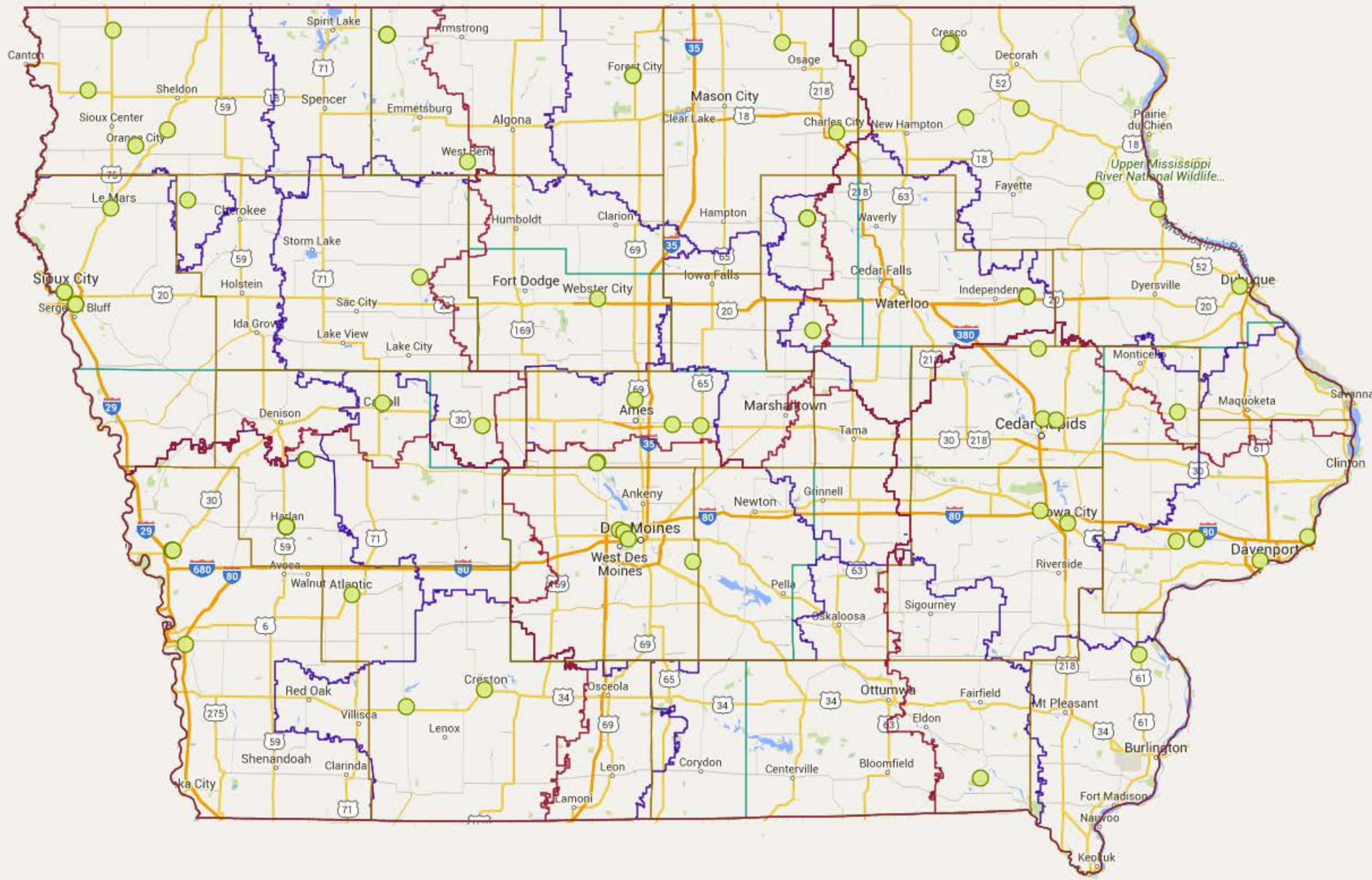
2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
FIRST Tech Challenge



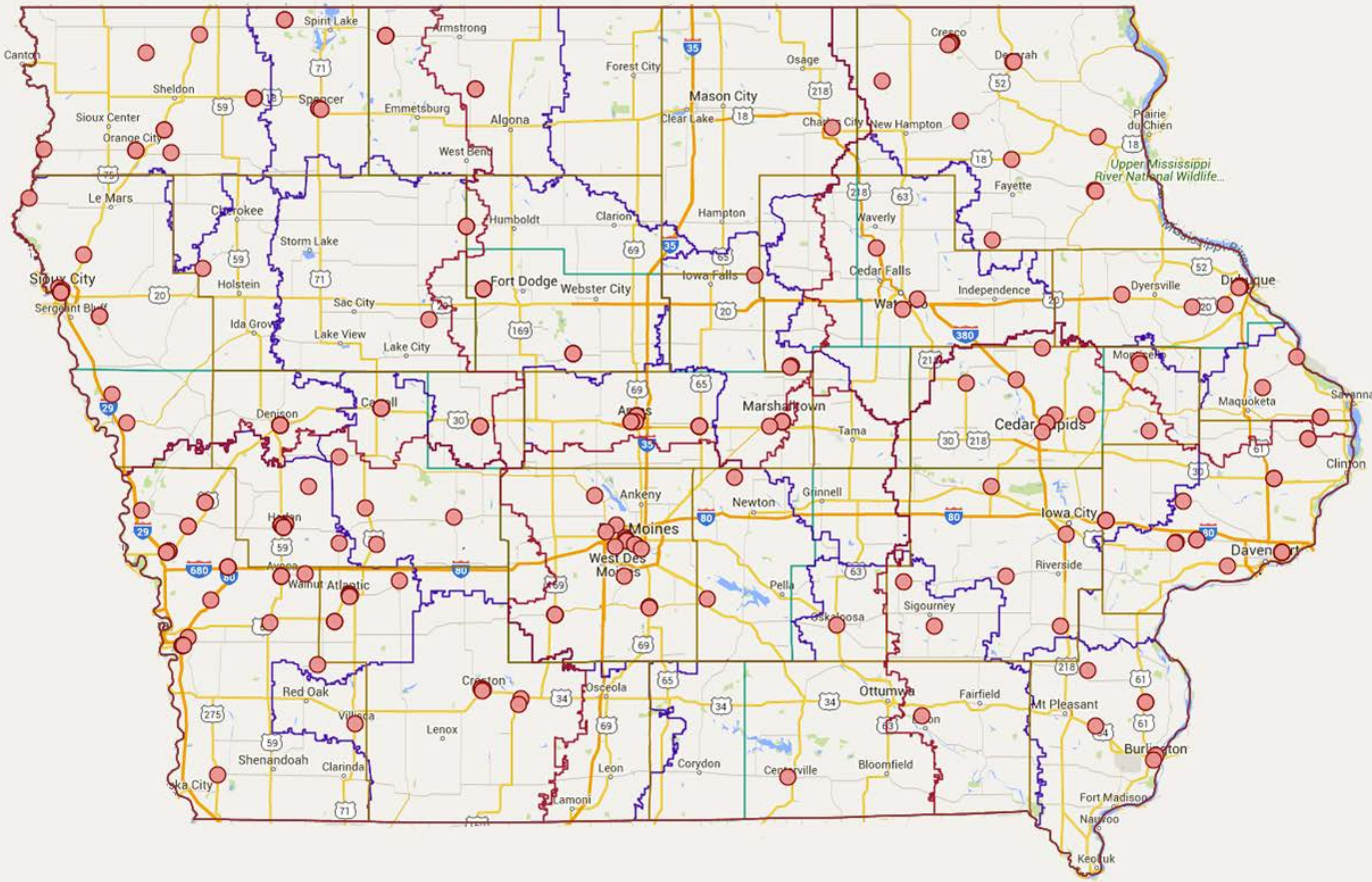
2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
HyperStream



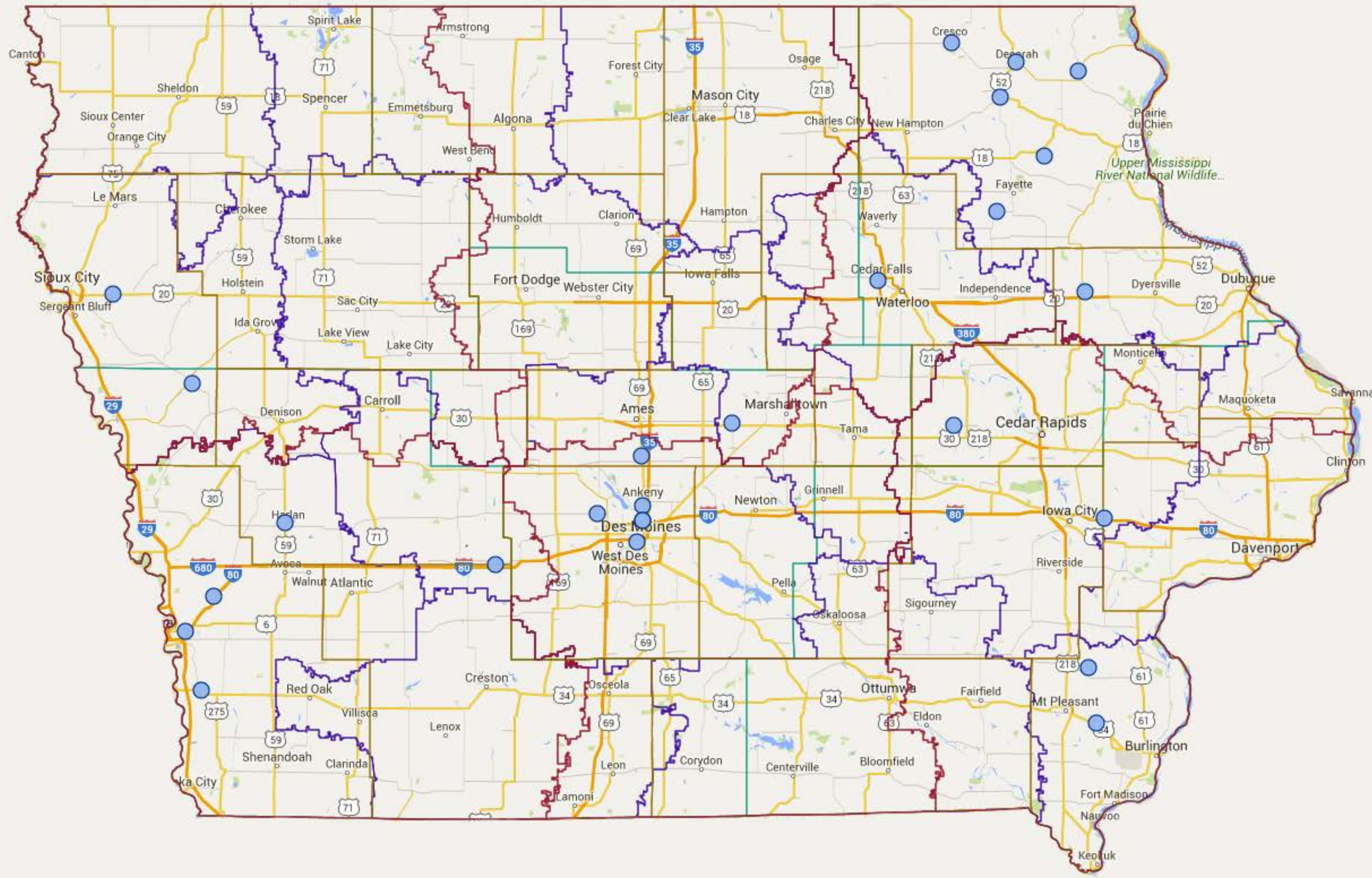
2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
KidWind



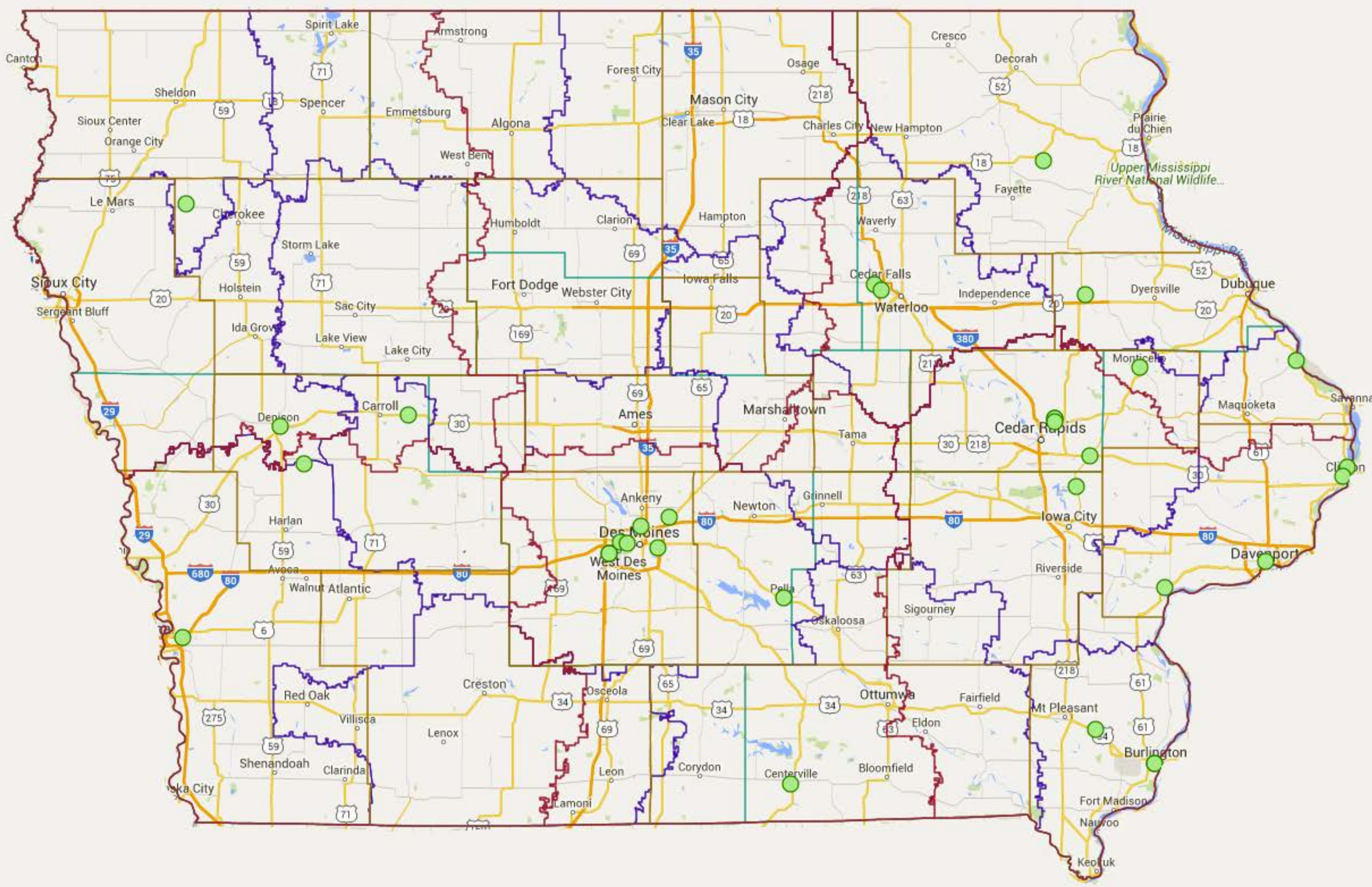
2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
Pint Size Science



2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
PLTW Engineering



2014-15 STEM Scale-Up Programs of the Governor's STEM Advisory Council
PLTW Gateway



Appendix L: Regional Scale-Up Program_Student Surveys

Student Survey

Scale-Up STEM Interest (POST) – Middle/High School Range

The following questions are about your interest in science, technology, engineering, and mathematics. You do not have to answer the questions and you can stop at any time. If you decide to stop, your grades will not be affected and you will not face any consequences. Please sit quietly until your classmates are finished.

1. Are you… _________ Male (Boy) _________ Female (Girl)
2. How old are you? _________ Years

Compared to the beginning of the (semester/program/etc.), are you more interested, just as interested, or less interested now in each of the following?
Place an "X" in the box to mark your answer.

	More interested now than before	Just as interested now as before	Less interested now than before
3. Math			
4. Science			
5. Computers and technology			

6. Compared to the beginning of the (semester/program/etc.), are you more interested, just as interested, or less interested in designing, creating, and building machines and devices (also called engineering)?
   1 More interested now than before
   2 Just as interested now as before
   3 Less interested now than before

7. Compared to the beginning of the (semester/program/etc.) are you more interested, just as interested, or less interested in someday having a job that uses skills in science, technology, math, or engineering?
   1 More interested now than before
   2 Just as interested now as before
   3 Less interested now than before

Student Survey

Scale-Up STEM Interest (POST) – Elementary School Range

These questions ask about your interest in science, computers, and math. You do not have to answer the questions. You can stop at any time. If you decide to stop, nothing bad will happen. If you choose not to answer the questions, please sit quietly until everyone is done.

1. Are you… _________ Boy _________ Girl

2. How old are you? _________ Years

3. Think about how interested you were in math in the fall. Are you more interested in math now, just as interested in math now, or less interested in math now?

   1 I am more interested now
   2 I am just as interested now
   3 I am less interested now

4. Think about how interested you were in science in the fall. Are you more interested in science now, just as interested in science now, or less interested in science now?

   1 I am more interested now
   2 I am just as interested now
   3 I am less interested now

5. Think about how interested you were in using computers in the fall. Are you more interested in using computers now, just as interested in using computers now, or less interested in using computers now?

   1 I am more interested now
   2 I am just as interested now
   3 I am less interested now

6. Think about how interested you were in designing, creating, and building things in the fall. Are you more interested in creating things now, just as interested in creating things now, or less interested in creating things now?

   1 I am more interested now
   2 I am just as interested now
   3 I am less interested now

7. Are you more interested now, just as interested, or less interested in having a job that uses science, math, and computer skills?

   1 I am more interested now
   2 I am just as interested now
   3 I am less interested now

Student Survey

Scale-Up STEM Interest (POST) – Early Elementary School Range

These questions are about your interest in science, computers, and math. You do not have to answer the questions. You can stop at any time. If you decide to stop, nothing bad will happen. If you choose not to answer the questions, please sit quietly until everyone is done.

1. Are you… _________ Boy _________ Girl
2. How old are you? _________ Years
3. Think about how much you liked <u>math</u> in the fall. Do you like math more now, about the same, or less now?

   1 I like it more now

   2 I like it the same now

   3 I like it less now

4. Think about how much you liked <u>science</u> in the fall. Do you like science more now, about the same, or less now?

   1 I like it more now

   2 I like it the same now

   3 I like it less now

5. Think about how much you liked using <u>computers</u> in the fall. Do you like using computers more now, about the same, or less now?

   1 I like it more now

   2 I like it the same now

   3 I like it less now

6. Do you like to <u>design and build things</u> more now, about the same, or less now than you did in the fall?

   1 I like it more now

   2 I like it the same now

   3 I like it less now

7. Are you more interested now, about the same, or less interested in having a <u>job</u> that uses science, math, and computer skills?

   1 I like it more now

   2 I like it the same now

   3 I like it less now

Appendix M: Regional Scale-Up Program_Student Survey item frequencies

The frequency tables for all questions in the student survey are presented in the order they appear in the questionnaire. The subgroup data included in the frequency tables are presented as descriptive statistical summaries. Between-group analyses were conducted to determine which (if any) of the subgroups differed from one another based on inferential statistical tests. Significant differences are noted with an asterisk (*) where p<0.05 or a double asterisk (**) where p<0.001, respectively.

E1. Are you…___Boy ___Girl
MS/HS1. Are you…___Male (Boy) ___Female (Girl)

			Education		
Response Options	n	Total %	Elem %	Middle School %	High School %
Male	8,467	51%	51%	52%	64%
Female	7,255	49%	49%	48%	36%
Total	15,722	100%	--	--	--

E2. How old are you? ____ Years
MS/HS 2. How old are you? ____ Years

Response	n	Total %
5	1,727	11%
6	918	6%
7	1,054	7%
8	1,541	10%
9	1,393	9%
10	1,848	12%
11	1,792	12%
12	1,305	8%
13	1,288	8%
14	1,065	7%
15	559	4%
16	408	3%
17	428	3%
18	263	2%
19	22	<1%
Total	15,611	100%
No response	183	--

E2.	How old are you? ____ Years			
MS/HS 2.	How old are you? ____ Years			

			Gender	
	Sub-group	Total	M	F
Subgroup	n	%	%	%
Elem (5-10y)	8,478	54%	52%	57%
MS (11-13y)	4,385	28%	27%	29%
HS (14-19y)	2,745	18%	21%	14%
Total	15,608	100%	100%	100%
No response	186	--	--	--

E3.	Think about how interested you were in math in the fall. Are you more interested in math now, just as interested in math now, or less interested in math now?
MS/HS 3.	Compared to the beginning of the (semester/program/etc.), are you more interested, just as interested, or less interested now in [Math]?

			Gender		Education**		
Response		Total	M	F	Elem	Middle School	High School
Options	n	%	%	%	%	%	%
More Interested	6,758	43%	42%	45%	55%	32%	23%
Just as interested	6,769	43%	44%	42%	30%	54%	66%
Less interested	2,159	14%	15%	13%	14%	14%	11%
Total	15,686	100%	100%	100%	100%	100%	100%
No Response	108	--	--	--	--	--	--

E4.	Think about how interested you were in science in the fall. Are you more interested in science now, just as interested in science now, or less interested in science now?
MS/HS 4.	Compared to the beginning of the (semester/program/etc.), are you more interested, just as interested, or less interested now in [Science]?

			Gender		Education**		
Response		Total	M	F	Elem	Middle School	High School
Options	n	%	%	%	%	%	%
More Interested	9,551	61%	61%	60%	69%	56%	44%
Just as interested	4,995	32%	32%	32%	24%	36%	51%
Less interested	1,164	7%	7%	8%	8%	8%	6%
Total	15,710	100%	100%	100%	100%	100%	100%
No Response	84	--	--	--	--	--	--

E5.	Think about how interested you were in using computers in the fall. Are you more interested in using computers now, just as interested in computers now, or less interested in computers now?
MS/HS 5.	Compared to the beginning of the (semester/program/etc.), are you more interested, just as interested, or less interested now in [Computers and Technology]?

Response Options	n	Total %	Gender** M %	F %	Education** Elem %	Middle School %	High School %
More Interested	9,593	61%	64%	58%	70%	51%	49%
Just as interested	4,878	31%	29%	33%	24%	39%	42%
Less interested	1,182	8%	7%	9%	6%	10%	9%
Total	15,653	100%	100%	100%	100%	100%	100%
No Response	141	--	--	--	--	--	--

E6.	Think about how interested you were in designing, creating, and building things in the fall. Are you more interested in creating things now, just as interested in creating things now, or less interested in creating things now?
MS/HS 6.	Compared to the beginning of the (semester/program/etc.), are you more interested, just as interested, or less interested in designing, creating, and building machines and devices (also called engineering)?

Response Options	n	Total %	Gender** M %	F %	Education** Elem %	Middle School %	High School %
More Interested	10,373	66%	69%	63%	72%	62%	54%
Just as interested	4,190	27%	25%	29%	21%	30%	38%
Less interested	1,141	7%	6%	9%	7%	7%	8%
Total	15,704	100%	100%	100%	100%	100%	100%
No Response	90	--	--	--	--	--	--

E7.	Are you more interested now, just as interested, or less interested in having a job that uses science, math, and computer skills?
MS/HS 7.	Compared to the beginning of the (semester/program/etc.) are you more interested, just as interested, or less interested in someday having a job that uses skills in science, technology, math, or engineering?

Response Options	n	Total %	Gender** M %	F %	Education** Elem %	Middle School %	High School %
More Interested	7,977	51%	54%	48%	56%	43%	47%
Just as interested	5,808	37%	36%	39%	29%	46%	47%
Less interested	1,836	12%	10%	14%	14%	11%	5%
Total	15,621	100%	100%	100%	100%	100%	100%
No Response	173	--	--	--	--	--	--