Iowa STEM Monitoring Project

2012-2013 Annual Report

Updated July 2014

Prepared for

Iowa Governor's STEM Advisory Council

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Recommended Citation:
Heiden, E. O., Cornish, D. L., Lutz, G. M., Kemis, M., & Avery, M. (2013). *Iowa STEM Monitoring Project: 2012-2013 Annual Report.* Cedar Falls, IA: University of Northern Iowa, Center for Social and Behavioral Research.

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List of Acronyms

AP	Advanced Placement
AWIM	A World in Motion
BEDS	Basic Educational Data Survey
CEA	Center for Evaluation and Assessment
CSBR	Center for Social and Behavioral Research
DOE	Iowa Department of Education
FLL	First Lego League
FREE	Fabulous Resources in Energy Education
FTC	First Tech Challenge
GIS	Geographic Information System (maps)
ISIS	Iowa STEM Indicators System
ISMP	Iowa STEM Monitoring Project
ISU	Iowa State University
ITP	Iowa Testing Program
IWD	Iowa Workforce Development
LEA	Local Education Agencies
NAEP	National Assessment of Educational Progress
NCES	National Center for Education Statistics
NCRC	ACT National Career Readiness Certificate
NPR	National Percentile Rank
PEERS	Partnership for Engineering and Educational Resources for Schools
Project HOPE	Healthcare, Occupations, Preparation, and Exploration
RISE	Research Institute for Studies in Education
RPI	Report of Participant Information
RPO	Report of Process and Outcomes
SCED Codes	School Codes for the Exchange of Data
SCI	Corridor STEM Initiative
SSTFI	State Science + Technology Fair of Iowa
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), the University of Iowa (UI) Center for Evaluation and Assessment (CEA) and Iowa Testing Programs (ITP). 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. The ISMP was developed within an evaluation framework for the STEM initiative in Iowa, which included multiple levels of evaluation, additional resources leveraged in support of evaluation, and alignment of evaluation activities with initiative goals and priorities. The ISMP is comprised of four components: 1) Iowa STEM Indicators System (ISIS); 2) Statewide Survey of Public Attitudes Toward STEM; 3) Statewide Student Interest Inventory; and 4) Regional Scale-Up Program Monitoring.

The Iowa STEM Indicators System (ISIS) is a system to track publicly available data at the national, state, and regional levels. The purpose of the system 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. Data used to track the ISIS indicators come from sources such as the Iowa Department of Education (DOE), the National Center for Education Statistics (NCES), Iowa Workforce Development (IWD), Regional Scale-Up Programs, ACT, and Iowa colleges and universities. Variability in when data from these sources are collected, analyzed, and released publicly requires continuous tracking and updating.

To measure public awareness, the UNI CSBR initiated a statewide public survey of Iowans. The field period for the survey was July through September, 2012. Three sampling strata were used: general population, parents of 4-11 year old children, and parents of 12-19 year old children. The dual-frame sampling design included both landline and cell phone numbers. The survey yielded 2,010 completed interviews. Data were weighted by demographic variables to better represent the adult population of Iowa.

Iowa Testing Programs at the University of Iowa administers the Iowa Assessments taken by nearly every student in grades 3-12 in the state annually. For the 2012-2013 academic year, an 8-item interest inventory was added to the Iowa Assessments. Two versions of the inventory were created: one for 3rd through 5th grade and one for grades 6th through 12th.

As part of the Iowa STEM Monitoring Project, the following three submissions were required as part of Regional Scale-Up Program monitoring: 1) a Report of Process and Outcomes (RPO), 2) a Report of Participant Information (RPI), and 3) completed student questionnaires. The general purpose of the online RPO was to inform the ISMP by providing the project partners with consistent information across all Scale-Up programs implemented in the regions. The purpose of the RPI 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. Last, a short student questionnaire was created for completion by all students who were served or impacted by Scale-Up programs. The purpose of the 7-item student survey was to assess self-reported changes in STEM interest as a result of participating in the Scale-Up program. The questionnaire asked the student to indicate their change in interest across STEM topics and in STEM careers after participating in the Scale-Up program.

Results indicate that math and science achievement (as measured by state and national standardized tests and the ACT) has not changed markedly in the last five years and disparities in math and science achievement have persisted over time. A smaller proportion of underrepresented minority students, those eligible for free/reduced lunch, and students with disabilities are proficient in math and science. National percentile ranks of the Iowa Assessments math and science scores are higher among students participating in Scale-Up programs than among statewide test-takers. Interest in STEM subjects and STEM careers is higher among elementary students compared to middle school or high school students. Among Scale-Up participants, gender differences in STEM interest are most pronounced in high school and least pronounced in elementary school, suggesting these differences widen over time.

Nearly 10,000 post-secondary degrees (n=9,680) were awarded in STEM-related fields in 2011-2012 from Iowa's 4-year public and private colleges and universities, and 15 community colleges. Efforts to increase post-secondary degrees in STEM-related fields will help fill the estimated 10,000 vacancies in STEM jobs statewide (2011-2012).

The number of Iowa teachers with an endorsement to teach a science subject has decreased 8% in the past five years. The number of Iowa teachers with an endorsement to teach math has remained steady in the past five years. (2008/09-2012/13). GIS mapping shows there is an uneven distribution of teachers with math and science endorsements between urban and rural areas of the state. This may help explain some of the findings of the public awareness survey about urban and rural differences in parent perceptions of how well their child is being prepared in STEM subjects.

The public awareness survey found that while only 26% of Iowans have heard of STEM, 65% of Iowans have heard about improving science, technology, engineering, and math education. So, "brand awareness" of the STEM acronym may be low, but a majority of Iowans are aware of efforts to improve education in math, science, technology and engineering. Among parents of a school-aged child, almost all agree it is very important that their child does well in elementary math and science and has some advanced skills in high school STEM subjects. However, the percent of parents who believe their child is being very well-prepared in STEM subjects varies by where they live, from 37% in rural locations to 62% of parents who live in a city. By focusing on STEM education and economic development, 97% of Iowans agree it will give more opportunities to the next generation, 86% agree it will improve the state economy, and 76% agree it will attract companies to move or expand in Iowa.

Among the 12 Regional Scale-Up Programs in STEM education in 2012-2013, all of the selected programs had positive effects on student interest and awareness in STEM topics and STEM careers. Eighty-nine percent of students reported they were more interested in at least one STEM subject after participating in one of the STEM education programs. After participating in programs, 90% of students said they were "More Interested" (50%) or "Just as Interested" (40%) in pursuing a STEM job which is particularly encouraging considering that without intervention, interest in STEM subjects steadily declines across the grades from elementary school through high school. Finally, among educators involved in the STEM education programs, 84% reported increased student interest and awareness of STEM subjects, and more than 50% reported increased student interest and awareness in STEM careers.

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. The purpose of this first report is to present a baseline summary of STEM education and workforce development centered on the activities of the Iowa Governor's STEM Advisory Council. Future monitoring activities will work to refine ISMP measures, indicators, and data collection/compilation systems and to strengthen relationships with data partners in the state.

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), the University of Iowa (UI) Center for Evaluation and Assessment (CEA) and Iowa Testing Program (ITP). 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 was established to identify and monitor changes in Iowa STEM on three levels. At its most broad, the project monitors Iowa STEM in the National context by comparing 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 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) Iowa STEM Indicators System (ISIS); 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 Infographic. The UNI CSBR coordinates all four ISMP components. Each ISMP partner has specific areas of responsibility with areas of overlap. Collaboration among ISMP partners has been key to the success of the ISMP in year 1.

Figure 1. Iowa STEM Monitoring Project Infographic

Governor's STEM Advisory Council

Iowa STEM Monitoring Project

Objective: 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.

Iowa State University of Science and Technology

RISE Research Institute for Studies in Education

The University of Iowa

University of Northern Iowa

Center for Social and Behavioral Research

Iowa STEM Indicators System (ISIS)

System to track publicly available data at the national, state, and regional levels

18 indicators in 4 areas:

1. K-12 student achievement/interest
2. K-12 student preparation
3. College completions
4. Employment

Data sources:

- Department of Education
- Iowa colleges and universities
- Census Bureau
- Iowa Workforce Development
- Scale-up programs
- Iowa Testing
- NAEP/ACT

Statewide Survey of Public Attitudes Toward STEM

Annual survey of Iowans regarding attitudes toward and awareness of STEM education and economic development

Special sections for parents of K-12 children (ages 4-11 and ages 12-19)

Year 1 data collection with 2,010 Iowans

Created to allow for comparisons with other state/regional/national studies

Statewide Student Interest Inventory

Annual assessment of Iowa K-12 student interest in STEM topics

Administered with regular Iowa Assessments in schools across the state

8 STEM interest items in 2 versions for older and younger students

Interest will be compared across demographic and geographic lines

Student interest and achievement will be compared

Scale-Up/ Regional

Regional perspective on STEM programming and student involvement

Over 800 local education agencies (LEA) participating in 12 Scale-Up programs

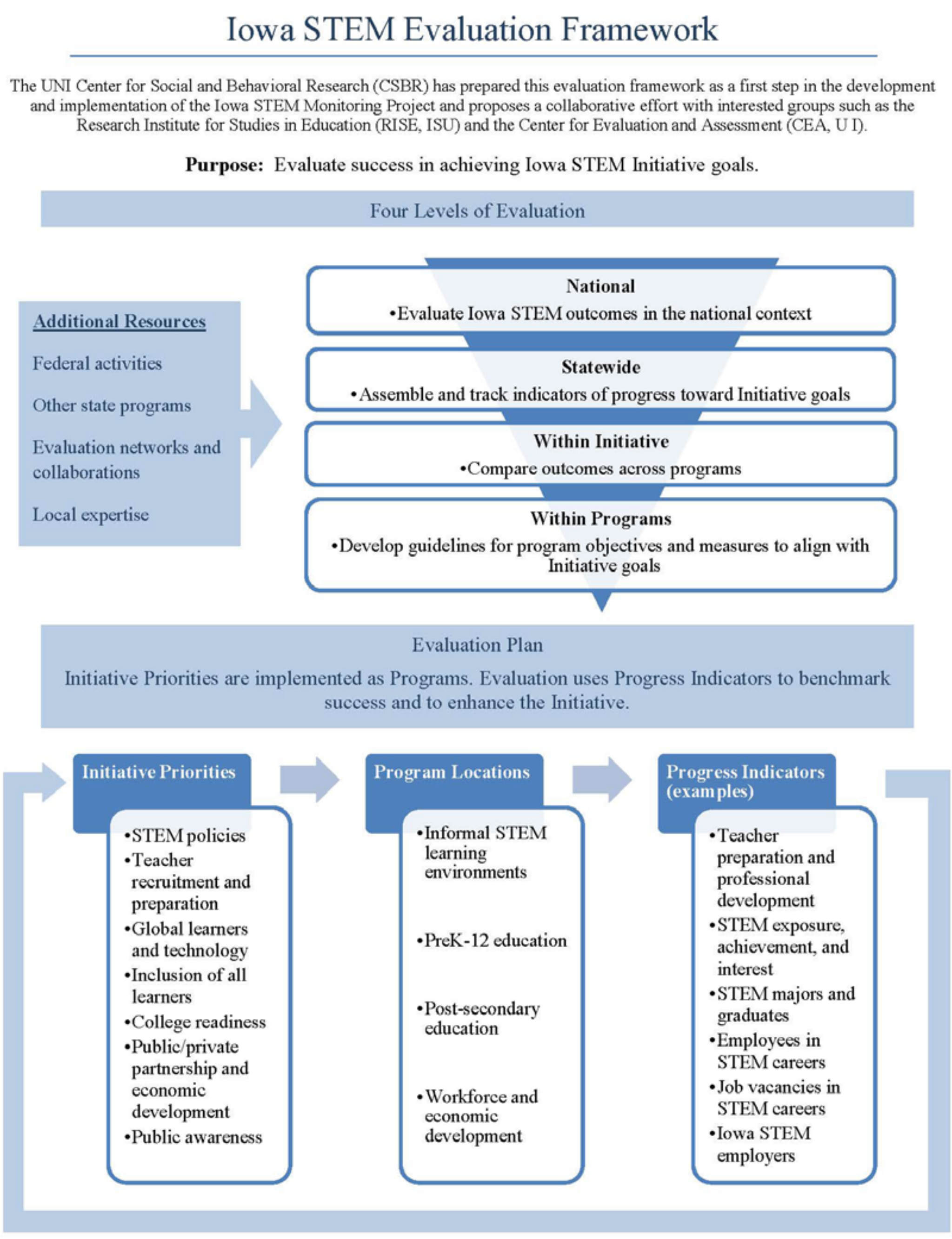
Each LEA reports about local Scale-Up implementation process;

Assessment of STEM interest among student participants in Scale-Up programs

Assessment of STEM achievement among student participants in Scale-Up programs

The ISMP was developed within an evaluation framework for the STEM initiative in Iowa (Figure 2). This framework included multiple levels of evaluation, additional resources leveraged in support of evaluation, and alignment of evaluation activities with initiative goals and priorities. This evaluation framework for the STEM initiative informed the ISMP that was implemented and is reported here.

Figure 2. Iowa STEM Evaluation Framework



Iowa STEM Indicators System (ISIS)

The Iowa STEM Indicators System (ISIS) is a system to track publicly available data at the national, state, and regional levels. The purpose of the system 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. ISIS was created to identify and fulfill the need for benchmarks related to a variety of sub-topics in the area of STEM education and workforce development. At the beginning of year 1, eighteen indicators were identified with 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 3) When possible, these indicators are analyzed to include comparisons across demographic, geographic, and other characteristics. Data used to track the ISIS indicators are publicly available and come from sources such as the Iowa Department of Education (DOE), the National Center for Education Statistics (NCES), Iowa Workforce Development (IWD), Regional Scale-Up Programs, ACT, and Iowa colleges and universities (Table 1). Variability in when data from these sources are collected, analyzed, and released publicly requires continuous tracking and updating. This limits the ability to report on all indicators at the same time annually. In addition, previously identified indicators may not lend themselves to ongoing surveillance throughout the ISMP after assessing the integrity and applicability of the data in providing useful benchmarks. New indicators may be identified as other data and data sources are identified or become available.

One of the first tasks in designing the system for monitoring STEM data was to define just what constitutes STEM. A review of literature and statewide STEM initiative websites did not result in a commonly used definition for STEM subjects that applies across educational levels, industries, or government agencies. Next, we consulted with Iowa Department of Education staff, selected mathematics and science teachers in Iowa, STEM Hub managers, selected higher education faculty, and STEM Initiative project directors in other states and received suggestions for developing a definition. For the purposes of this project, the National Assessment of Educational Progress (NAEP) definitions seemed to be most applicable and appropriate for monitoring Iowa's STEM Initiative. The overall categories with the number of corresponding SCED Codes (School Codes for the Exchange of Data) are listed below (Table 2). A list of Iowa SCED codes for classes within each category are listed in Appendix A. [This definition was used particularly to select data for Indicators 9-13.]

Figure 3. Iowa STEM Indicators System

ISIS Iowa STEM Indicators System

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 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.

STEM Achievement and Interest among K-12 Students

A. STEM Achievement: Iowa Tests
Indicator 1: Iowa student achievement in mathematics and science (scores and AYP).

B. STEM Achievement: National Tests
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 of students taking advanced elective STEM courses in high school (AP/dual).
Indicator 5: Predicted ACT scores among 10th grade ACT-Plan test-takers

C. STEM Interest
Indicator 6: Percentage of ACT test-takers interested in majoring in a STEM area in college.
Indicator 7: Percentage of Iowa 8th graders interested in STEM careers and educational paths (IHAPI).
Indicator 8: Number/Percentage of K-12 students interested in STEM topic areas (as identified in ITBS interest inventory).

STEM Preparation of K-12 Students

A. STEM Teachers
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

Indicator 14: Number of college students who complete degrees in individual STEM majors (AA, BA, other).
Indicator 15: Number of college students who complete graduate degrees in individual STEM majors.

STEM Employment

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 (NCRC test-taking/scores)

Table 1. Preliminary Indicators Identified for 2012-2013

	Ind.	Description	Data source(s)	Year 1
STEM Achievement and Interest among K-12 Students	1	Iowa student achievement in mathematics and science	Iowa Testing Programs (ITP)	✓
	2	Iowa student achievement on NAEP mathematics and science tests	National Center for Education Statistics (NCES)	✓
	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	Predicted ACT scores among 10th grade ACT-Plan test-takers	ACT	*
	6	Percentage of ACT test-takers interested in majoring in a STEM area in college	ACT	✓
	7	Percentage of Iowa 8th graders interested in STEM careers and educational paths	I Have a Plan Iowa	*
	8	Number/Percentage of K-12 students interested in STEM topic areas	Iowa Testing Programs (ITP)	✓
STEM Preparation of K-12 Students	9	Number of current Iowa teachers with licensure in STEM-related subjects	Iowa Department of Education (DOE)	✓
	10	Number of current Iowa teachers with endorsement to teach STEM-related subjects	Iowa DOE	✓
	11	Number of beginning teachers recommended for licensure/endorsement in STEM-related subjects	Iowa DOE	**
	12	Teacher retention in STEM-related subjects	Iowa DOE	**
	13	Enrollment in STEM-related courses in high school	Iowa DOE	**
STEM College Completions	14	Number of college students who complete degrees in individual STEM majors (AA, BA, other)	NCES	✓
	15	Number of college students who complete graduate degrees in individual STEM majors	NCES	✓
STEM Employment	16	Percent of Iowans in workforce employed in STEM occupations	Iowa Workforce Development (IWD)	✓
	17	Job vacancy rates in STEM occupational areas	IWD	✓
	18	STEM workforce readiness	IWD	✓

* Indicator under review, no data included in year 1 annual report.
**Indicator under analysis, no data included in year 1 annual report.

Table 2. Defined STEM Courses

STEM Course defined by NAEP	Number of Corresponding SCED Codes
Advanced Mathematics	
Algebra III	2
Other advanced mathematics	9
Pre-calculus/analysis	1
Calculus	5
Advanced science and engineering	
Advanced biology	8
Chemistry	6
Advanced environmental/earth science	12
Physics	5
Engineering	8
STEM-related technical	
Engineering/science technologies	25
Health science/technology	3
Computer science	16

Indicator 1: Iowa student achievement in mathematics and science

Results of the Iowa Assessments tests of mathematics and science indicate that proficiency in mathematics and science has been fairly consistent over time during the past five years (Tables 3 and 4). Over three-quarters of students in 4th, 8th, and 11th grade were proficient on the Iowa Assessment in math and science. However, disparities are evident among students in underrepresented demographic groups. A much smaller proportion of African American students, Hispanic students, those eligible for free or reduced lunch, and students with disabilities meet that benchmark.

Data source: Iowa Testing Programs, University of Iowa

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

Grade		2010-2012	2009-2011	2008-2010
4th	Proficient – Overall	80%	81%	80%
	Proficient – White	83%	84%	84%
	Proficient – Black/AA	51%	51%	52%
	Proficient – Hispanic	66%	66%	64%
	Proficient – Free/Reduced Lunch	68%	69%	68%
	Proficient – Disability	48%	49%	48%
8th	Proficient – Overall	76%	77%	76%
	Proficient – White	79%	80%	80%
	Proficient – Black/AA	43%	44%	45%
	Proficient – Hispanic	58%	60%	58%
	Proficient – Free/Reduced Lunch	60%	62%	60%
	Proficient – Disability	29%	31%	30%
11th	Proficient – Overall	80%	77%	77%
	Proficient – White	83%	81%	80%
	Proficient – Black/AA	48%	42%	44%
	Proficient – Hispanic	61%	57%	56%
	Proficient – Free/Reduced Lunch	64%	60%	60%
	Proficient – Disability	37%	31%	32%

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

Grade		2010-2012	2009-2011	2008-2010
8th	Proficient – Overall	80%	83%	82%
	Proficient – White	83%	85%	85%
	Proficient – Black/AA	51%	51%	57%
	Proficient – Hispanic	65%	69%	66%
	Proficient – Free/Reduced Lunch	67%	71%	70%
	Proficient – Disability	44%	47%	47%
11th	Proficient – Overall	85%	84%	83%
	Proficient – White	86%	84%	83%
	Proficient – Black/AA	57%	52%	53%
	Proficient – Hispanic	68%	65%	64%
	Proficient – Free/Reduced Lunch	71%	68%	67%
	Proficient – Disability	47%	44%	42%

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

The National Assessment of Educational Progress (NAEP) is a test for American students in grades 4, 8, and 12 in a variety of subject areas including math and science. In 2014, an assessment will be added in technology and engineering literacy. NAEP is implemented by the Commissioner of Education Statistics, who heads the National Center for Education Statistics, a division of the US Department of Education. Among 4th and 8th grade students in Iowa, math scores have remained relatively constant since 2007 (Table 5). Science scores were constant for 8th grade students, but only one year of data was available for 4th grade students (Table 6).

Data source: National Center for Education Statistics

Table 5. Mathematics Scores for Iowa Students on the National Assessment of Educational Progress

Grade	Variable	2011	2009	2007
4	Scale score[1] (all students)	243	243	243
	Scale score (males)	244	243	244
	Scale score (females)	242	242	241
	National rank[2]	20	19	15
	Num. jurisdictions[3] significantly higher than IA	10	6	7
	Percent at or above "proficient"	43%	41%	43%
8	Scale score (all students)	285	284	285
	Scale score (males)	286	285	287
	Scale score (females)	284	284	284
	National rank	25	28	18
	Num. jurisdictions significantly higher than IA	18	16	7
	Percent at or above "proficient"	34%	34%	35%
12*	Scale score (all students)	--	156	--
	Scale score (males)	--	156	--
	Scale score (females)	--	156	--
	National rank	--	6	--
	Num. jurisdictions significantly higher than IA	--	3	--
	Percent at or above "proficient"	--	25%	--

1. Scale scores range from 0-500 for reading, math, U.S. history, and geography, and 0-300 for science, writing, and civics, respectively.
2. 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).
3. A jurisdiction is defined as any government defined geographic area sampled in the NAEP assessment.

*Note. Grade 12 NAEP results only available for 11 jurisdictions. Rank is based on those 11 jurisdictions only and does not represent national rank among all jurisdictions. Data only available for 2009.

Table 6. Science Scores for Iowa Students on the National Assessment of Educational Progress

Grade	Variable	2011*	2009	2007*
4	Scale score[1] (all students)	--	157	--
	Scale score (males)	--	158	--
	Scale score (females)	--	157	--
	National rank[2]	--	11	--
	Num. jurisdictions[3] significantly higher than IA	--	5	--
	Percent at or above “proficient”	--	41%	--
8	Scale score (all students)	157	156	--
	Scale score (males)	159	158	--
	Scale score (females)	155	154	--
	National rank	17	17	--
	Num. jurisdictions significantly higher than IA	12	7	--
	Percent at or above “proficient”	35%	35%	--
12*	Scale score (all students)	--	--	--
	Scale score (males)	--	--	--
	Scale score (females)	--	--	--
	National rank	--	--	--
	Num. jurisdictions significantly higher than IA	--	--	--
	Percent at or above “proficient”	--	--	--

1. Scale scores range from 0-500 for reading, math, U.S. history, and geography, and 0-300 for science, writing, and civics, respectively.
2. 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).
3. A jurisdiction is defined as any government defined geographic area sampled in the NAEP assessment.

*Note. 2011 results only available for grade 8; no 2007 results available for science in any grade. Grade 12 NAEP results not available for science.

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

ACT scores include both an overall Composite Score and individual test score 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. In the five years between 2008 and 2012, the number of Iowa students taking the ACT increased slightly (Table 7). Mathematics and science scores remained relatively constant during that time period, as did the percentage of students meeting the math and science benchmarks for college readiness.

Data source: ACT, Inc.

Table 7: ACT scores and benchmarks in math and science among Iowa students statewide

	2012	**2011**	**2010**	**2009**	**2008**
Number of students tested	23,119	22,968	22,943	22,377	22,950
% meeting benchmarks – Math	51%	52%	51%	50%	50%
% meeting benchmarks – Science	38%	40%	37%	37%	37%
Average ACT scores – Composite	22.1	22.3	22.2	22.4	22.4
Average ACT scores – Math	21.7	21.9	21.8	21.9	22.0
Average ACT scores - Science	22.2	22.4	22.3	22.4	22.3

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

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. Among Iowa high school students taking AP exams in STEM subjects, the percentage that score a 3 or better have remained fairly constant in the past five years (Table 8). However, the number of students taking the exam has increased over time in most subjects.

Data source: College Board

Table 8. Percentage of Iowa high school students scoring 3 or higher on Advanced Placement exams in STEM-related topics.

	2012	2011	2010	2009	2008
Biology	55% (588)	57% (531)	54% (525)	57% (478)	57% (461)
Calculus AB	65% (889)	59% (767)	58% (696)	62% (711)	66% (664)
Calculus BC	82% (245)	81% (227)	87% (239)	78% (190)	80% (227)
Chemistry	56% (481)	57% (493)	55% (425)	52% (358)	57% (349)
Computer Science A	77% (53)	79% (57)	81% (65)	71% (17)	100% (21)
Environmental Science	66% (184)	65% (140)	68% (96)	55% (87)	69% (49)
Physics B	73% (243)	72% (240)	76% (238)	75% (198)	79% (183)
Statistics	70% (411)	68% (366)	68% (351)	71% (294)	74% (251)

Note. Percentages reflect the proportion of test takers within each subject who scored 3 or higher on that subject exam. Numbers in parentheses indicate the numerator in the proportion.

Indicator 5: Predicted ACT scores among 10th grade ACT-Plan test-takers

This indicator using data from ACT was initially identified as a way to understand changes that occur in high school regarding achievement and interest in STEM. However, the usefulness of the indicator is under review and data are not reported here. It will likely be revised or replaced with another indicator.

Indicator 6: Percentage of ACT test-takers interested in majoring in a STEM field in college

This indicator reflects the percentage of ACT test-takers interested in majoring in a STEM field in college. Among all students, the largest proportion expressed an interest in pursuing degrees related to health sciences or technologies (Table 9). A larger percentage of students planning on 2 years or less of college than students planning on 4 years or more of college expressed an interest in pursuing agriculture or natural resources conservation programs. Conversely, a larger percentage of students planning on 4 years or more of college expressed an interest in engineering.

Data source: ACT, Inc.

Table 9. Percentage of students in Iowa who are interested in pursuing a STEM field in higher education by college type

	2012			2010		
	All students	Plan on ≤ 2 yrs college	Plan on ≥ 4 yrs college	All students	Plan on ≤ 2 yrs college	Plan on ≥ 4 yrs college
Agriculture / Natural Resources Conservation	3%	9%	3%	3%	8%	3%
Computer Science/Mathematics	2%	2%	2%	3%	4%	3%
Engineering	6%	2%	7%	4%	3%	5%
Engineering Tech/Drafting	1%	2%	1%	3%	3%	3%
Health Sciences/Technologies	19%	16%	19%	19%	19%	20%

Indicator 7: Percentage of Iowa 8th graders interested in STEM careers and education paths

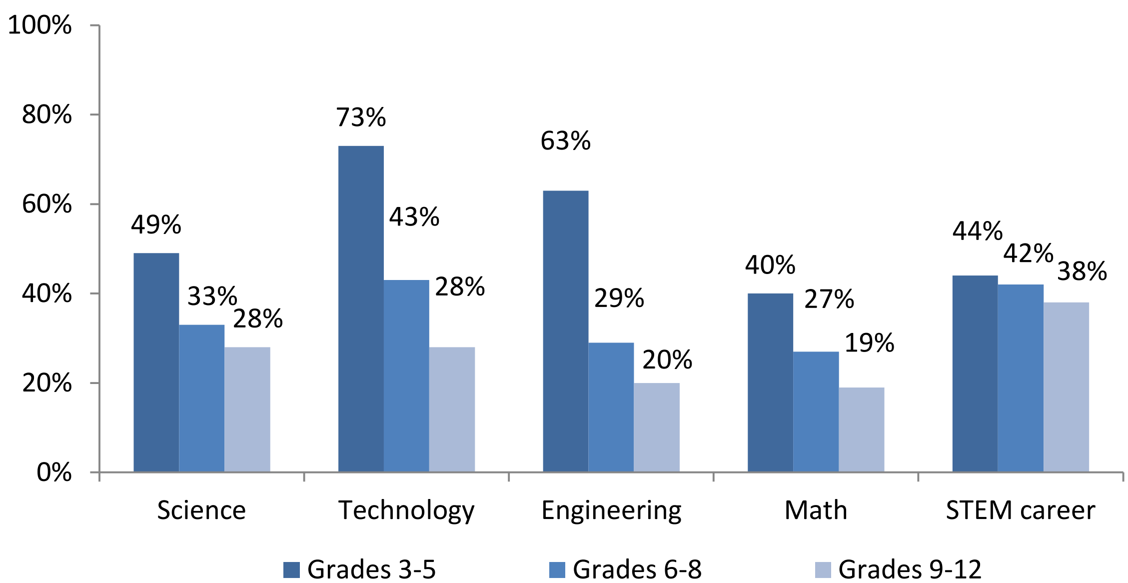
This indicator using data from I Have a Plan Iowa was initially identified as a way to understand changes that occur between middle school and high school regarding achievement and interest in STEM. However, the usefulness of the indicator is under review and data are not reported here. It will likely be revised or replaced with another indicator.

Indicator 8: Percentage of K-12 students interested in STEM topics and careers

Iowa Testing Programs at the University of Iowa administers the Iowa Assessments taken by nearly every student in grades 3rd through12th in the state annually. For the 2012-2013 academic year, an 8-item interest inventory was added to the Iowa Assessments to gauge interest in specific subject areas and STEM careers. Interest was measured on a 3-point scale using the responses “I like it a lot”, “It’s okay”, and I don’t like it very much” for students in grades 3rd through 5th, and responses “Very interested”, “Somewhat interested”, and “Not very interested” for students in grades 6th through 12th. 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 4). More information and results from the interest inventory can be found in the ‘Statewide Student Interest Inventory’ and the ‘Report of Participant Information’ sections of this report.

Data source: Iowa Testing Programs, University of Iowa

Figure 4. Percentage of students statewide by grade group who said they “like it a lot” (Grades 3-5) or were “very interested” (Grades 6-12) in STEM topics or a STEM career



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

Indicator 9 examines the preparation and qualifications of STEM-related teachers in terms of the level or type of licensure they hold. STEM teachers were defined as those who teach STEM subjects within a specified list of SCED codes related to NAEP definitions (see Table 2 and Appendix A for more information). License types reflect career progress from beginning teachers (Initial) to full professionals (Standard) and beyond (Master Educator). [Note: In *The Annual Condition of Education 2012*, STEM teachers represented approximately 11% of all Iowa public schools teachers.] Table 10 provides the numbers of STEM-related teachers for each license type for the last three years. Overall, the numbers of STEM-related teachers in each category have been relatively stable over the past three years, with over 200 teachers holding initial licenses, over 2000 with standard professional licenses, and over 1000 master educator licenses.

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

Table 10. Distribution of Iowa Teacher Licensures in STEM-related subjects, 2010-2013

	2012-13	**2011-12**	**2010-11**
Initial	284	245	249
Standard	2193	2349	2332
Master Educator*	1150	1191	1134
Others**	83	87	70
TOTAL	3710	3872	3785

*Teachers with a "Permanent Professional" license are included in this group.
**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.

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

Indicator 10 examines the preparation and qualifications of STEM teachers in terms of the number and types of endorsements they hold in science and/or mathematics. Table 11 provides the total number of teachers with any science and/or mathematics endorsements (combined). In addition, it provides the numbers of teachers who hold grade-related endorsements, content-specific science endorsements such as biology, chemistry, and physics, and those in STEM-related areas of agriculture, health, and industrial technology. (There are no specific endorsements for content areas within mathematics such as algebra, calculus, etc.) It is important to note that Iowa does not have a STEM endorsement at this time. Overall, the number of Iowa teachers with an endorsement to teach a science subject has decreased 8% in the past five years. The number of Iowa teachers with an endorsement to teach math has remained steady in the past five years (2008/09-2012/13). The number of science secondary endorsements appears to be declining, as well as subject-specific endorsements in biology, chemistry, and physics. However, the number of science middle school endorsements has been increasing. These data are also represented as line graphs below (Figures 5-7). Additional representations of the tabled data are included in Appendix B.

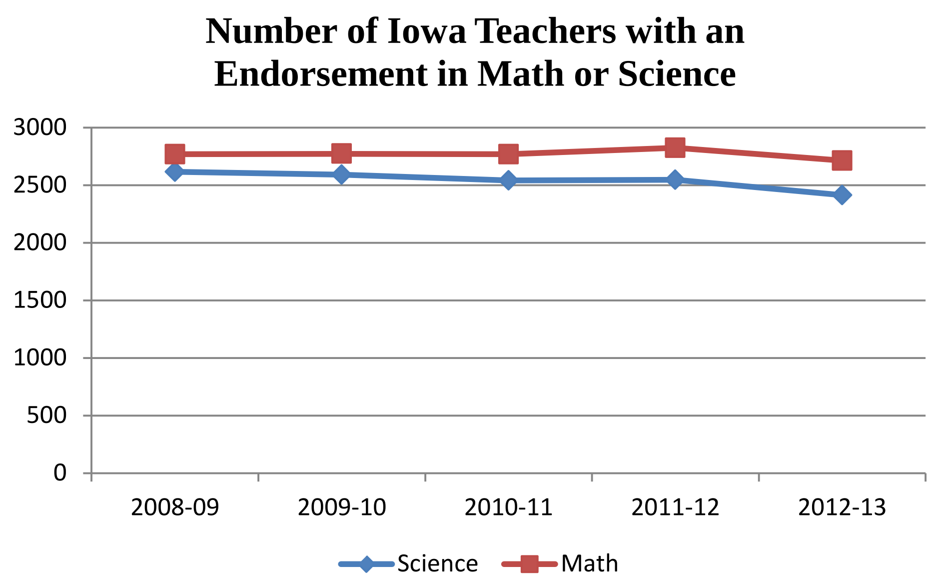
Maps detailing selected teacher endorsement data by school district and STEM Hub Region have been prepared. Two maps with 2012-13 data for Iowa teachers with endorsements in science and math are included below as an example of the types of mapping being prepared for this indicator. A full set of maps for five years is available in Appendix 3. See below for more information about the GIS mapping of indicators.]

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

Table 11. Distribution of Iowa Teachers with STEM Endorsements, 2008-2013

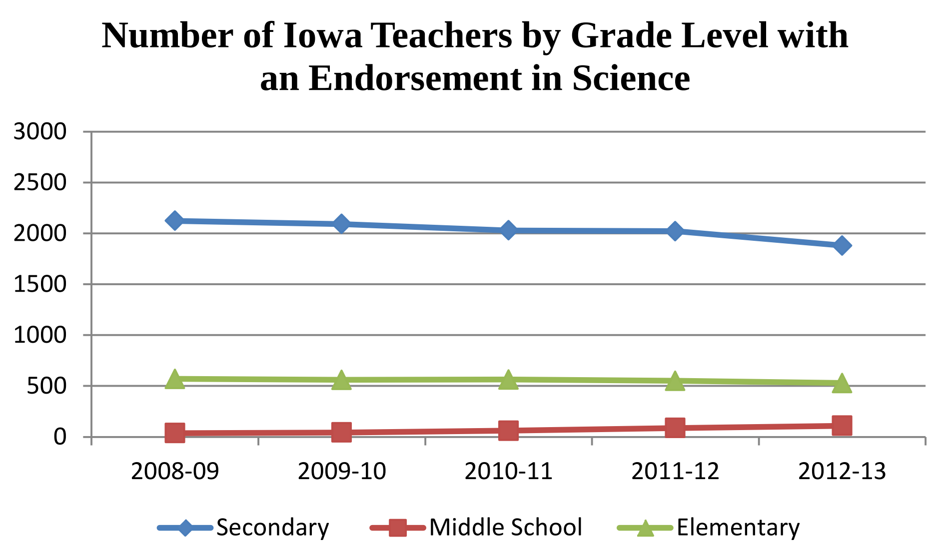
STEM Endorsement	2012-13	2011-12	2010-11	2009-10	2008-09
All Sciences	2412	2546	2541	2590	2616
All Math	2713	2824	2768	2772	2768
Science-Secondary	1880	2022	2030	2092	2123
Science-Middle	109	88	61	44	37
Science-Elementary	529	551	563	561	569
Biology 5-12	1427	1533	1527	1575	1599
Chemistry 5-12	880	947	940	994	998
Physics 5-12	525	585	600	642	652
Agriculture 5-12	237	261	280	269	270
Health 5-12	24	28	26	28	21
Industrial Technology 5-12	483	537	558	587	609

Figure 5. Number of Iowa Teachers with an Endorsement in Math or Science



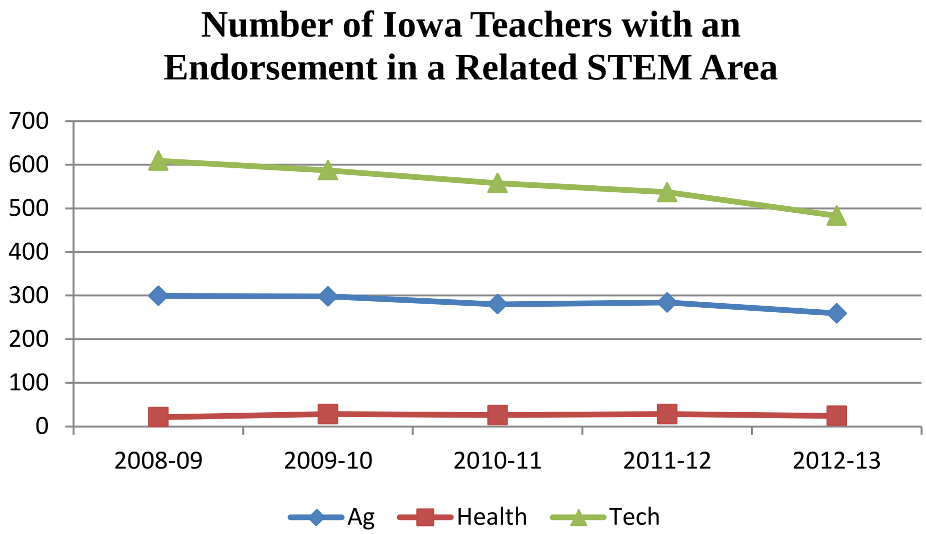
Source: Iowa Department of Education, February 2013

Figure 6. Number of Iowa Teachers by Grade Level with an Endorsement in Science



Source: Iowa Department of Education, February 2013

Figure 7. Number of Iowa Teachers with an Endorsement in a Related STEM Area



Source: Iowa Department of Education, Feb 2013

GIS Data Mapping of Indicators

With the cooperation of the Iowa State University Geographic Information Systems (GIS) Support and Research Facility, selected data will be available as GIS maps. Data analyzed in this way are plotted and displayed on a state map that includes district and STEM region boundaries. Decisions about what types of data and analyses are appropriate for mapping will continue to evolve throughout the Iowa STEM Monitoring Project.

Maps available at this time show the geographical distributions of teachers with STEM endorsements in science and mathematics (Indicator 10) for 2008-09 through 2012-13 (Maps 1-10, Appendix C). As maps are updated with data for the next academic year or as new maps are created throughout Year 2, they will be submitted to the Governor's STEM Advisory Council and/or posted on the Iowa STEM website.

The preliminary maps included in this report illustrate basic frequency distributions only. They are provided as baseline descriptions and intended to stimulate discussion about the possibilities and benefits of mapping additional data. Current plans call for further higher-level statistical analyses to inform decisions about categories and scales, calculation of relationships such as student-teacher ratios and enrollment equity, and indicators of change over time.

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 current (2012-13) district structure. Districts that have consolidated since 2008-09 are represented by their current boundaries and data from the previously separate districts have been aggregated and reported under their current configuration. Strategies for representing future consolidations are currently under consideration.

In reviewing the current maps, it is important to note that all of the districts reported as having no teachers endorsed in mathematics or science are districts that do not include grades 7-12. However, there are other districts that do not have grades 7-12 but have STEM-endorsed teachers; their numbers are reported on the maps.

As Figures 8 and 9 show, there is an uneven distribution of teachers with math/science endorsements, and even some total gaps. This may help explain some of the findings of the public awareness survey about urban and rural differences in parent perceptions of how well their child is being prepared in STEM subjects.

Figure 8. Iowa Teachers by District with Endorsements in Math, 2012-2013

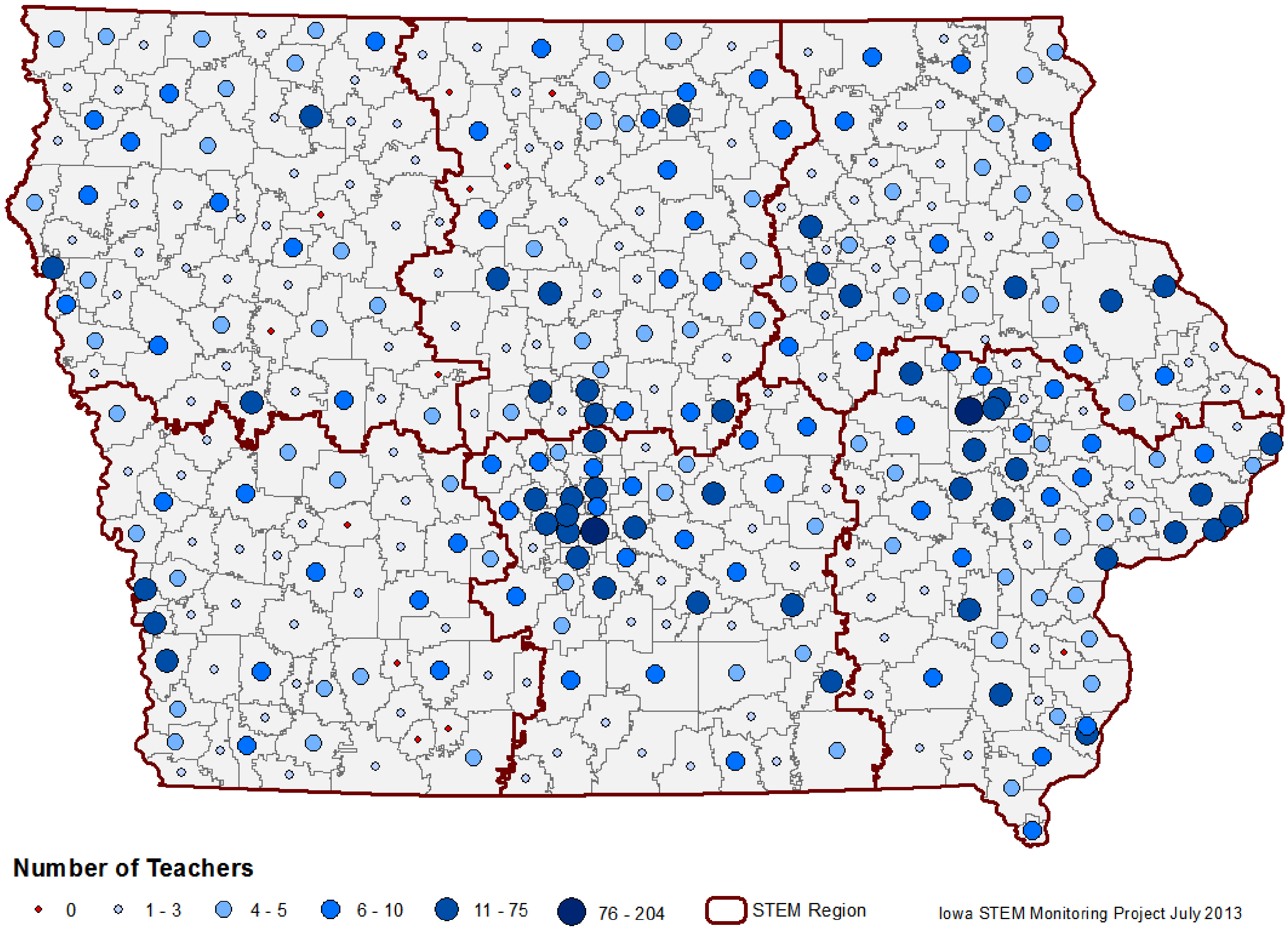
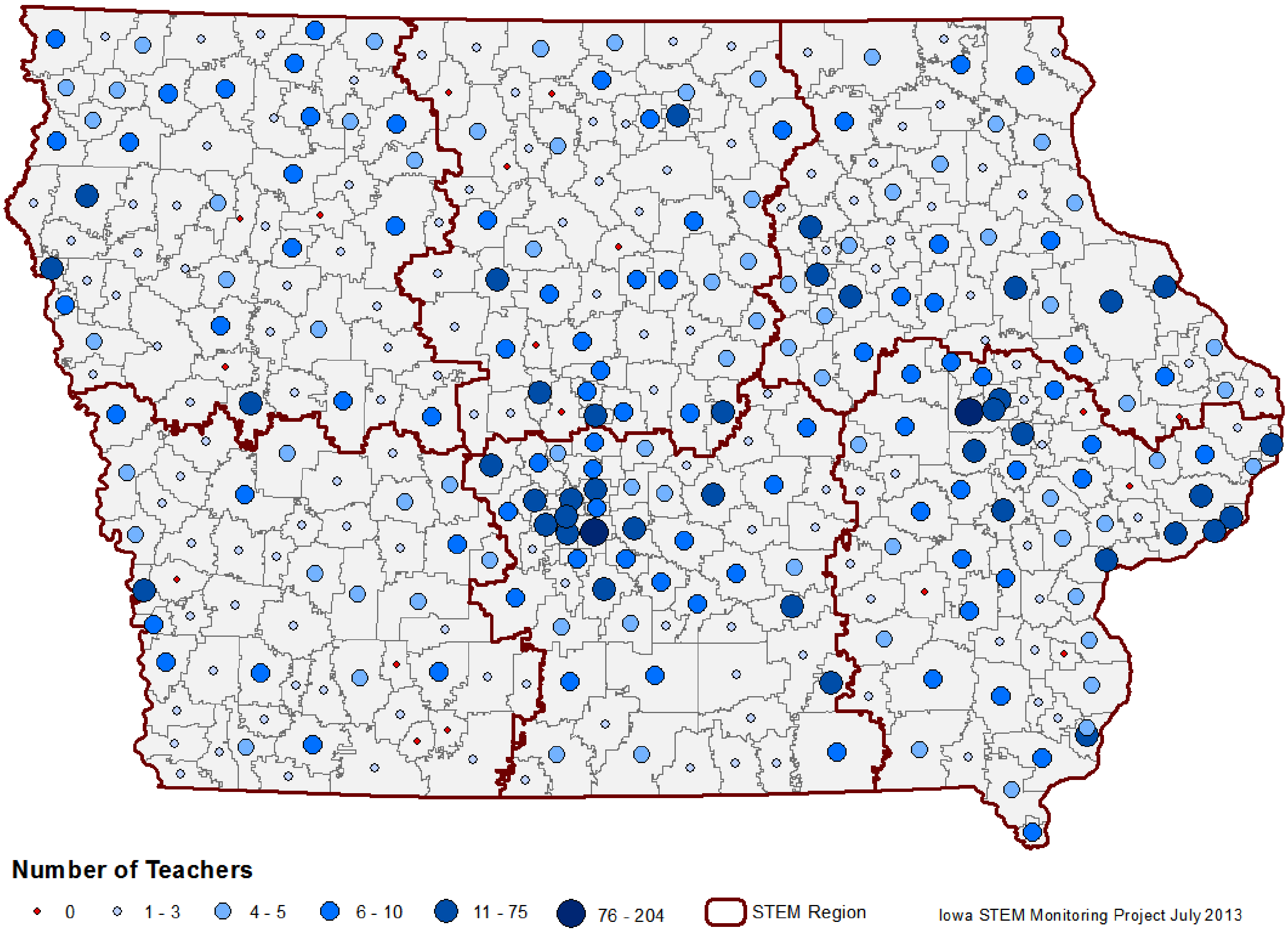


Figure 9. Iowa Teachers by District with Endorsements in Science, 2012-2013



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

Indicator 11 is not reported for year 1. Data have been requested. The intent of this indicator is to report the number of new teachers with STEM endorsements recommended for licensure by Iowa teacher education programs each year.

Indicator 12: Teacher retention in STEM-related subjects

Indicator 12 is not reported for year 1. Baseline data are currently available for the last three years beginning in 2010-11 and are under analysis. The intent of this indicator is to determine level of experience for current teachers and in particular, five-year retention rates for new STEM teachers.

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

Indicator 13 is not reported for year 1. Data are currently available for the last five years beginning in 2008-09 and are under analysis. The intent of this indicator is to describe the opportunities available for Iowa students to take basic and advanced level STEM courses in high school, as well as report enrollment patterns by course/level and by gender.

Indicator 14 & 15: Number of college students who completed degrees in individual STEM majors

The purpose of indicators 14 and 15 is to determine short-term and long-term trends in STEM degrees awarded to Iowa's graduates. Appendix D provides a list of Iowa's community colleges, and 4-year public and private colleges and universities that are counted. Nearly 10,000 post-secondary degrees (n=9,680) were awarded in STEM-related fields in 2011-2012 from Iowa's 4-year public and private colleges and universities, and 15 community colleges (Table 12).

Data Source: National Center for Education Statistics

Table 12. Number of college students who completed degrees[1] in STEM-related majors, 2011-2012

Degree Area	Associate's	Bachelor's	Master's	Doctorate	Total
Agriculture	416	444	58	10	928
Architecture	--	125	54	--	179
Biological/Biomedical Sciences	08	838*	74	124	1,044
Computer/Information Sciences	351	203*	61*	11	626
Engineering/Engineering Tech	396	1,291*	270	122	2,079
Health Professions	2,126	736*	380*	720*	3,962
Mathematics/Statistics	--	204*	82	44	330
Natural Resources/Conservation	47	117*	07	07	178
Physical Sciences	--	234*	47	73	354
Total	3,344	4,192	1,033	1,111	9,680

1. Includes Associate's degrees conferred by Iowa's 15 public community colleges, and bachelor's and Master's conferred by Iowa's public and private colleges/universities.

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

Projected growth rates are calculated for a variety of occupational areas over ten-year periods. Among all occupational areas, approximately 16% are anticipated to be within STEM sectors in the ten-year period from 2010-2020 (Table 13).

Data source: Iowa Workforce Development

Table 13. Percentage of Iowans in workforce employed in STEM occupations

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

Indicator 17: Job vacancy rates in STEM occupational areas

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. From 2011-2012, there were an estimated 10,000 vacancies in STEM jobs statewide. (Table 14).

Data source: Iowa Workforce Assessment Survey, IWD

Table 14: Estimated job vacancy rates in STEM occupational areas

Occupational Category	Vacancy Rate 11/12	Est. Vacancy 11/12	Vacancy Rate 09/10	Est. Vacancy 09/10	Vacancy Rate 08/09	Est. Vacancy 08/09
Architecture and Engineering	05%	815	03%	616	07%	1,238
Community and Social Science	03%	699	03%	651	05%	1,165
Computer and Mathematical science	03%	810	01%	392	04%	1,238
Farming, Fishing, and Forestry	11%	588	04%	491	06%	362
Healthcare Practitioner and Technical	04%	2,738	03%	2,578	06%	4,724
Healthcare Support	08%	3,953	04%	1,961	08%	3,669
Life, Physical, and Social Science	06%	659	06%	905	05%	605
Total Estimated Vacancies		10,262		7,594		13,001

Note. 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

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.

Data source: ACT, Inc.; Iowa Workforce Development

Table 15. Percentage of Iowa test takers who are workforce ready in applied mathematics on the National Career Readiness Certificate

Year	Test takers	Scored 5+	% workforce-ready
2012	12,313	8,092	65.7%
2011	6,502	4,367	67.2%
2010	3,287	2,185	66.5%

Statewide Survey of Public Attitudes Toward STEM

One of the goals of the Iowa STEM Advisory Council was to raise public awareness of STEM education and workforce/economic development. State and regional studies conducted in other areas of the US indicated that an urgency gap between STEM advocates and the public may be an important obstacle to overcome on the road to STEM excellence in Iowa. In order to make improvements in STEM education, innovation, and careers, important strides must be made in the areas of public policy, education, and business/industry development and involvement. Those strides will be facilitated by public support.

Methods. To measure public awareness, the UNI CSBR initiated a statewide public survey of Iowans. The development of the survey was accomplished in several steps. First, a thorough search of the extant research on the topic was conducted to identify previous studies on the topic.

Second, likely concepts to be included were compiled and presented to members of the Advisory Council through an online survey format. Members were emailed an invitation with a link to an online survey that contained a series of open-ended feedback questions. Third, a draft of the questionnaire was created, cross-walked with targeted priorities to ensure inclusion of relevant items, and reviewed by the ISMP partners. Once revisions were complete, the fourth step, programming and testing, was conducted (See Appendix E for survey instrument).

The field period for the survey was July through September, 2012. Three sampling strata were used: general population, parents of 4-11 year old children, and parents of 12-19 year old children. The dual-frame sampling design included both landline and cell phone numbers.

The survey yielded 2,010 completed interviews. Data were weighted by demographic variables to better represent the adult population of Iowa. As part of the weighting process, case weights were calculated for each respondent to enhance the extent to which the sample is representative of the population on several key demographic characteristics (See Appendix F for technical notes about the weighting process). This weighting procedure includes adjustments for nonresponse bias and increases the match between the sample and the larger population. The weighted percentages are approximately equal to the percentage of people in the population for those demographic characteristics included in the weighting process; however, the weighted percentages for characteristics not included in the weighting process are not necessarily equal to the distribution in the population. Moreover, one of the main reasons for conducting the survey was to estimate the attitudes, opinions, and behaviors of the population for which population values are unknown. These weighted data produce population estimates of the number of adult Iowans who likely hold a particular attitude or opinion or have engaged in particular behaviors. Descriptive statistics, including frequencies and distributions, were calculated for the total sample and for population subgroups based on gender, education, parent status, place of residence, and race for select questions in the survey. Unless otherwise noted, the term “percent” refers to the “weighted percent” and **not** the percent of survey respondents. Likewise, descriptions of findings are based on an analysis of the weighted data. All analyses were conducted in either SPSS or Sudaan.

Select findings. Only 26% of Iowans had heard of the abbreviation STEM. Recall was highest among Iowans with a 4-year degree or higher and among Iowans with children in school. Although “brand awareness” of STEM may be low, 65% of Iowans said they had heard something in the past month about “improving math, science, technology, and engineering education” in the state. Most Iowans agreed that advancements in STEM will give more opportunities to the next generations (98%), increased focus on STEM education will improve the Iowa economy (86%), more jobs are available for people with good science and math skills (85%), and more companies would move to Iowa if the state had a reputation for workers with good STEM skills (76%). Two-thirds of Iowans (67%) say there are not enough skilled workers in the state to fill the available STEM jobs.

Among parents of children ages 12-19, just 44% said their child has *a lot of interest* in STEM topics and 62% said their child is doing *very well* in STEM subjects in school. Nearly one-half (48%) of all Iowans said their child is being *very well prepared* in STEM subjects by the school he or she attends. However, only 37% of parents living on a farm or in a small town responded that way, compared to 62% of parents in cities. After high school graduation, 83% of parents said their child is likely to attend a 2-year college or 4-year college/university and 59% said their child is likely to pursue a STEM career. (See Appendix G for item frequencies for each survey item)

Future research. The public survey will be conducted annually to provide periodic cross-sectional measurements of public attitudes toward and awareness of STEM education and workforce/economic development in the state.

Results

A total of 2010 completed interviews were conducted (Table 16).

Table 16. Sample Characteristics

Demographic Characteristic	Sample size (n)	Population Estimate	% (weighted)
Total Sample	2,010	2,311,931	--
Gender			
Men	909	1,129,261	48.8
Women	1,101	1,182,670	51.2
Age Group			
18-44	763	1,057,047	45.8
45-64	825	852,375	36.9
65 and older	422	402,509	17.4
Hispanic/Latino			
Yes	39	115,353	5.0
No	1,969	2,195,986	95.0
Race			
White	1,942	2,155,064	93.2
African American or Black	22	62,740	2.7
Other	46	94,127	4.1
Education			
High school graduate/GED or less	477	1,006,641	43.5
Some college or technical school (1-3 yrs, AA)	669	813,474	31.3
4-year undergraduate or graduate degree	862	578,685	25.0
STEM degree or training			
Yes	702	663,840	28.8
No	1,300	1,639,726	71.2
Current or recent employment that uses STEM skills			
Yes	997	990,085	50.0
No	793	991,340	50.0
Income			
Less than $25,000	223	374,520	19.5
$25,000 to $49,999	385	480,774	25.1
$50,000 to $74,999	360	374,234	19.5
$75,000 to $99,999	289	270,971	14.1
$100,000 or More	441	415,221	21.6
Place of residence			
Rural / Small town (<5,000 pop.)	1,011	956,954	41.6
Large town (5,000-<25,000 pop.)	323	437,014	19.0
Urban (>25,000 pop.)	662	903,774	39.4
Parent			
Not a parent of a school aged child	1,261	1,859,795	80.4
Parent of 4-11 year old	379	254,309	11.0
Parent of 12-19 year old	370	197,827	8.6

Note. Respondents who said "don't know" or who did not give a response to the demographic questions are excluded from the distributions above.

STEM Awareness and Exposure

Only 26% of Iowans have heard of the acronym STEM (Figure 10). Recall of the STEM acronym is highest among Iowans with a 4-year college degree or more (47%) and parents of a school-aged child (35%; Figure 11.) Although awareness of the acronym STEM may be low, 78% have heard about K-12 education in general, and 65% of Iowans have heard something about improving math, science, technology, and engineering education in the past month.

Figure 10. Have you heard? Percent of Iowans with STEM Awareness (%)

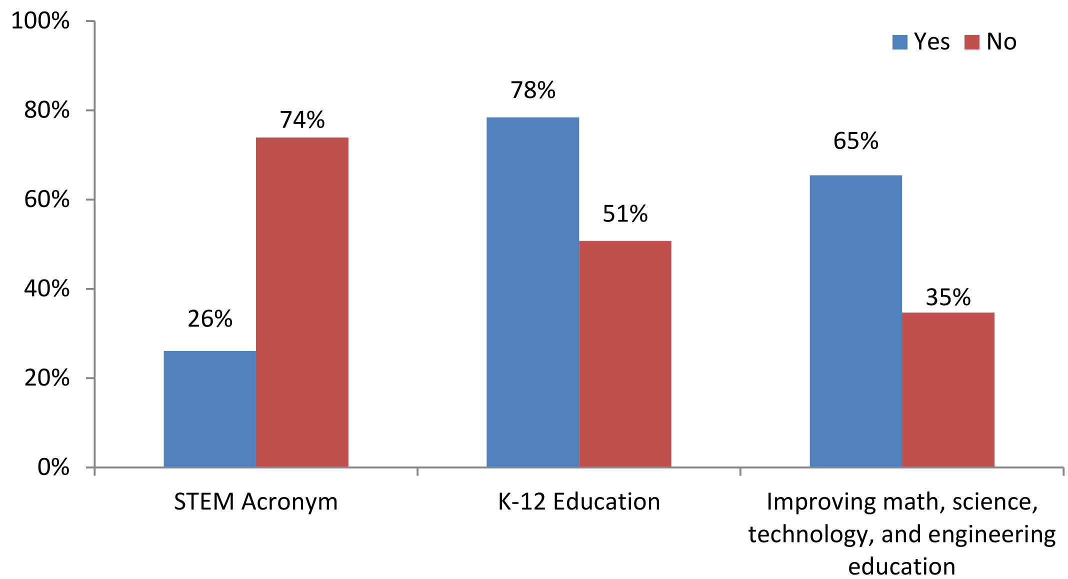
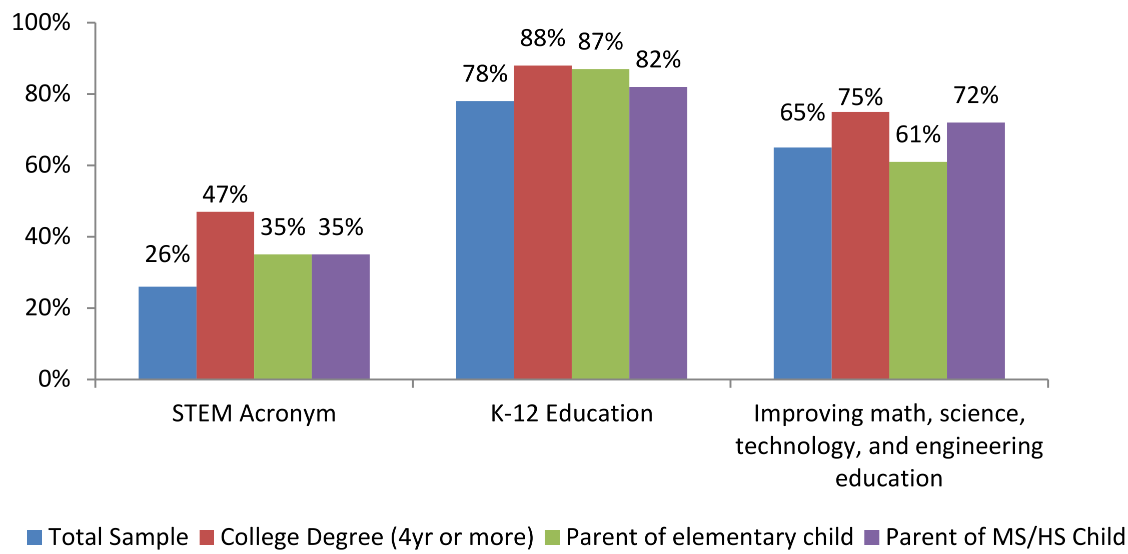
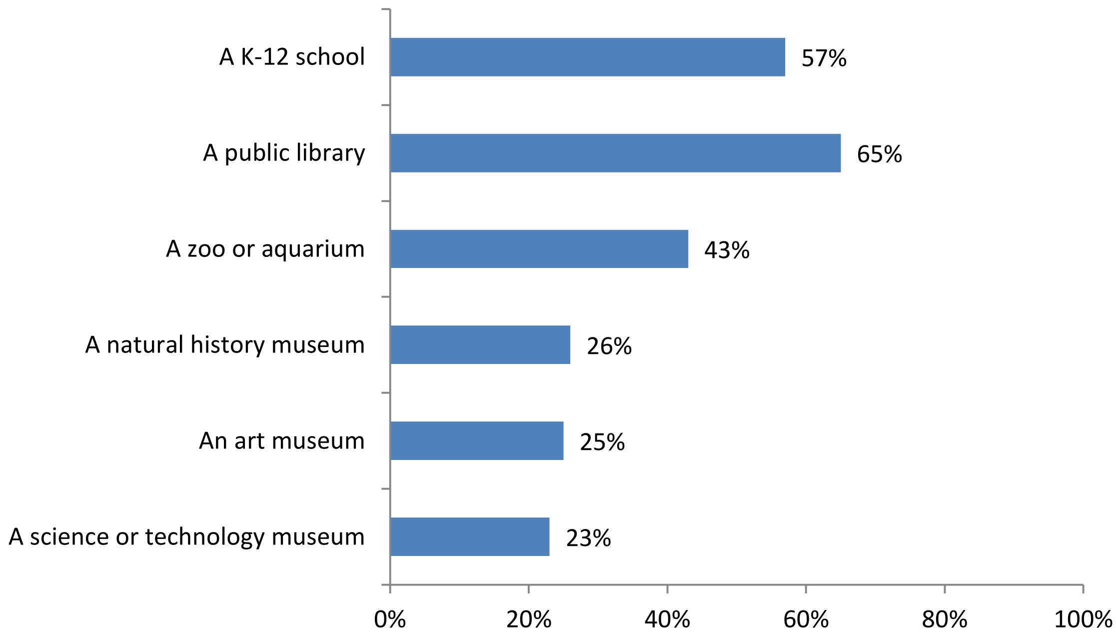


Figure 11. Have you heard about STEM? Percent of Iowans with STEM Awareness by education and parent status (%)



Schools, libraries, zoos, and museums are all educational settings where exposure to STEM topics, education, activities may occur. Nearly two-thirds of Iowans reported having visited a public library in the past year, and 57% had visited a K-12 school (Figure 12). Females were significantly more likely than males to have visited a school (p=0.04) or a public library (p=0.05) in the past year. In addition, Iowans with higher educational attainment of a Bachelor's degree or more were more likely than others to have visited any STEM educational setting. Parents were also more likely than non-parents of a school-aged child to have visited a STEM education setting, with the highest percentage among parents of 4-11 year old children, followed by parents of 12-19 year old children.

Figure 12. Percentage of Iowans visiting informal STEM education settings in the past year (%)



Attitudes Toward STEM and the Role of STEM in Iowa

Public attitudes toward STEM topics are generally positive which may indicate some of the groundwork related to public awareness already exists. The majority of Iowans agree that STEM fields provide more opportunities for the next generation (97%), and science and technology are making our lives better (94%) (Figure 13). In addition, Iowans agree on the role of STEM on improving Iowa's economy (86%), attracting companies to move or expand in Iowa (76%), and the better availability of jobs for people with good math and science skills (85%). However, 61% of Iowans said there were not enough skilled workers in Iowa to fill the available jobs in STEM areas (Figure 14). Perhaps as a result, most Iowans support workforce development by increasing STEM jobs for rural Iowans (89%), and recruiting women (63%) and underrepresented minorities (59%) into STEM careers.

Figure 13. Attitudes Toward STEM, the Economy, and Workforce Development (% Agree)

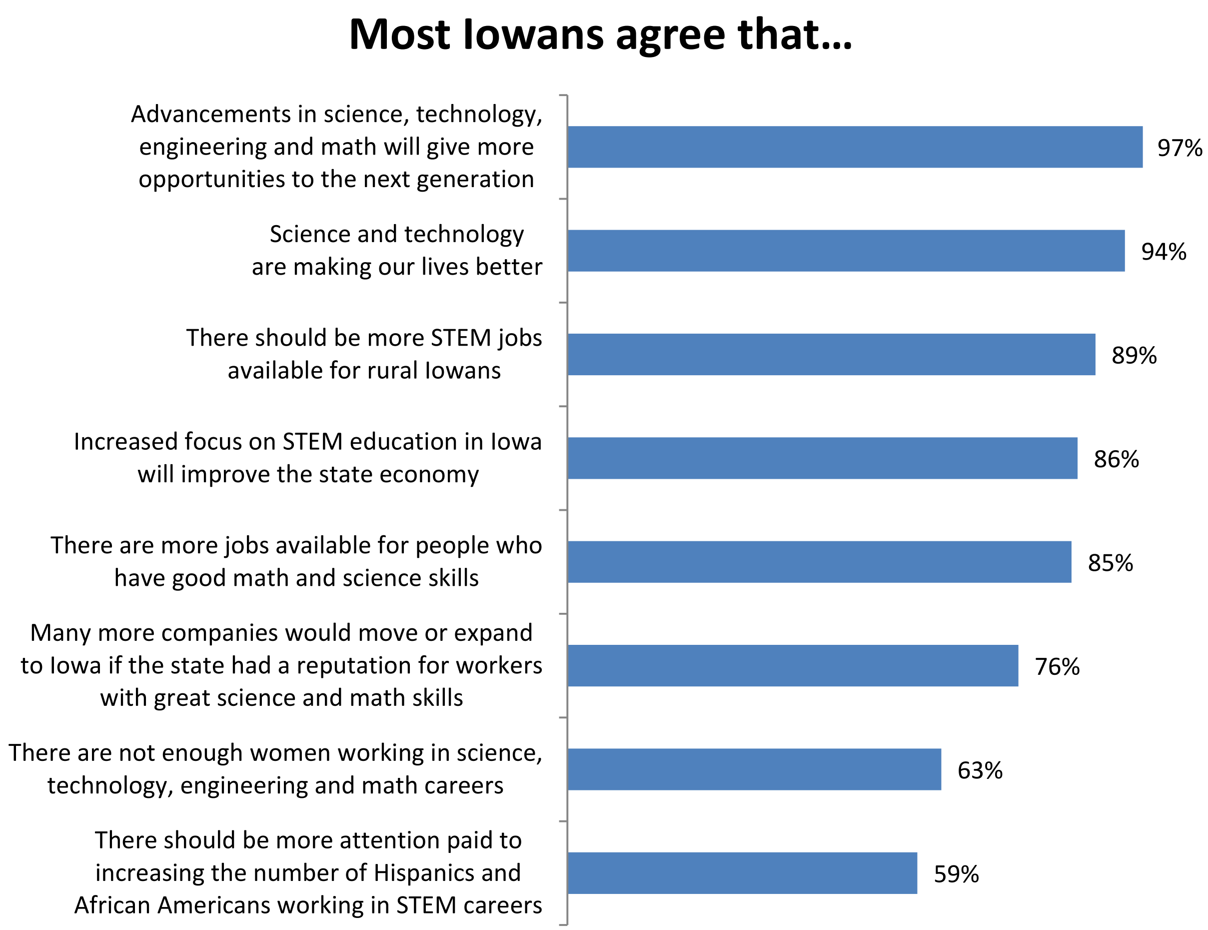
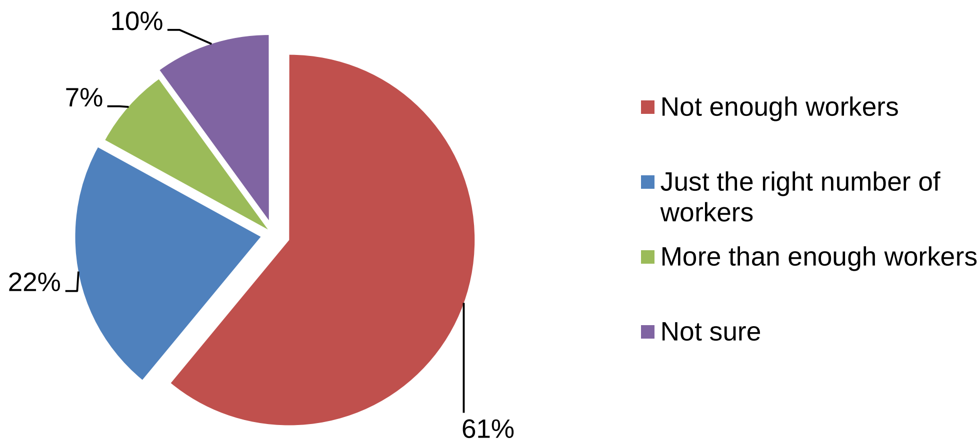


Figure 14. Percentage of Iowans who feel there are enough skilled workers to fill available STEM jobs



STEM Education

Nearly all of Iowans surveyed (95%) agree that math and science teach important critical thinking skills (Figure 15). The majority also agree that Iowa colleges and universities are doing a good job preparing students for STEM careers (83%) and STEM teachers (79%). However, there is less agreement about the quality of STEM education among schools in their community with 65% of Iowans said schools in their communities are doing an *excellent* or *good* job teaching science and math, but only 40% said this about engineering and 55% about technology (Figure 16). Among possible reasons why some students may do poorly in math and science, 83% of Iowans said students think the subjects aren't relevant, 79% said students think the subjects are too hard, and 54% said there is not enough good science and math teachers. Ensuring access to a full range of math and science courses, and providing internships for developing practical job skills were the most commonly cited strategies to improve math and science education among respondents (Figure 17).

Figure 15. Attitudes about STEM education (% Agree)

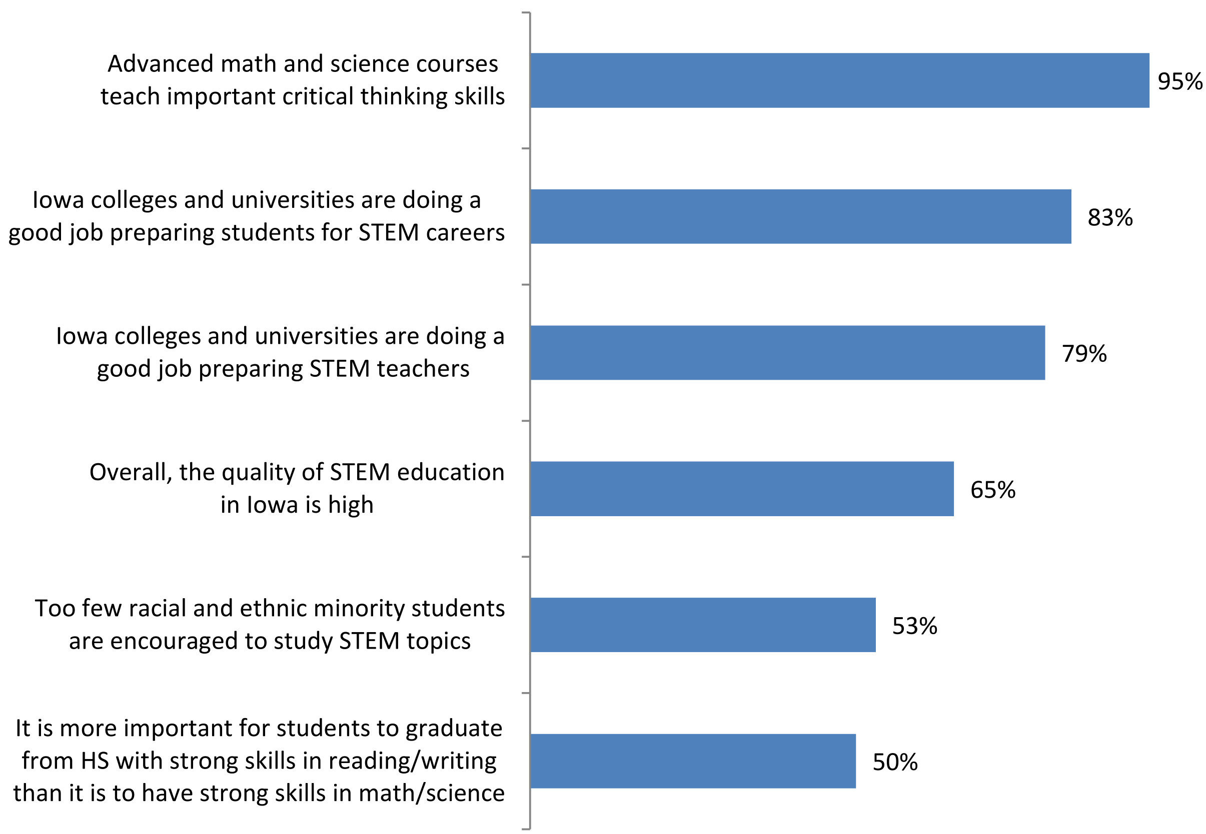


Figure 16. Quality of education in schools (Percentage of Iowans)

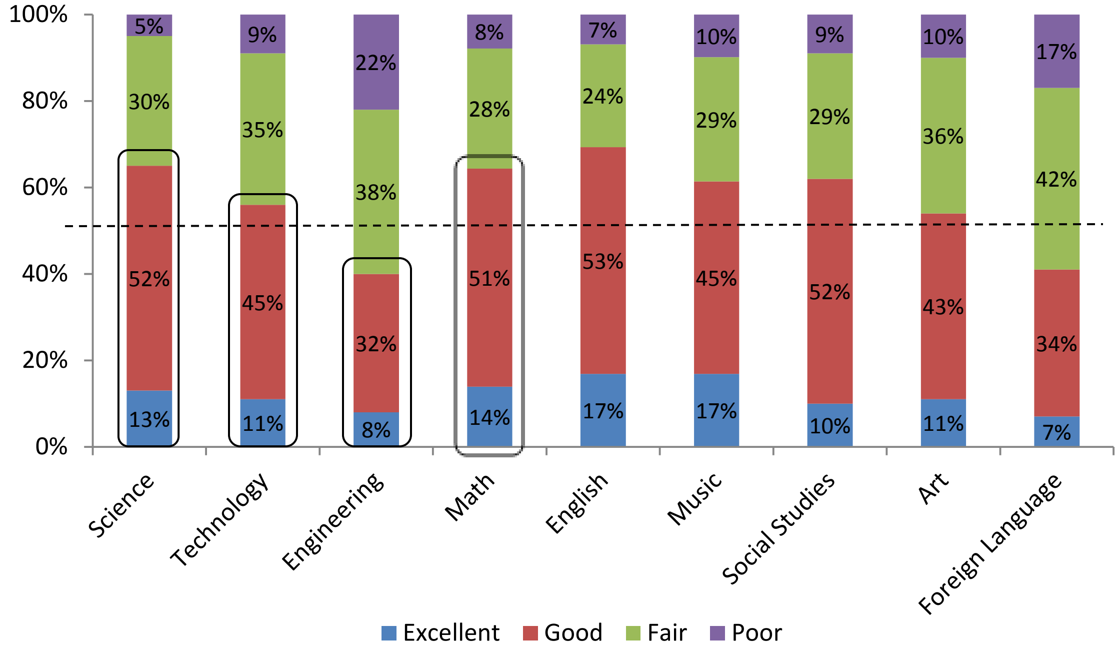
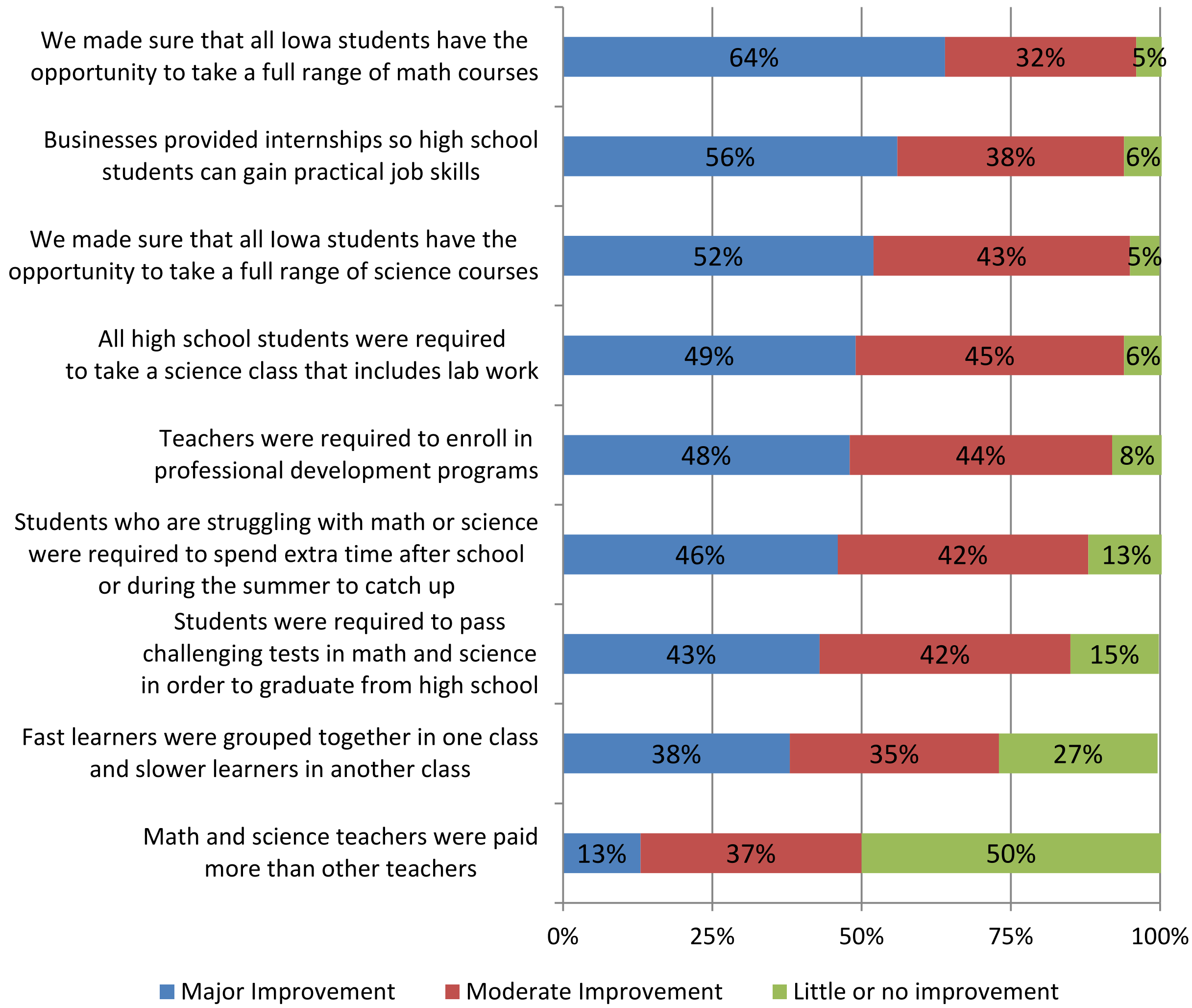
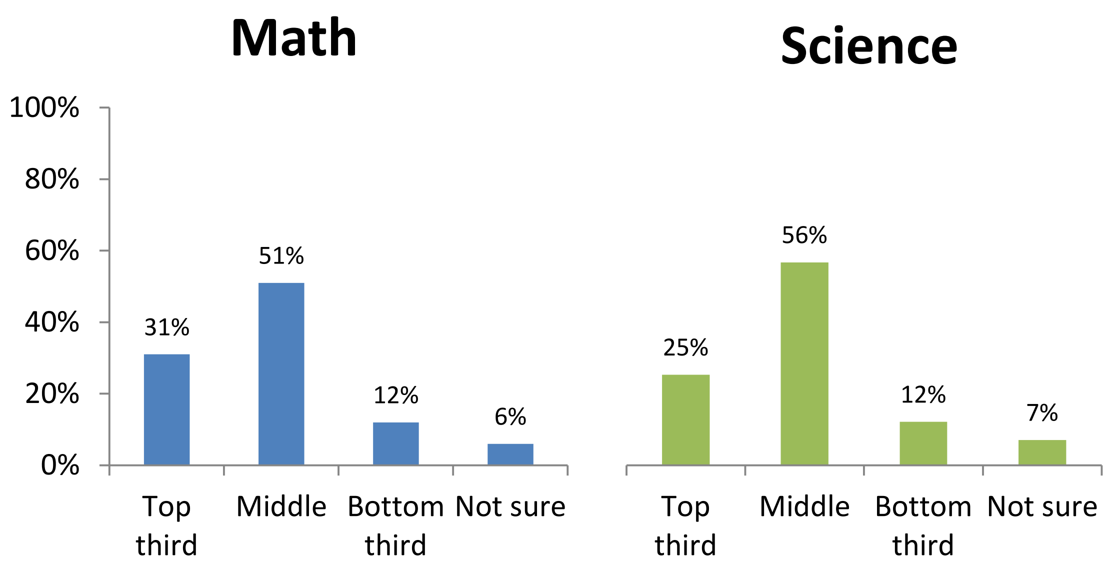


Figure 17. Strategies to improve math and science education in Iowa



Over half of Iowans perceived that Iowa students scored in the middle third on students' standardized tests in math and science compared to students nationwide (Figure 18). The perceptions of Iowans closely reflect the actual national rank of Iowa students on standardized test scores as Iowa's national rank on math and science do fall in the middle third nationally. According to the National Assessment of Educational Progress, students in 4th grade rank 20th in math (i.e. middle third) and 11th (i.e. top third) in science, respectively. Iowa students in 8th grade rank 25th in math (i.e. middle third) and 17th (i.e. top third) in science, respectively. (See Indicator 2 for more details.)

Figure 18. Public perceptions of Iowa's rank on students' standardized tests



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, and their child's educational progress/goals (e.g. plans after graduation, perceived child interest/achievement in STEM topics and STEM careers)

Nearly all parents said that student exposure to and achievement in STEM topics is important to them. (Table 17). Based on responses regarding allocation of time to different topics, parents of an elementary child support more time allocated to hands-on science activities (Figure 19), while parents of a middle/high school student support more time allocated to practical math skills (Figure 20). The challenge is very few parents think LESS time should be spent on anything.

Table 17. Importance of STEM skills among of parent respondents with a school-aged child

Parents of 4-11 year olds	**% Agree**	**Parents of 12-19 year olds**	**% Agree**
It is very important to me that my child does well in math	100%	It is very important to me that my child has some advanced math skills	93%
It is very important to me that my child does well in science	100%	It is very important to me that my child has some advanced science skills	92%
It is very important to me that my child has some technology skills	100%	It is very important to me that my child has some advanced technology skills	94%
It is very important to me that my child has some exposure to engineering concepts	94%	It is very important to me that my child has some exposure to advanced engineering concepts	82%

Figure 19. Attitudes of parents of 4-11 year olds towards time spent on STEM topics

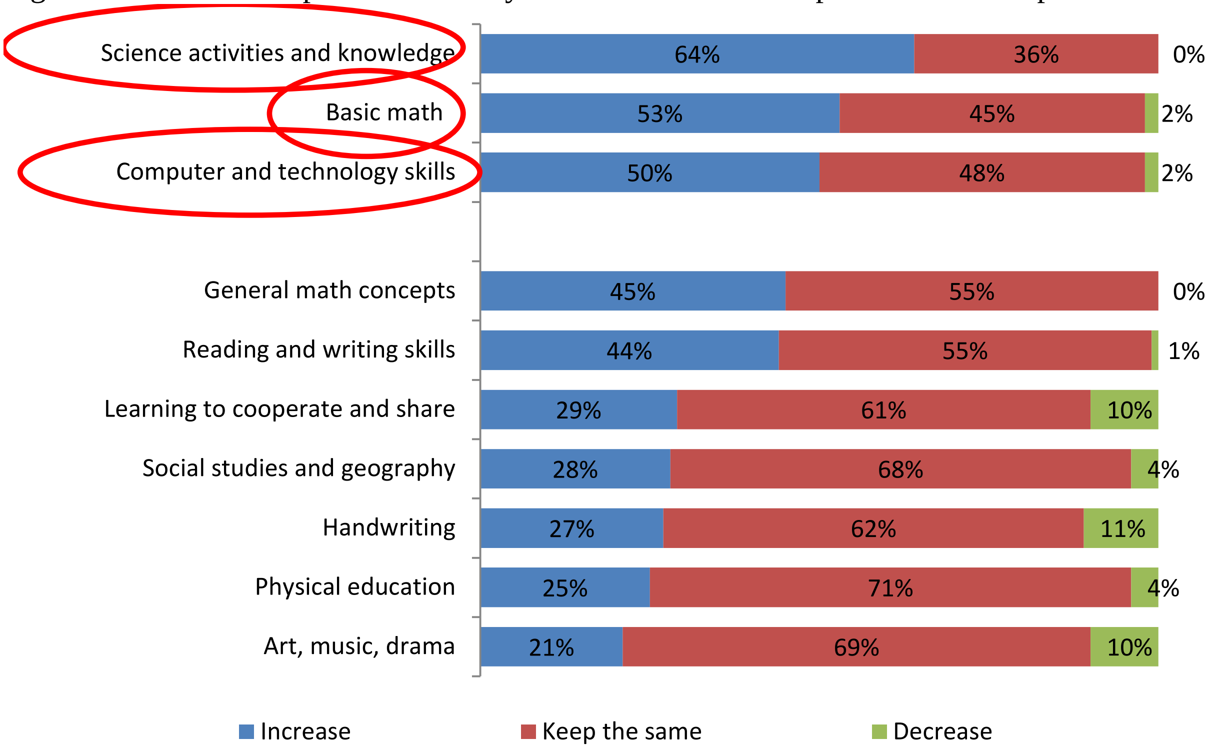
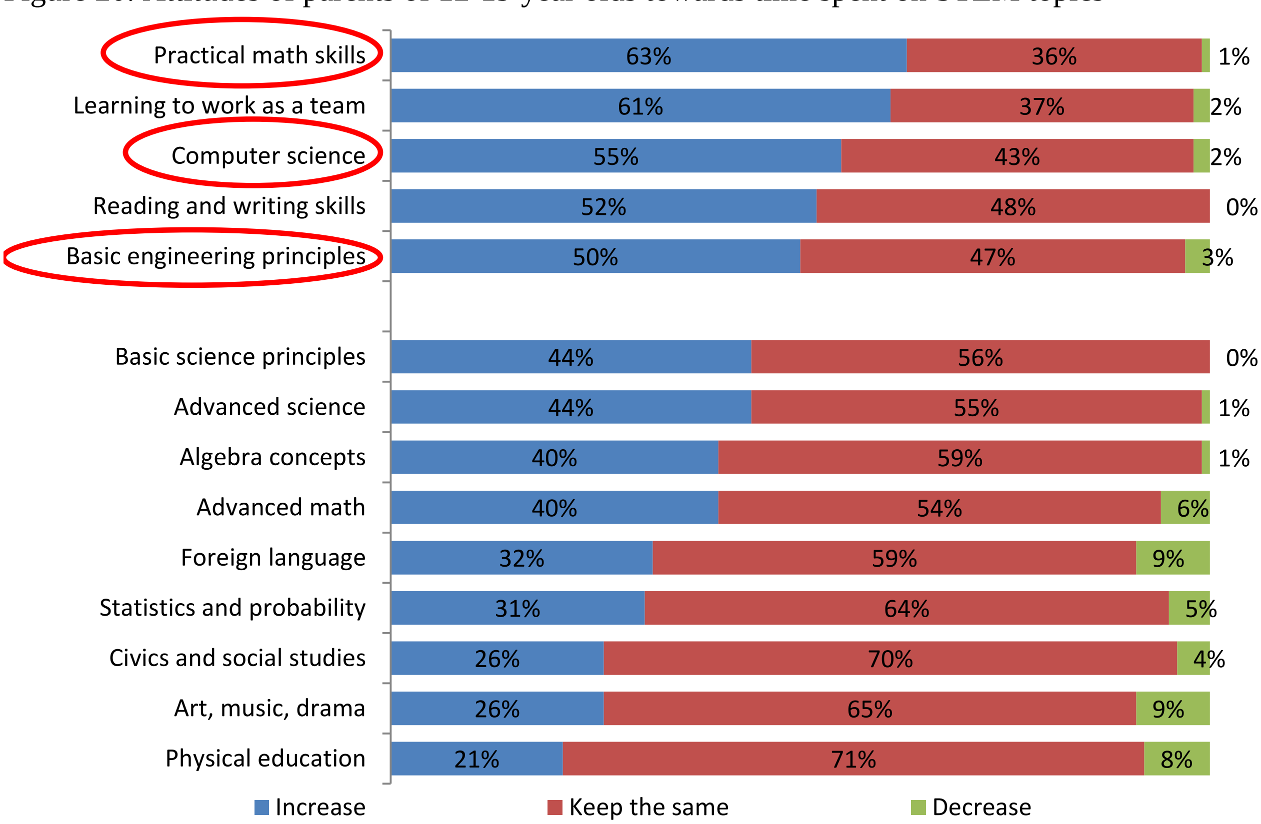


Figure 20. Attitudes of parents of 12-19 year olds towards time spent on STEM topics



Among all parents, 46% say their child is being *very well* prepared in STEM subjects (Figure 21). In addition, about half (47%) of all parents said their child has *a lot of interest* in STEM, and about one-third (34%) said their child has *some interest* in STEM (Figure 22). Among parents who said their child showed "a lot of interest" in STEM, 84% said their child was doing very well in STEM classes. However, among those who said their child has only "some interest" in STEM classes, a lower proportion (53% v. 84%, respectively) said their child was doing very well in STEM classes (another 45% say their child is doing "OK"). In other words, a parent perception of greater student interest in STEM coincides with the perception that their child is doing very well in STEM achievement. Although most parents would encourage their child to pursue a STEM career, only about one-half think it is likely (Figure 23). A potential target for STEM pipeline growth may be those students who show "some interest" in STEM topics and are doing "OK" or "very well" in STEM achievement.

Figure 21. Parent perceptions their child's school in preparing child in STEM subjects

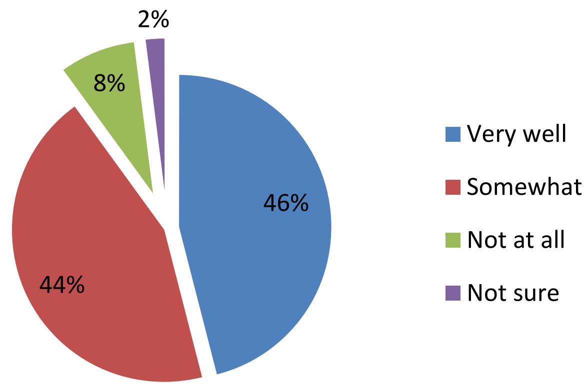


Figure 22. Parent perceptions of their student's interest in STEM

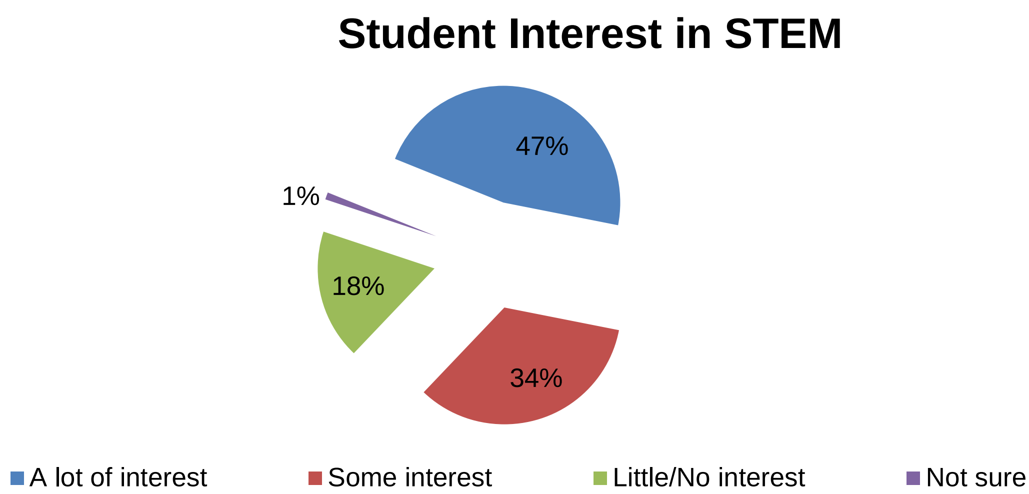
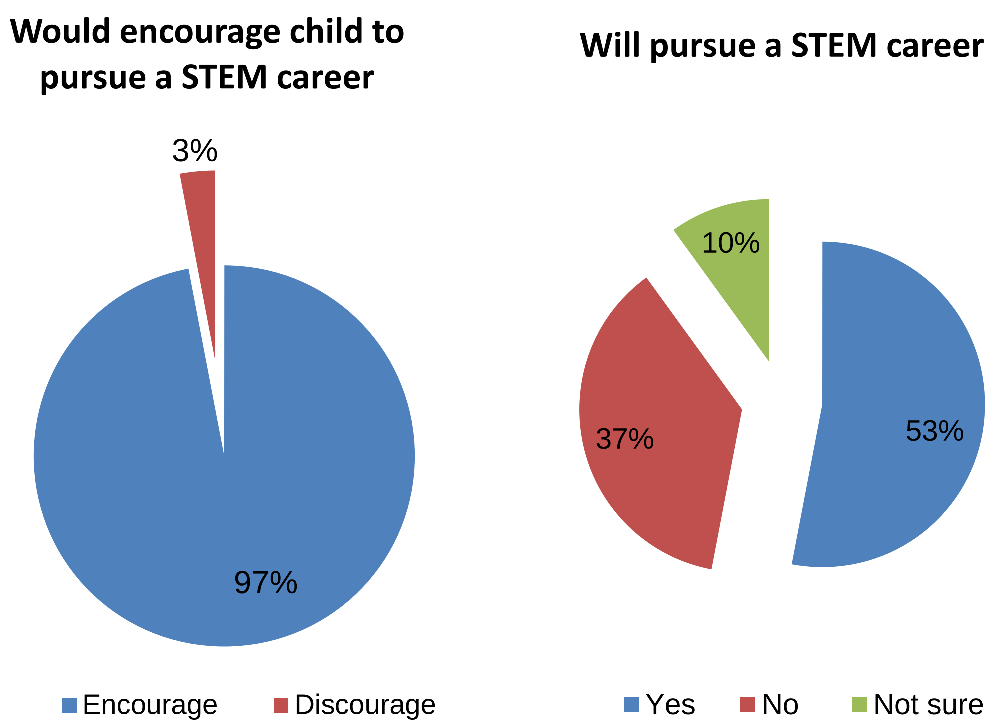


Figure 23. Parent perceptions of STEM careers versus perceptions of their child's intention to choose a STEM career



Statewide Student Interest Inventory

Iowa Testing Programs at the University of Iowa administers the Iowa Assessments taken by nearly every student in grades 3 through12 in the state annually. For the 2012-2013 academic year, an 8-item interest inventory was added to the Iowa Assessments. Interest was measured on a 3-point scale using the responses "I like it a lot", "It's okay", and I don't like it very much" for students in grades 3rd through 5th, and responses "Very interested", "Somewhat interested", and "Not very interested" for students in grades 6th through 12th. 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 Report of Participant Information section for additional comparative results between students who participated in a Scale-Up Program and students statewide).

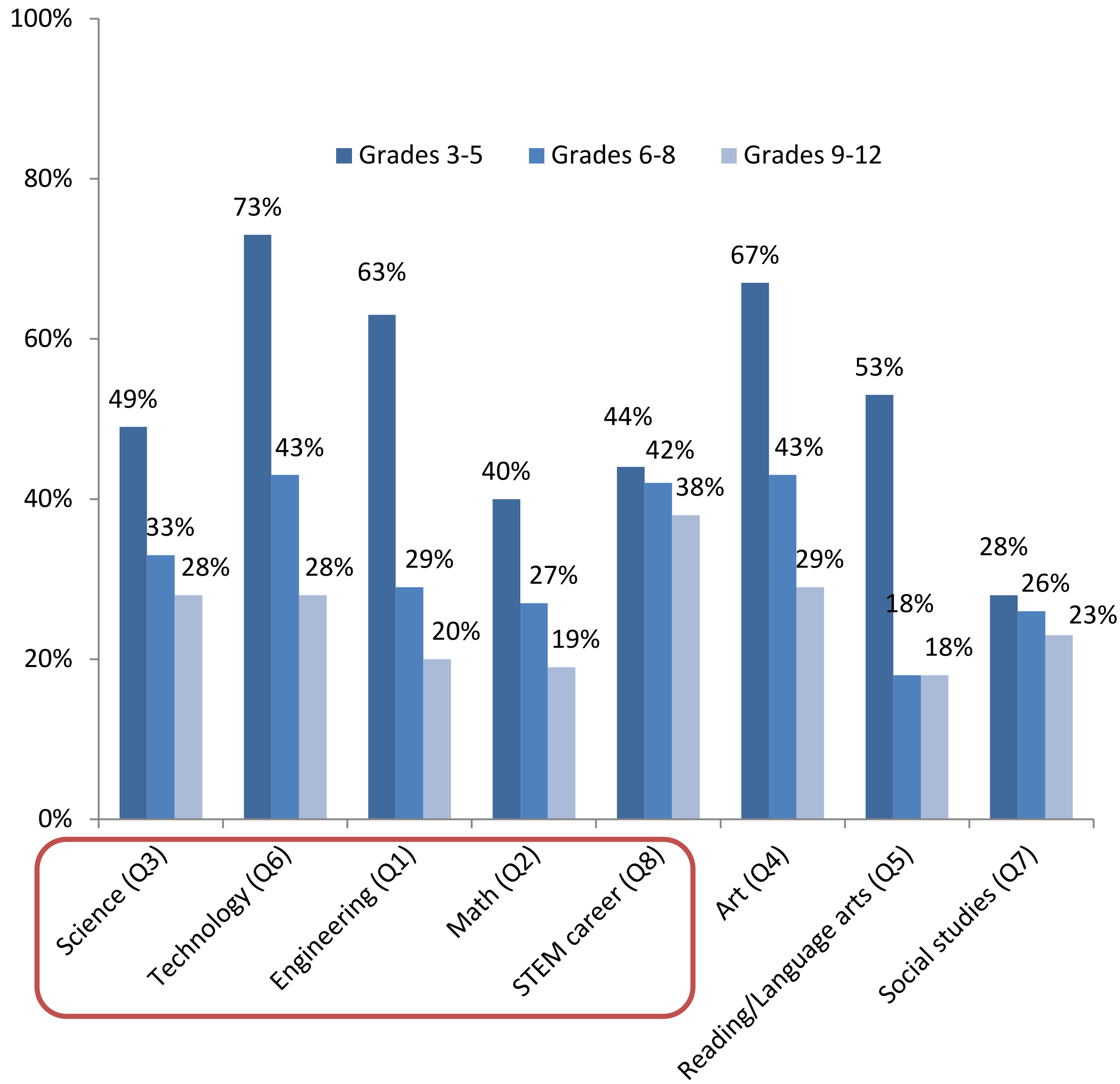
Two versions of the inventory were created: one for 3rd through 5th grade and one for grades 6th through 12th. The items were pilot tested by students in the target grade levels. Table 18 shows the differences in the way items were worded for the two versions. Item frequencies for each of the interest inventory questions can be found in Appendix H.

Table 18. 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?

Among all students statewide who took the Iowa Assessments, interest in all subjects and STEM careers was highest among elementary students followed by middle school and high school students (Figure 24). Results are consistent with evidence that suggests overall academic motivation and interest in all subjects, including STEM, decreases over time from elementary to high school (Barber & Olsen, 2004, Dotterer, McHale, & Crouter, 2009, Eccles, Midgley, & Adler, 1984).

Figure 24. Percent of all students statewide by grade group who said they "like it a lot" (Grades 3-5) or were "very interested" (Grades 6-12) in seven subject areas or a STEM career



Barber, B. K., & Olsen, J. A. (2004). Assessing the transitions to middle and high school. *Journal of Adolescent Research, 19*(1), 3-30.
Dotterer, A. M., McHale, S. M., & Crouter, A. C. (2009). The development and correlates of academic interests from childhood through adolescence. *Journal of Educational Psychology, 101*(2), 509.
Eccles, J. S., Midgley, C., & Adler, T. (1984). Grade-related changes in the school environment. *The development of achievement motivation*, 283-331.

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 2012-2013, 12 STEM 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 community. The programs were administered through the six STEM Regional Hubs, and implemented through formal and informal local education agencies (LEA) including schools, libraries, museums, science centers, and clubs/organizations (e.g. 4-H, girl scouts).

Methods As part of the Iowa STEM Monitoring Project, the following three submissions were required from all LEAs implementing a Scale-Up Program: 1) a Report of Process and Outcomes (RPO), 2) a Report of Participant Information (RPI), and 3) completed student questionnaires.

The RPO is an online report that is submitted by each LEA implementing a Scale-Up program. The general purpose of the RPO is to inform the ISMP by providing the project partners with consistent information across all Scale-Up programs implemented in the regions. The data are submitted directly to RISE at ISU. The RPO includes brief questions about Scale-Up Program implementation and outcomes. (See Appendix I for RPO instrument)

In addition, any LEA 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 was required to submit one RPI. The purpose of the RPI 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 LEA to Iowa Testing Programs using a secure web-based interface (with security similar to an online banking website). Identifying data from the RPI was not shared with any other entity. Iowa Testing Programs provided de-identified and aggregated interest and achievement scores of participants across programs to enable comparisons between Scale-Up participants and other students in the state. In some cases, Scale-Up programs did not submit an RPI. The ISMP partners worked with Regional Managers to determine the submission of this report on a case-by-case basis.

Last, a short student questionnaire was created for completion by all students who were served or impacted by Scale-Up programs. This includes any Scale-Up program that either directly served K-12 students or served K-12 teachers with the goal of indirectly impacting student interest in STEM. The purpose of the student survey was to assess self-reported changes in STEM interest as a result of participating in the Scale-Up program. Following each Scale-Up program, teachers and leaders were asked to have students complete a brief, 7-item questionnaire to assess student interest in STEM topics and careers. The questionnaire was administered via paper and pencil by the teacher or group leader. The questionnaire asked the student to indicate their change in interest across STEM topics and in STEM careers after participating in the Scale-Up program compared to the beginning of the fall/semester. Change in interest was measured on a 3-point scale using the response choices of “less interested”, “just as interested”, and “more interested”. In addition, the survey asked for demographic information about gender and age. Three versions of the instrument were created to accommodate different grade levels, and the instrument was pilot tested with the target audience during development. The student survey was to be administered on the last day/session of the program/semester (or as close to that day as possible). (See APPENDIX M-N for survey instruments and item frequencies) As with the RPI, the student survey was not reported for all Scale-Up programs. The ISMP partners worked with Regional Managers to determine the administration date and feasibility of this activity on a case-by-case basis.

Descriptive statistics were used to analyze the data from the student survey. The percent of students who indicated they were “more interested” in STEM topics was compared across three grade groups (elementary v. middle school v. high school). Significant differences were assessed using chi-square tests. All analyses were conducted in SPSS.

Results Results from the 3 monitoring activities for Regional Scale-Up Programs are presented their respective sections that follow.

Report of Process and Outcomes (RPO)

The Report of Process and Outcomes (RPO) for 2012-2013 includes data collected across all six regions of the state and 10 Scale-Up programs. Data were collected for the following Scale-Up programs:

- A World in Motion (AWIM)
- Corridor STEM Initiative (CSI)
- Fabulous Resources in Energy Education (FREE)
- FIRST Lego League (FLL)
- FIRST Tech Challenge (FTC)
- Hyperstream—Technology Hub for Iowa's Students
- KidWind
- Partnership for Engineering and Educational Resources for Schools (PEERS)
- Project HOPE (Healthcare, Occupations, Preparation, and Exploration)
- State Science + Technology Fair of Iowa (SSTFI).

RPO data was not collected for The CASE for Agriculture Education in Iowa (not implemented this year), and iExplore STEM (a program not meant for individual Scale-Up). Although submission of the RPO is a requirement of each LEA or group implementing a Scale-Up, only 283 responses were received, for an overall response rate of approximately 44%.

Program Participation

Two-hundred eighty-three (283) Scale-Up programs reported, documenting 10,046 participants in four different categories: 1) K-12 students; 2) parents; 3) teachers; and 4) "others" which included community members/partners, engineers, business mentors, and pre-service teachers (See Appendix J for a listing of the other participants). All Scale-Up programs involved K-12 students, with the exception of one program that included college students. Additionally, over 75% of the programs included teachers, and approximately one-third of the programs included parents and others. About two-thirds of the student participants were male. Over half of participating parents were male, and two-thirds of teacher participants were female.

Table 19 shows the number and percentage of Scale-Up programs that included each of the four participant categories, as well as the total number of participants and percentage of female and male participants in each category.

Table 19. Teacher report of program participation

	Number of Programs	**Percentage of Programs**	**Number of Participants**	**Percentage of Male Participants**	**Percentage of Female Participants**
Students (K-12)	282	99.6%	8,829	62%	38%
Parents	101	35.7%	421	57%	43%
Teachers	216	76.3%	425	37%	67%
Others	92	32.5%	371	63%	37%

The teachers who participated in the Scale-Up projects primarily taught courses related to STEM. However, some LEAs reported teacher participants that taught courses such as language arts, reading, and social studies. Many teachers taught multiple subjects. (See Appendix K for a listing of the subjects taught.)

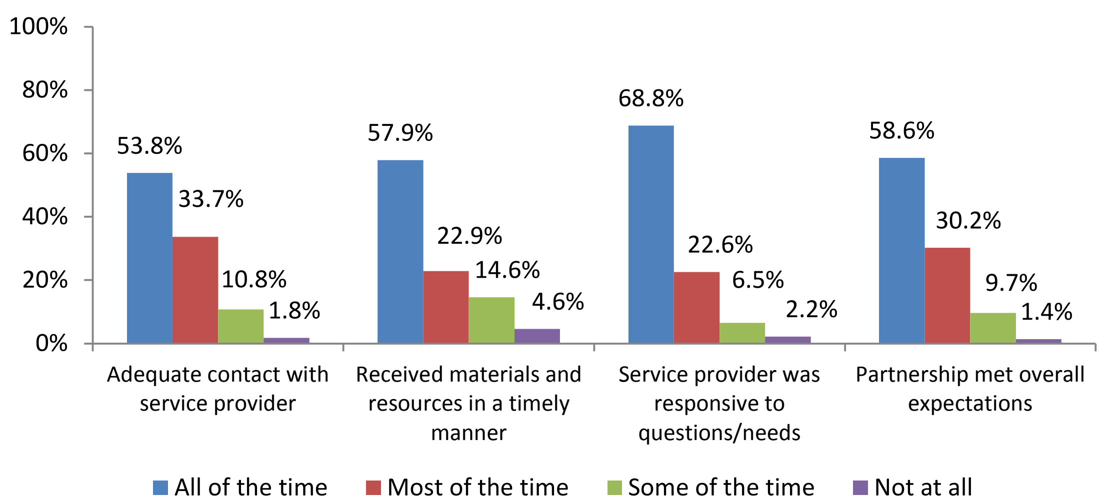
Program Implementation

LEAs reported on six aspects of program implementation: 1) customization; 2) experiences with service provider; 3) collaboration with local groups; 4) local involvement; and 5) challenges and successes. Summaries of open-ended responses follow. A full listing of open-ended comments is provided in Appendix L.

Customization In the initial Scale-Up application, LEAs outlined an implementation timeline and plan. In the RPO, respondents were asked how closely they adhered to their intended outlines and plans and to describe any changes made in the implementation of those plans. Many participants reported that they stayed on schedule. Reasons given for deviations to timelines and plans included setbacks due to bad weather, late arrival of materials, other lessons that interfered with STEM programming, and lack of clarity about expectations and student schedules. Additionally, approximately one-third of the LEAs customized their Scale-Up program in order to serve unique local needs. Some of the customizations included adjusting lessons to fit grade level, adjusting or eliminating lessons due to time constraints, adding field trips, and utilizing different materials than those provided in the kits.

Experiences with service providers The LEAs 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. Over 50% of the LEAs reported having positive experiences with their service providers all of the time. 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 25 shows the frequency distribution in these four areas.

Figure 25. LEAs' Experiences with Service Providers



The percentage of LEAs that responded "not at all" to any of the categories ranged from 1% to 5% and was related to receiving materials late or after the Scale-Up was over, poor communication (i.e., unanswered emails, phone calls, voicemails), frustration, and the inflexibility of grant fund rules.

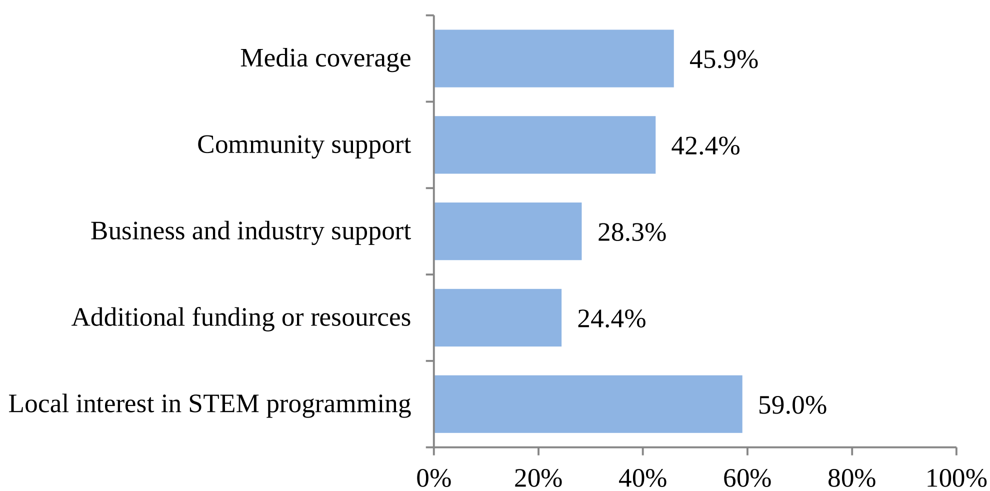
Collaboration LEAs also reported on collaboration between their specific Scale-Up program and various entities, including in-school groups, out-of-school groups, community groups, volunteer groups, and "other" groups (Table 20). Over 40% reported collaborations with In-School groups, and approximately one-quarter of Scale-Up programs collaborated with out-of-school, community, or volunteer groups. Participants described in written comments collaborating specifically with other teachers from a variety of different grade levels and subjects, school administrators and staff, experts from local colleges and universities, Iowa State extension offices, and parent volunteers. Participants also collaborated with 4-H programs, local businesses, college and university staff, and other local and regional teams in the area.

Table 20. 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	115	40.6%
Out-of-School Groups	64	22.6%
Community Groups	78	27.6%
Volunteer Groups	68	24.0%
Other Groups	18	6.4%

Local involvement At the local level, over 40% of LEAs reported receiving media coverage and community support, and about 60% of LEAs reported a local interest in STEM Programming. Other sources of local involvement included support from business and industry and receiving additional funding or resources. Figure 26 illustrates LEAs' support at the local level.

Figure 26. Local Level Support to Scale-Up Programs



Challenges, barriers, and successes In an open-ended question, respondents described challenges and barriers they faced during Scale-Up implementation. Some of the challenges and barriers reported were being first-time coaches or teachers, the financial rules of the grant (i.e., reimbursement instead of being paid upfront), implementation taking away from classroom time, learning new technology and being familiar with new materials. Respondents also shared recommendations of things they found helpful during the implementation of their program. Many mentioned building a network of fellow teachers, engineers, industry volunteers, other regional and state teams, and local colleges and universities that helped smooth the implementation process.

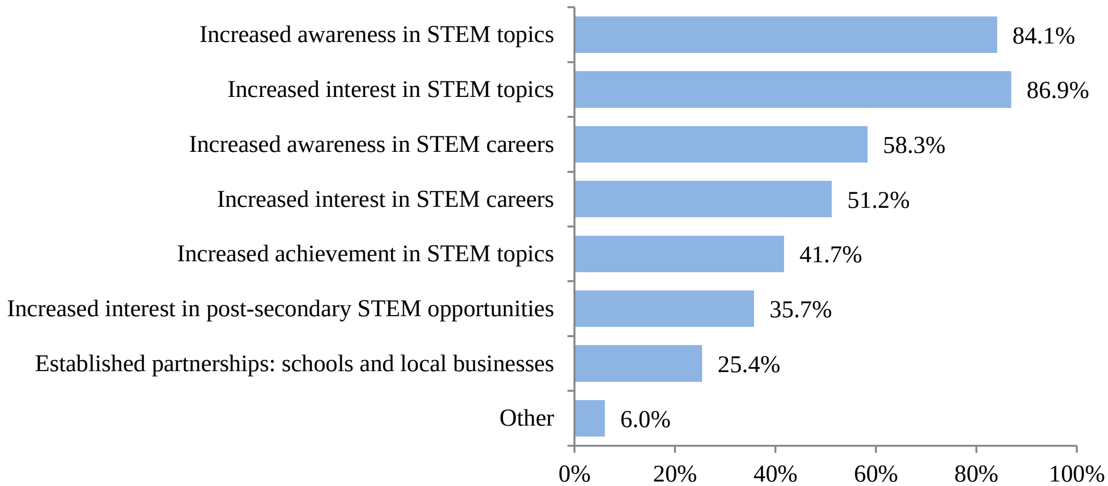
Respondents recommended going to local competitions to observe so their students could gain valuable experience, attending professional development workshops, and taking advantage of resources (e.g., handouts, the teachers' manual, email support) provided by the program.

Observed Outcomes

LEAs positively reported on the observation of outcomes as a result of the Scale-Up programs, with 96% of them responding that the outcomes they observed met their expectations. Less than 4% of the LEAs reported that the outcomes did not meet their expectations. In some cases, the outcomes of the program exceeded participants expectations, while others had a more negative experience and mentioned as things that fell short of expectations: some students were not motivated; many teachers noted time constraints; there was lack of support and training for participants; and participants' organizational and leadership skills were lacking.

From a list of outcomes, over 80% of the LEAs reported observing an increase in both awareness and interest in STEM topics, while over 50% of the LEAs reported observing an increase in awareness and interest in STEM careers (Figure 27). Approximately 40% of LEAs observed increased student achievement in STEM topics and more than a third reported increased interest in post-secondary STEM opportunities. About one fourth reported that they had established partnerships between schools and local businesses. A few respondents also noted other observable outcomes, included students who experienced increases in confidence, critical thinking skills, and interest in technology and science. Some respondents said new partnerships and support from college and university staff and parents were also observable outcomes of the program.

Figure 27. Observed Outcomes of the Scale-Up Programs



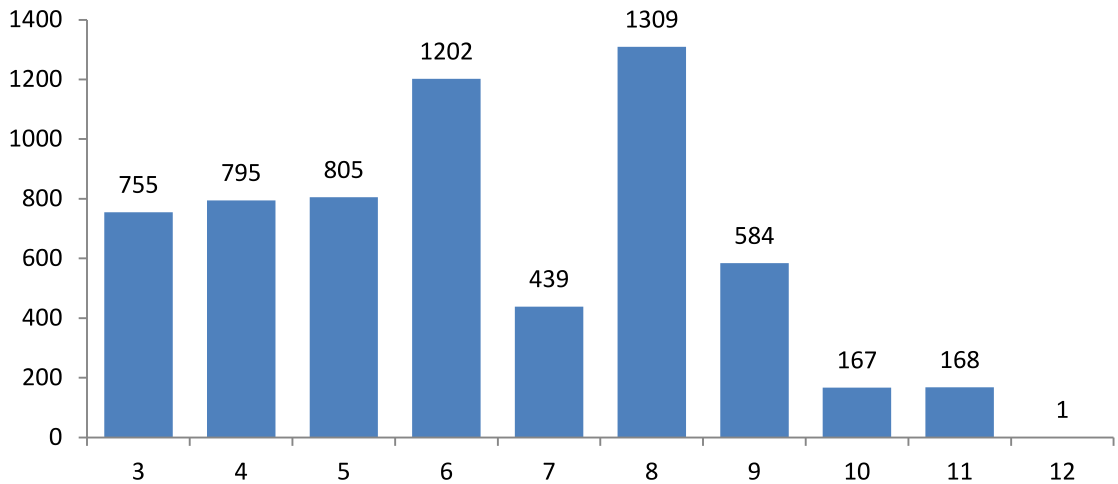
Respondents also provided examples of the impact the program had on teachers and students. In written comments, many respondents reported that students experienced an increase in motivation, engagement, and interest in STEM content areas as well as STEM careers. They also thought that students' critical thinking, problem solving, and teamwork skills also showed improvement throughout the program. Applying their knowledge of math, science, and technology to real-world problems also had a positive impact on students. Teachers reported that the program allowed students to explore hands-on learning, which encouraged students to continue work on project even after programming had ended. Some responded that the program improved teachers' "comfort levels" with teaching STEM content and that some of their fellow teachers were impressed with the program and were considering applying for a grant.

Finally, respondent were asked describe anything unexpected that happened during implementation or if there were any unexpected results (both positive and negative) because of the program. Some positives included increased confidence, pride, and engagement among students and teachers, student growth as leaders and "mini mathematicians and engineers," parent involvement, and new networks with local colleges and universities, businesses, and engineers and other science experts. Some negatives reported were late distributions of resources and materials, faulty materials, students dropping out of the club/program before completing their projects, more participants than resources or time would have otherwise allowed, and limitations due to bad weather.

Report of Participant Information (RPI)

Overall, student information was submitted to successfully match 6,225 Scale-Up participants to their Iowa Assessments data. Figure 28 shows the distribution of all cases by grade level. Descriptive analysis was conducted with the matched Scale-Up participants. Tests to determine statistical significance were not conducted due to the large variation in sample sizes between matched Scale-Up participants (n=6,225) and students statewide (n=241,957).

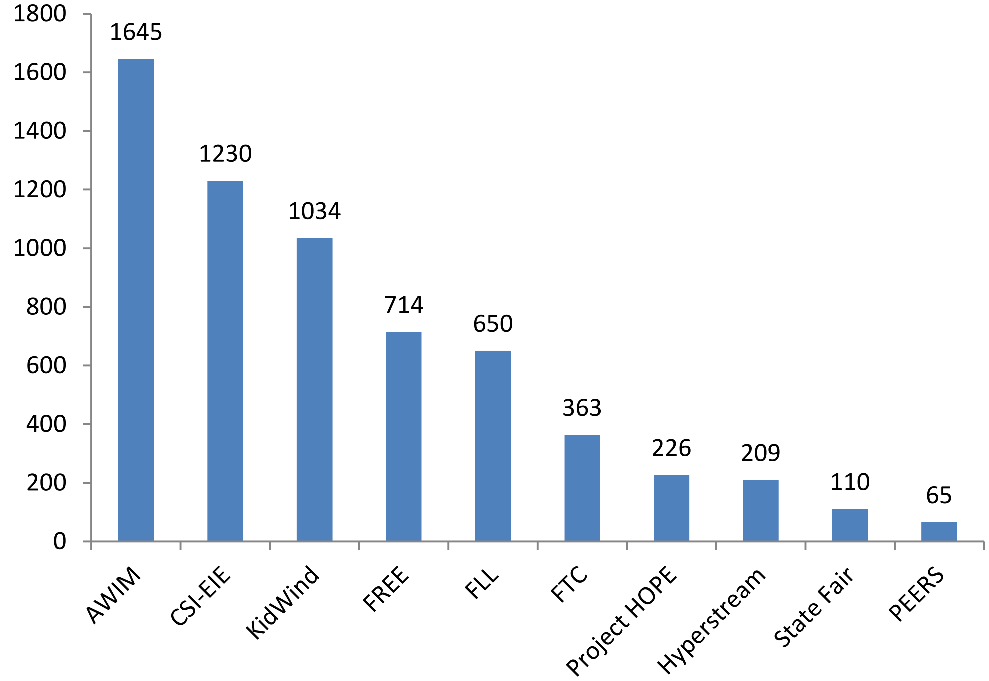
Figure 28. Number of matched Scale-Up participants by grade



*Counts updated with corrected data July, 2014.

Among the 6,225 matched Scale-Up participants, 26% were A World in Motion participants, 20% Corridor STEM Initiative – Engineering is Elementary (CSI-EiE), 17% KidWind, 11% Fabulous Resources for Energy Education (FREE), and 10% FIRST Lego League (FLL) (Figure 29).

Figure 29. Number of matched participants by Scale-Up program

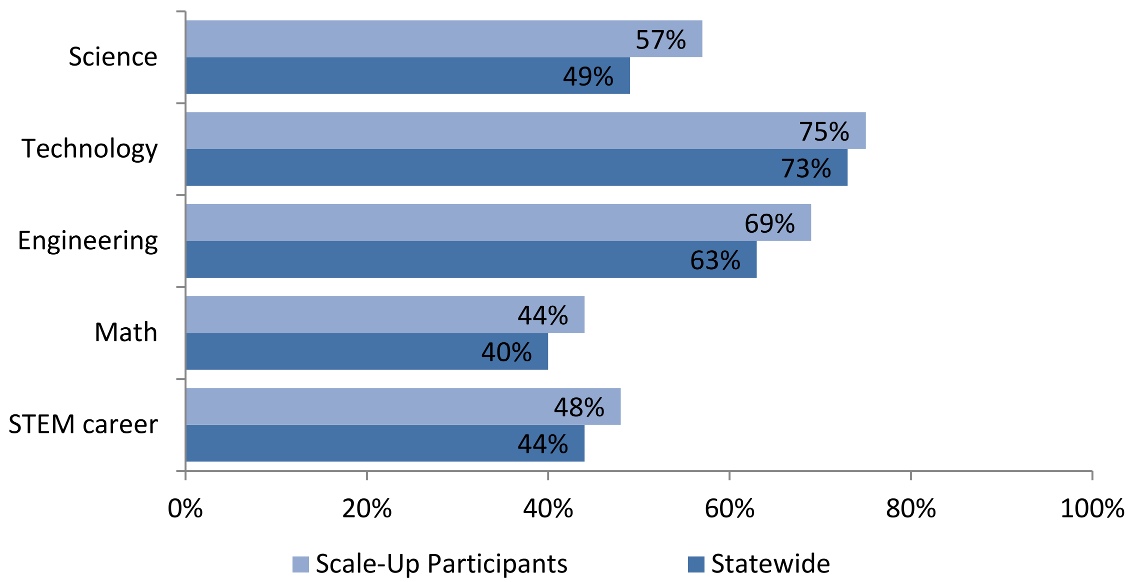


*Counts updated with corrected data July, 2014.

STEM Interest Among Students on the Iowa Assessments – A Statewide and Scale-Up Comparison

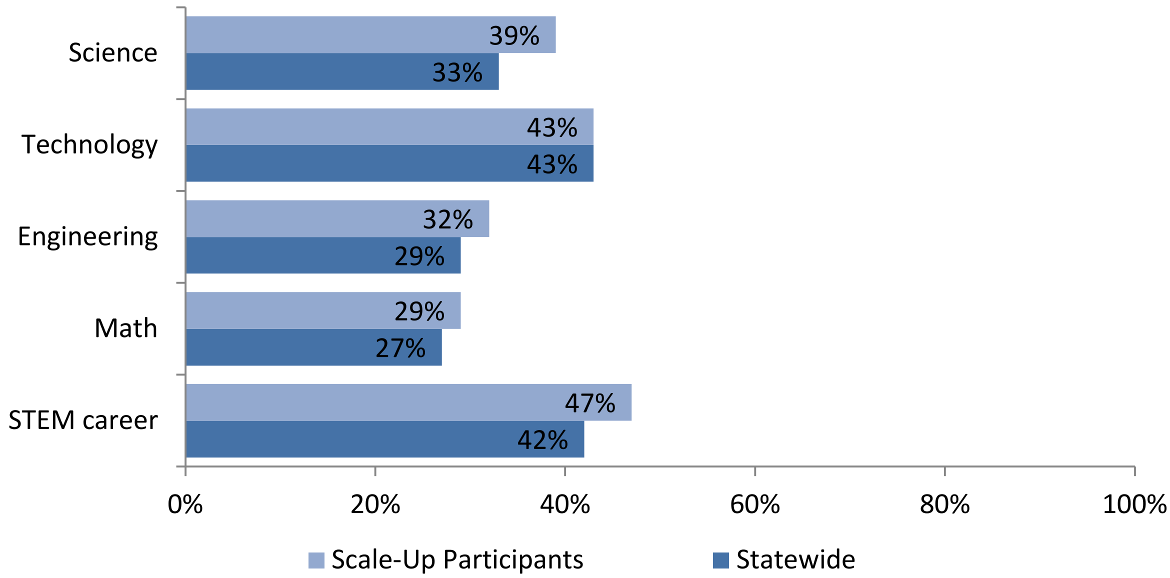
The proportion of Scale-Up participants expressing interest in STEM subjects and careers was compared to the proportion of statewide test-takers that expressed interest. In each of the grade groups, the percent of Scale-Up students who said "I like it a lot" (Grades 3-5) or were "very interested" (Grades 6-12) was higher than students statewide (Figures 30-32). Comparing Scale-Up students and students statewide, the relative difference between Scale-Up students was smaller in elementary and middle school (Figure 30-31), with larger differences between the two groups in high school (Figure 32). Notably, interest in STEM subjects decreases for both students in Scale-Up programs and statewide from elementary into high school. However, interest in having a STEM job <u>increases</u> for Scale-Up students from elementary into high school (from 48% in Grades 3-5 to 53% in Grades 9-12), but <u>decreases</u> for students statewide (from 44% in Grades 3-5 to 38% in Grades 9-12), respectively.

Figure 30. Percent of students grades 3-5 who said "I like it a lot" (Grades 3-5) in STEM subjects/careers on the Iowa Assessments, statewide versus Scale-Up comparison



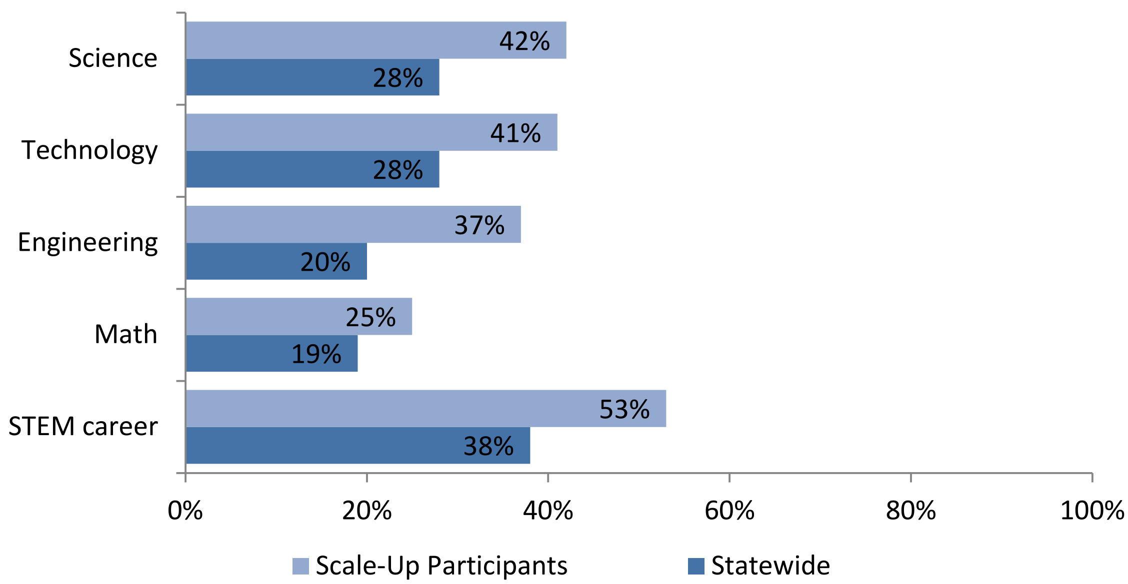
Source: Iowa Assessments, Iowa Testing Programs

Figure 31. Percent of students grades 6-8 who said they were “very interested” in STEM subjects/careers on the Iowa Assessments, statewide versus Scale-Up comparison



Source: Iowa Assessments, Iowa Testing Programs

Figure 32. Percent of students grades 9-12 who said they were “very interested” in STEM subjects/careers on the Iowa Assessments, statewide versus Scale-Up comparison

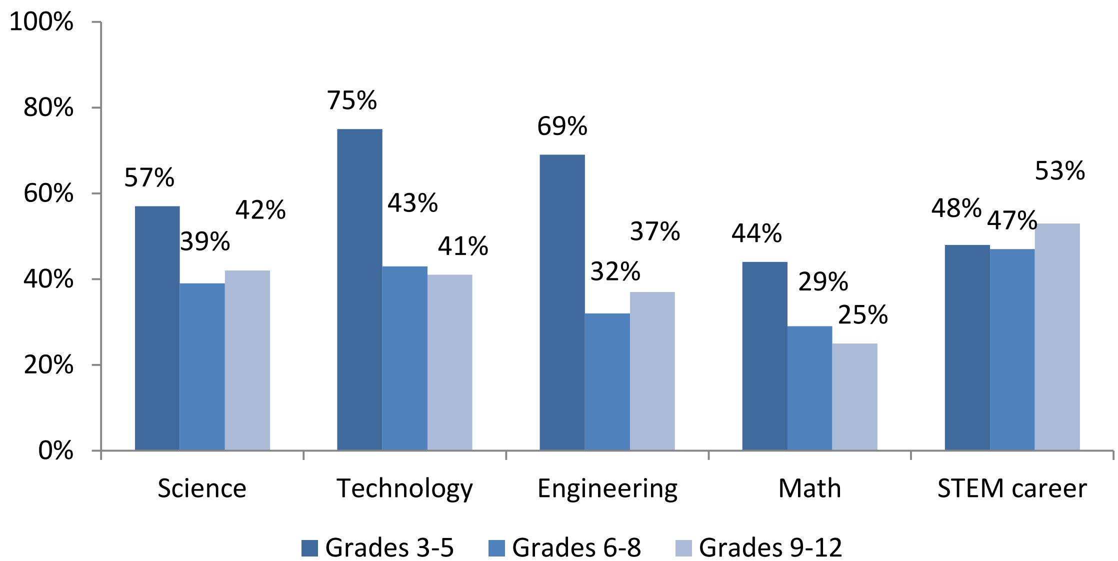


Source: Iowa Assessments, Iowa Testing Programs

STEM Interest on the Iowa Assessments by Grade among matched Scale-Up participants

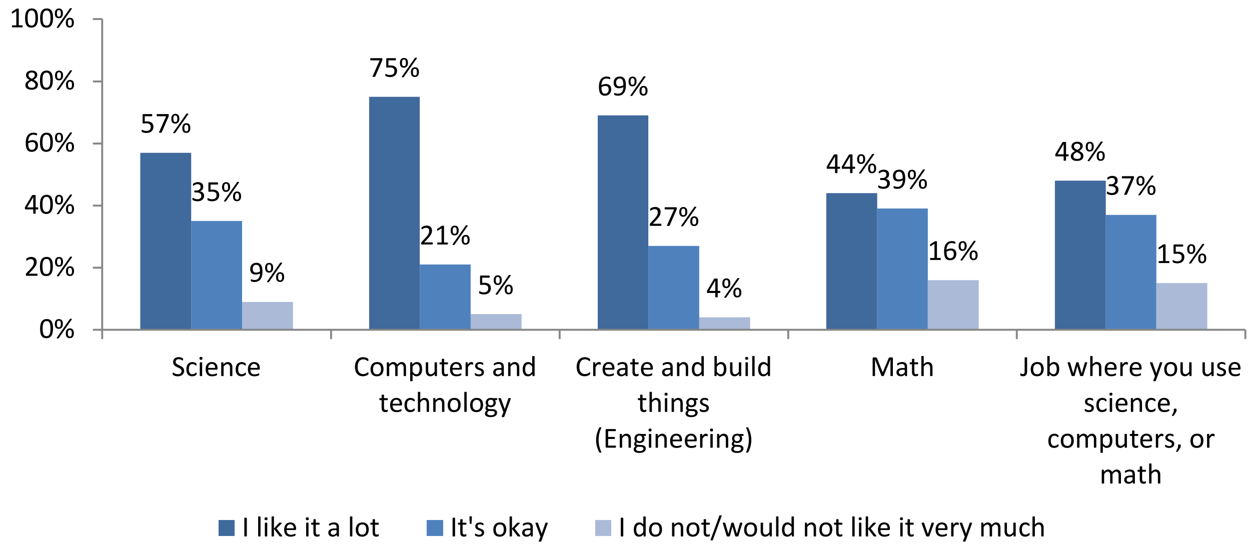
Figures 33-36 use data from the Interest Inventory on the Iowa Assessments to show the percent of Scale-Up students by interest level in STEM topics or careers for elementary, middle school, and high school students respectively. In elementary school Scale-Up students, more students said they were interested in individual STEM subjects, specifically computers and technology, science, and engineering, respectively (Figure 33-34). However, among middle school and high school Scale-Up students, more students said they were "very interested" in a STEM career than any one individual STEM subject (Figures 33, 35-36).

Figure 33. Percent of Scale-up students in each grade group who said they "like it a lot" or were "very interested" in STEM subjects or a STEM career on the Iowa Assessments



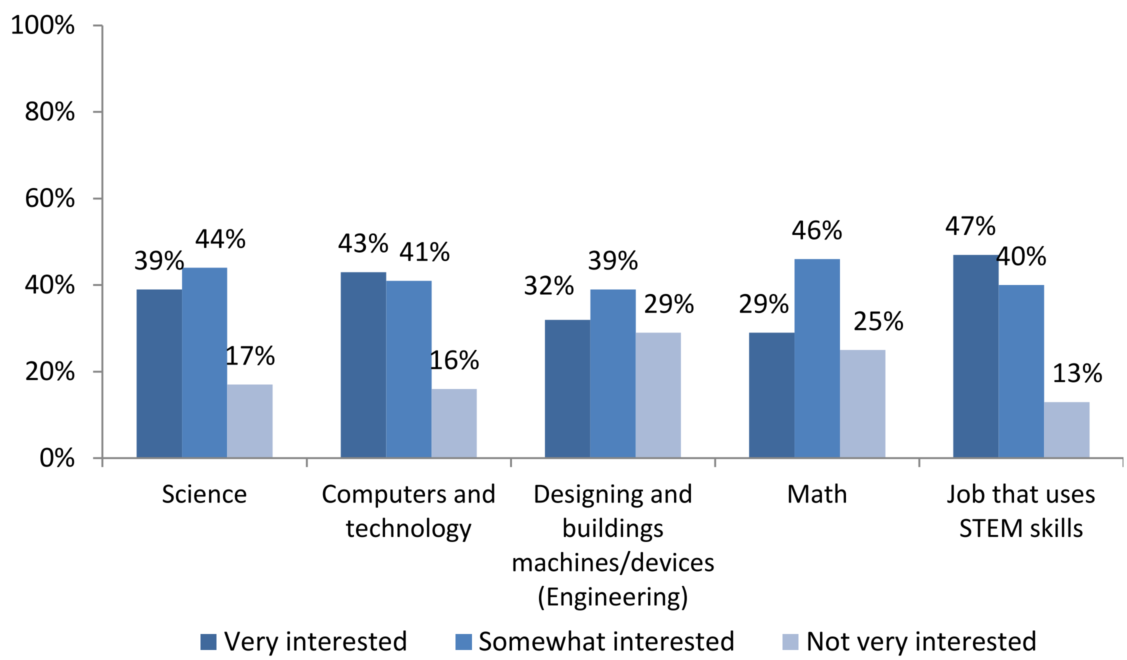
Source: Iowa Assessments, Iowa Testing Programs

Figure 34. Interest in STEM subjects/careers from the Interest Inventory on the Iowa Assessments among Scale-Up students in grades 3-5



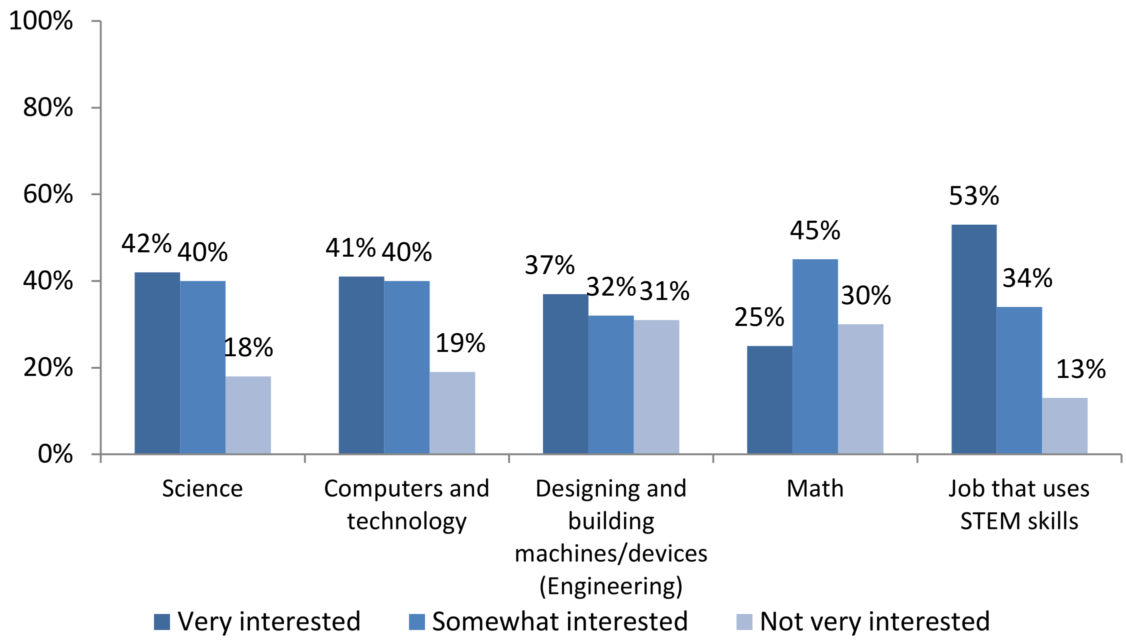
Source: Iowa Assessments, Iowa Testing Programs

Figure 35. Interest in STEM subjects/careers from the Interest Inventory on the Iowa Assessments among Scale-Up students in grades 6-8



Source: Iowa Assessments, Iowa Testing Programs

Figure 36. Interest in STEM subjects/careers from the Interest Inventory on the Iowa Assessments among Scale-Up students in grades 9-12



Achievement on the Iowa Assessments, Statewide versus Scale-Up Student Comparison

The matched Scale-Up participants were also compared to the statewide sample of test-takers with regard to achievement in math and science. The Iowa Assessment scores in these two subjects were compared based National Percentile Rank. In math achievement, Scale-Up participants scored more than students statewide, an average of 8 percentage points better in National Percentile Rank (Table 21). In science achievement, Scale-Up participants scored higher than students statewide, an average of 10 percentage points better in National Percentile Rank (Table 22).In all grades (3-11) for both math and science, students from Scale-Up programs were ranked higher than all students statewide.

Note this only shows association between Scale-Up Programs and achievement in science and math, but not causation. Therefore, these findings should be interpreted with caution. Further, tests of significance (student's t-test) were not conducted on the difference between average scores of statewide versus scale-up students at the recommendation of Iowa Testing Programs due to the large disparity in sample size between the scale-up participants and the state as a whole.

Table 21. Math achievement by grade level on the Iowa Assessments, Statewide versus Scale-Up Student Comparison

Grade	Statewide Math Scores	National Percentile Rank, (NPR, Statewide)	Scale Up Math Scores	National Percentile Rank, (NPR, Scale-UP)	Difference in NPR
3	179.11	58	233.8	62	+4
4	195.61	58	203.1	71	+13
5	210.28	57	216.6	66	+9
6	221.41	53	226.3	58	+5
7	237.93	57	256.5	74	+17
8	251.79	58	254.7	61	+3
9	270.46	65	279.3	72	+7
10	281.28	65	280.0	79	+14
11	288.96	65	309.7	82	+17
Average*	--	59.5	--	69	+10

NPR=National Percentile Rank

*Note: Averages are only reported for National Percentile Rank. The scoring range of math and science scores vary by grade level which prevents the ability to average scores across grades.

Data source: Iowa Assessments, Iowa Testing Programs

*Counts updated with corrected data July, 2014.

Table 22. Science achievement by grade level on the Iowa Assessments, Statewide versus Scale-Up Student Comparison

Grade	Statewide Science Scores	National Percentile Rank, (NPR, Statewide)	Scale Up Science Scores	National Percentile Rank, (NPR, Scale-UP)	Difference in NPR
3	182.13	62	184.2	66	+4
4	201.97	66	210.9	75	+9
5	212.87	59	221.7	69	+10
6	226.37	58	233.5	66	+8
7	240.03	59	257.5	72	+13
8	255.73	61	258.8	63	+2
9	279.18	71	289.5	78	+7
10	291.29	73	308.4	82	+9
11	296.64	71	319.43	84	+13
Average*	--	67	--	73	+6

NPR=National Percentile Rank
*Note: Averages are only reported for National Percentile Rank. The scoring range of math and science scores vary by grade level which prevents the ability to average scores across grades.
Data source: Iowa Assessments, Iowa Testing Programs
*Counts updated with corrected data July, 2014.

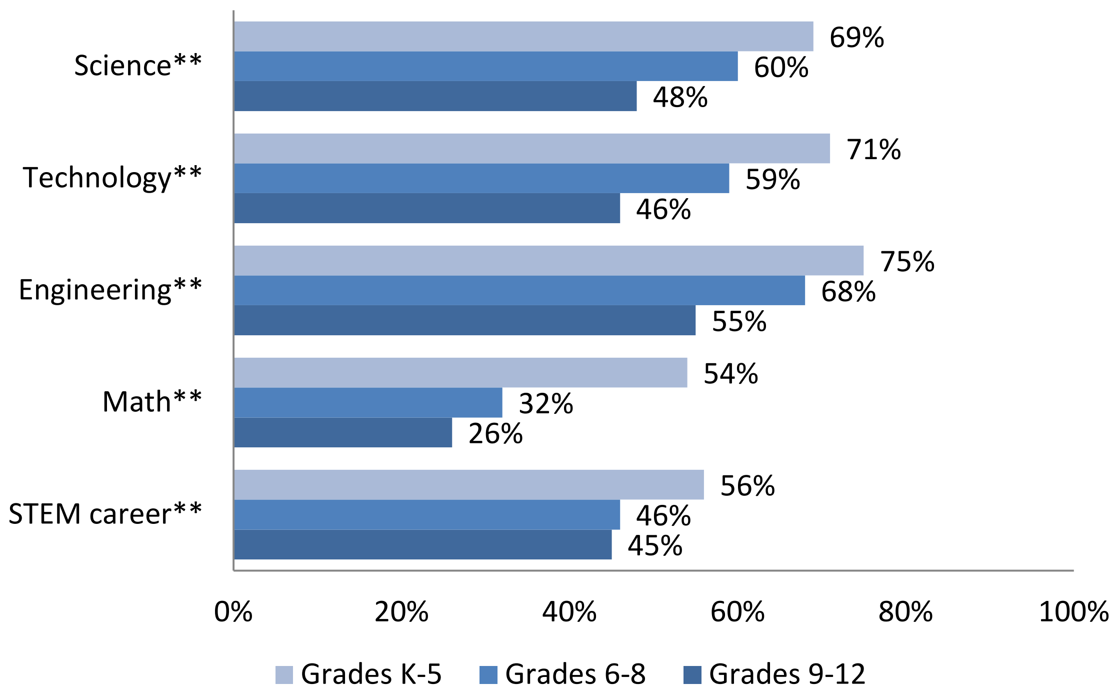
Scale-Up Program Student Survey

Student questionnaires were completed by students following participation in a Scale-Up program. Note that no baseline survey of student participants was completed which limits the ability to show differences in student interest before and after Scale-Up program participation.

LEAs implementing Scale-Up programs returned 7,729 student questionnaires. Of these, 4,181 were male (54.4%) and 3,505 were female (45.6%). The average age of participants was 11.3 years. Elementary students had the largest group of participants at 38.3% of the total sample (n = 2,955), followed by middle school students (33.6%, n = 2,588) and high school students (26.8%, n = 2,063), respectively. (See Appendix M for the Scale-Up Program Student Survey instruments and Appendix N for item frequencies)

Following Scale-Up Program participation, 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 37, $p<0.001$ for all items, respectively).

Figure 37. Percent of students by grade group that were "more interested" in STEM topics/careers after participating in a Scale-Up program



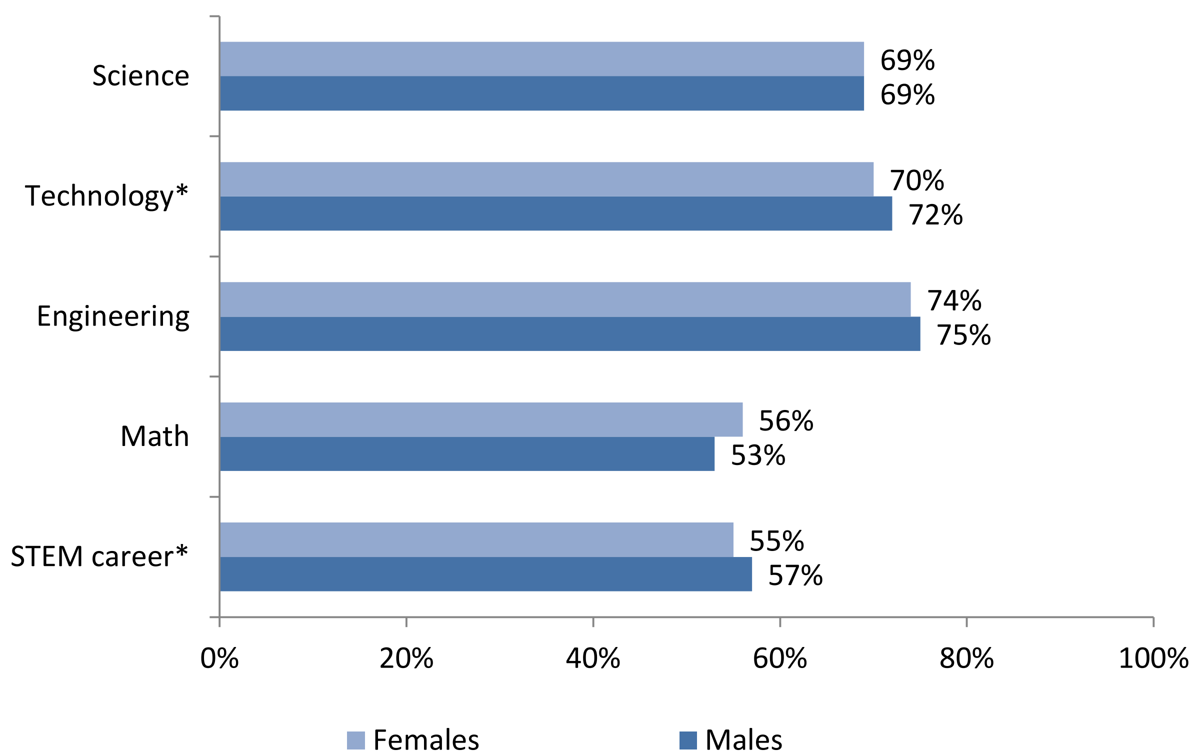
** p<0.001
Source: Regional Scale-Up Program, Student Survey

Significant differences were found in the percent male versus female students who said they were “more interested” following Scale-Up Program participation in all grade groups (Figures 38-40). The difference between male and females students was 3% or less across STEM topics among students in grades 3-5 (Figure 38). These differences in gender widen among middle school and high school Scale-Up students.

In grades 6-8, the differences in interest between males and females were significant in each STEM topic except for science (Figure 39). The difference in interest was greatest for engineering and computers/technology. For engineering, 74% of males were “more interested” compared to 62% of females. For computers and technology, 64% of males were “more interested” compared to 52% of females, respectively.

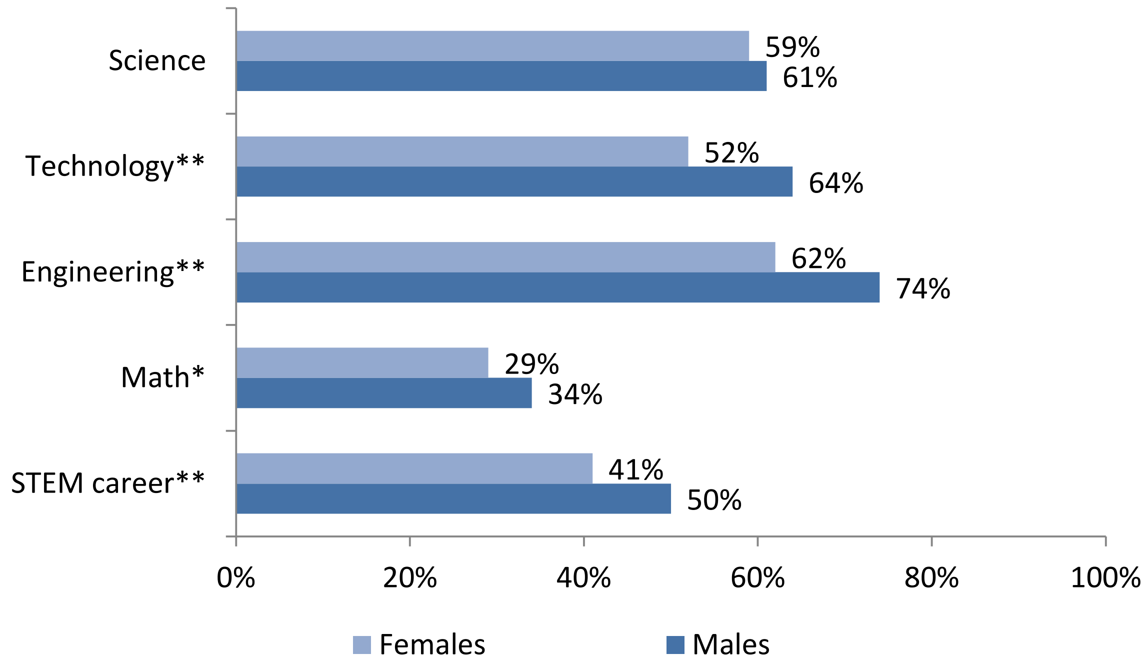
Like middle school students, the differences in interest between males and females in grades 9-12 were significant in each STEM topics except for science (Figure 40). The difference between males and females in any individual STEM topic or career was largest among high school students, suggesting differences in interest level widen as students get older.

Figure 38. Percent of males and females in grades 3-5 that were “more interested” in STEM subjects or careers after participating in the Scale-Up program



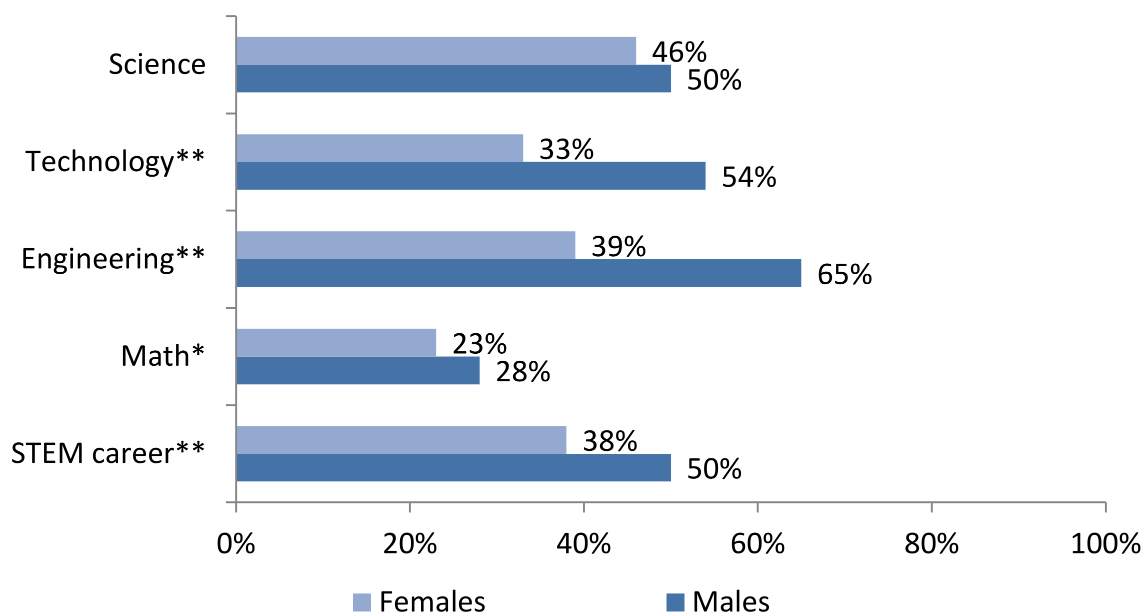
* p<0.05
Source: Regional Scale-Up Program, Student Survey

Figure 39. Percent of males and females in grades 6-8 who were “more interested” in STEM subjects or careers after participating in the Scale-Up program.



* p<0.05; ** p<0.001
Source: Regional Scale-Up Program, Student Survey

Figure 40. Percent of males and females in grades 9-12 who were “more interested” in STEM subjects or careers after participating in the Scale-Up program



* p<0.05; ** p<0.001
Source: Regional Scale-Up Program, Student Survey

Student Interest in STEM by Scale-Up Program

Among the Scale-Up Programs implemented in 2012-2013, all of the selected programs had a positive effect on student interest and awareness in STEM topics and STEM careers. Following Scale-Up program participation, over 60% of Scale-Up student participants said they were *more interested* in the STEM topics of science, technology, and engineering, respectively (Table 23). The following table shows the percent of students who said they were *more interested* in STEM subjects or careers by Scale-Up program. Program-level percentages that are greater than the total group percentage are highlighted in green. Program-level percentages near the group total percentages are highlighted in orange. Note that Scale-Up programs vary in their emphasis across individual STEM topics with some programs focusing on all 4 individual STEM topics and/or careers, where other programs might have only one or two areas of focus. This may affect how students rate their interest level across different STEM topics following program participation.

Table 23. Percent of Scale-Up participants "more interested" in STEM topics and careers after Scale-Up participation by program

	S	T	E	M	Careers
Total (n)	**60%**	**60%**	**67%**	**39%**	**50%**
A World in Motion (2,821)	62%	58%	66%	44%	49%
Corridor STEM Initiative (1,411)	68%	67%	72%	47%	51%
KidWind (1,149)	59%	50%	63%	33%	46%
FIRST Lego League (987)	65%	73%	78%	39%	59%
FREE (497)	48%	38%	49%	22%	34%
FIRST Tech Challenge (406)	49%	74%	77%	28%	63%
HyperStream (176)	47%	72%	65%	28%	46%
Project HOPE (118)	37%	32%	33%	25%	42%
State Science + Tech Fair (84)	41%	45%	50%	18%	32%
PEERS (62)	60%	58%	59%	27%	64%

Summary & Conclusions

This report presented the first year of data compilation and synthesis of the ISMP. A wide variety of data sources and measures were systematically reviewed to get a better understanding of STEM in Iowa from educational and workforce development perspectives. A number of ISMP processes and methods were developed and implemented during the first year. These processes allowed for a broad view of STEM in Iowa. Subsequent years of the ISMP will build upon this broad view by identifying the most effective and efficient ways of tracking STEM education and workforce development. The baseline assessment presented here provides an important first step in identifying valuable sources of data and collectively observing changes in measures and indicators

In the course of implementing the ISMP, several important process-oriented lessons were learned. Specifically, three themes emerged as best practices to ensure efficient and effective momentum.

Collaboration is necessary, and coordinated collaboration is best

When the ISMP was developed, several highly qualified and competent organizations pooled their tangible and intangible resources for a common goal. Each organization brought a unique specialty and skill set to the project and enhanced the group's ability to think creatively about ways to systematically track and monitor STEM in Iowa. An important component of this collaboration was that it occurred in a coordinated way with one organization and individual serving as the primary liaison between the Iowa STEM Advisory Council and the ISMP partners. Having a designated liaison improved the flow of communication between the Council and ISMP and among the partners involved.

Alignment of evaluation methodologies with state priorities is key

The Iowa STEM Advisory Council identified several targeted priorities on which to focus. Throughout the ISMP development process, the partners worked to clearly align the methods and data collection instruments with the priorities and goals of the Council activities. Without such an alignment, none of the ISMP data would be relevant or useful.

Start small, then add components

During the initial development of the ISMP, the partners included a much wider array of evaluation methodologies in the project implementation plan. However, due to budget constraints, the plan was scaled back considerably to include the four components described above. Limiting the scope of the ISMP proved to be an advantage to the partners and to stakeholders. We were able to devote the necessary time and consideration to planning and initiating activities. This would not have been possible with a larger scope of work. After one full year with the ISMP in place, several methods (such as the Regional Scale-Up Program data collection) have been implemented, refined based on process evaluation, and initiated as systematic and routine components. In the future, additional methods such as case studies, qualitative data collection, targeted quantitative data collection, social network analysis, or asset mapping may be possible.

Results indicate that math and science achievement (as measured by state and national standardized tests and the ACT) has not changed markedly in the last five years and disparities in math and science achievement have persisted over time. A smaller proportion of underrepresented minority students, those eligible for free/reduced lunch, and students with disabilities are proficient in math and science. National percentile ranks of the Iowa Assessments math and science achievement scores are higher among students participating in Scale-Up programs than among statewide test-takers. 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. Among Scale-Up participants, gender differences in STEM interest are most pronounced in high school and least pronounced in elementary school, suggesting these differences widen over time.

Nearly 10,000 post-secondary degrees (n=9,680) were awarded in STEM-related fields in 2011-2012 from Iowa's 4-year public and private colleges and universities, and 15 community colleges. Efforts to increase post-secondary degrees in STEM-related fields will help fill the estimated 10,000 vacancies in STEM jobs statewide (2011-2012).

The number of Iowa teachers with an endorsement to teach a science subject has decreased 8% in the past five years. The number of Iowa teachers with an endorsement to teach math has remained steady in the past five years. (2008/09-2012/13). GIS mapping shows there is an uneven distribution of teachers with math and science endorsements between urban and rural areas of the state. This may help explain some of the findings of the public awareness survey about urban and rural differences in parent perceptions of how well their child is being prepared in STEM subjects.

The public awareness survey found that while only 26% of Iowans have heard of STEM, 65% of Iowans have heard about improving science, technology, engineering, and math education. So, "brand awareness" of the STEM acronym may be low, but a majority of Iowans are aware of efforts to improve education in math, science, technology and engineering. Among parents of a school-aged child, almost all agree it is very important that their child does well in elementary math and science and has some advanced skills in high school STEM subjects. However, the percent of parents who believe their child is being very well-prepared in STEM subjects varies by where they live, from 37% in rural locations to 62% of parents who live in a city. By focusing on STEM education and economic development, 97% of Iowans agree it will give more opportunities to the next generation, 86% agree it will improve the state economy, and 76% agree it will attract companies to move or expand in Iowa.

Among the 12 Regional Scale-Up Programs in STEM education in 2012-2013, all of the selected programs had positive effects on student interest and awareness in STEM topics and STEM careers. Eighty-nine percent of students reported they were more interested in at least one STEM subject after participating in one of the STEM education programs. After participating in programs, 90% of students said they were "More Interested" (50%) or "Just as Interested" (40%) in pursuing a STEM job which is particularly encouraging considering that without intervention, interest in STEM subjects steadily declines across the grades from elementary school through high school. Finally, among educators involved in the STEM education programs, 84% reported increased student interest and awareness of STEM subjects, and more than 50% reported increased student interest and awareness in STEM careers.

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. The purpose of this first report is to present a baseline assessment of STEM education and workforce development centered on the activities of the Iowa Governor's STEM Advisory Council. Future monitoring activities will work to refine ISMP measures, indicators, and data collection/compilation systems and to strengthen relationships with data partners in the state.

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List of Appendices

Appendix A: 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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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).

K12 STEM	Course Description	SCED Course Titles	Definition
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.
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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).

K12 STEM	Course Description	SCED Course Titles	Definition
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.
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.

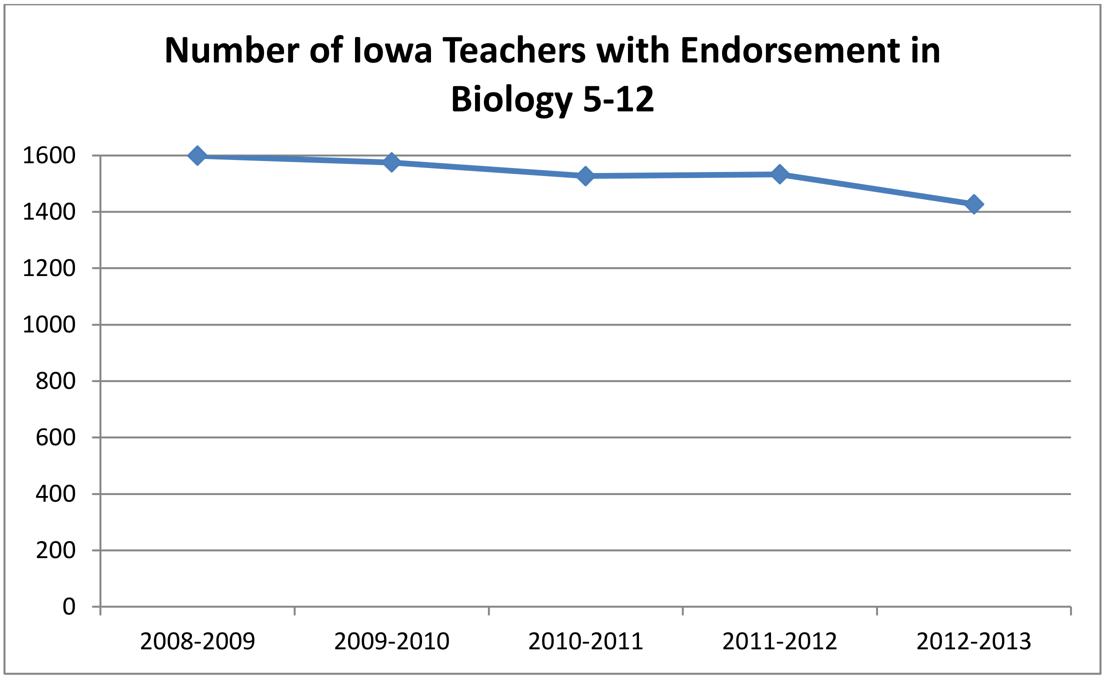
K12 STEM	Course Description	SCED Course Titles	Definition
Engineering	21002	Engineering Applications	Engineering Applications courses provide students with an overview of the practical uses of a variety of engineering applications. Topics covered usually include hydraulics, pneumatics, computer interfacing, 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.
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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.

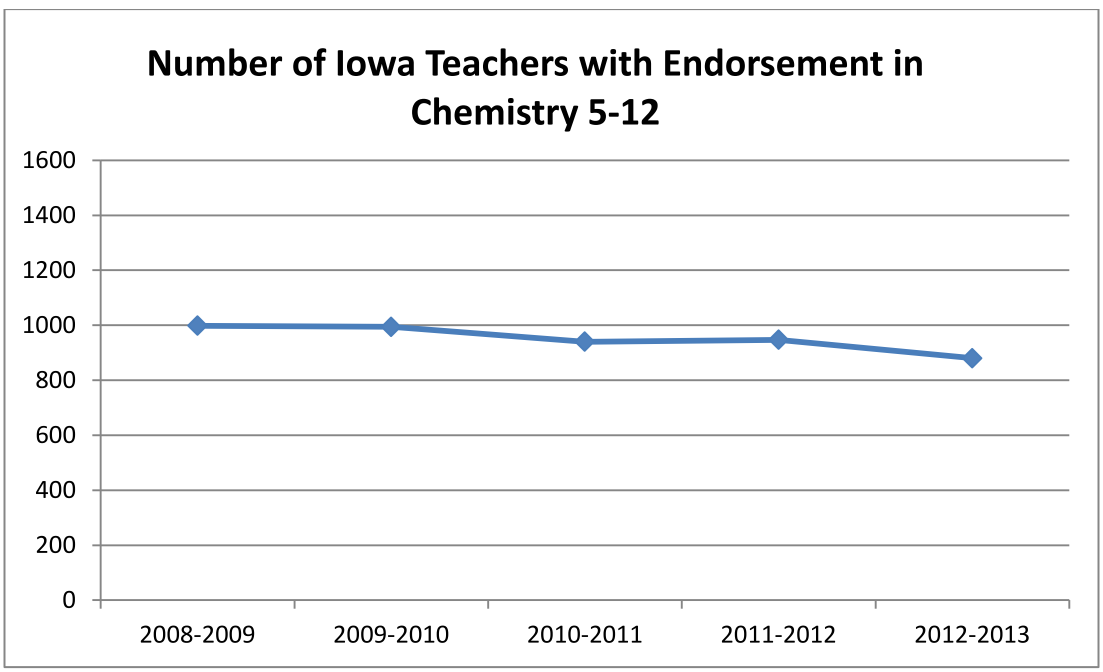
K12 STEM	Course Description	SCED Course Titles	Definition
Engineering	21014	Biotechnical Engineering	Biotechnical Engineering courses enable students to develop and expand their knowledge and skills in biology, physics, technology, and mathematics. Course content may vary widely, drawing upon diverse 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 includes 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.

K12 STEM	Course Description	SCED Course Titles	Definition
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.

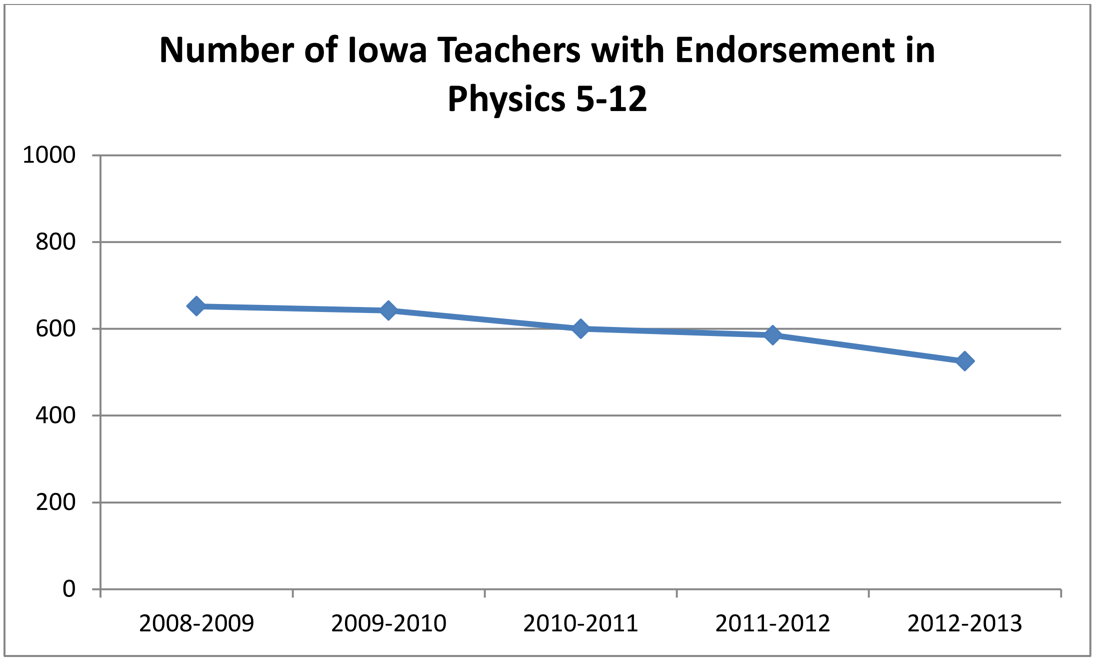
Appendix B: Indicator 10_Additional representations of STEM-related Endorsements



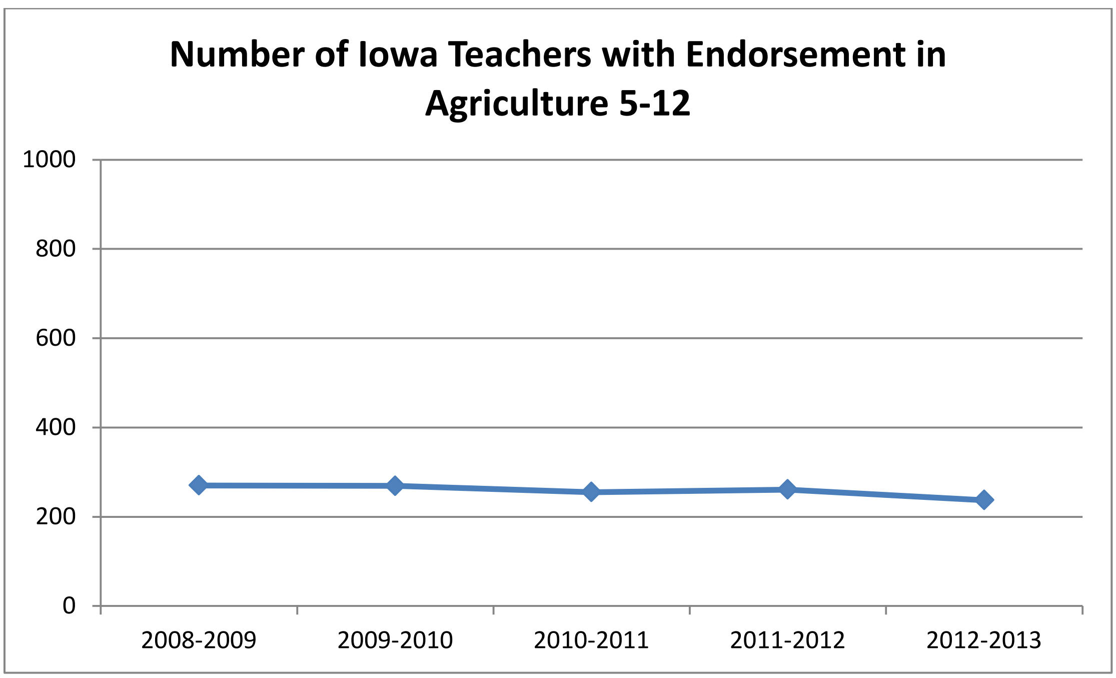
Source: Iowa Department of Education, February 2013



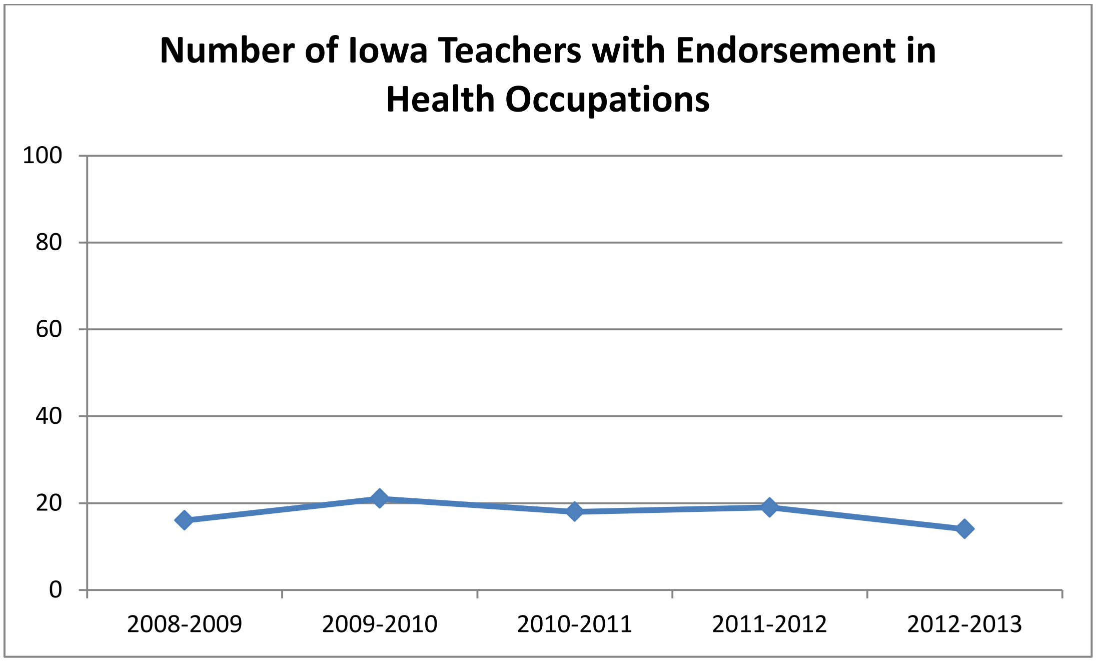
Source: Iowa Department of Education, February 2013



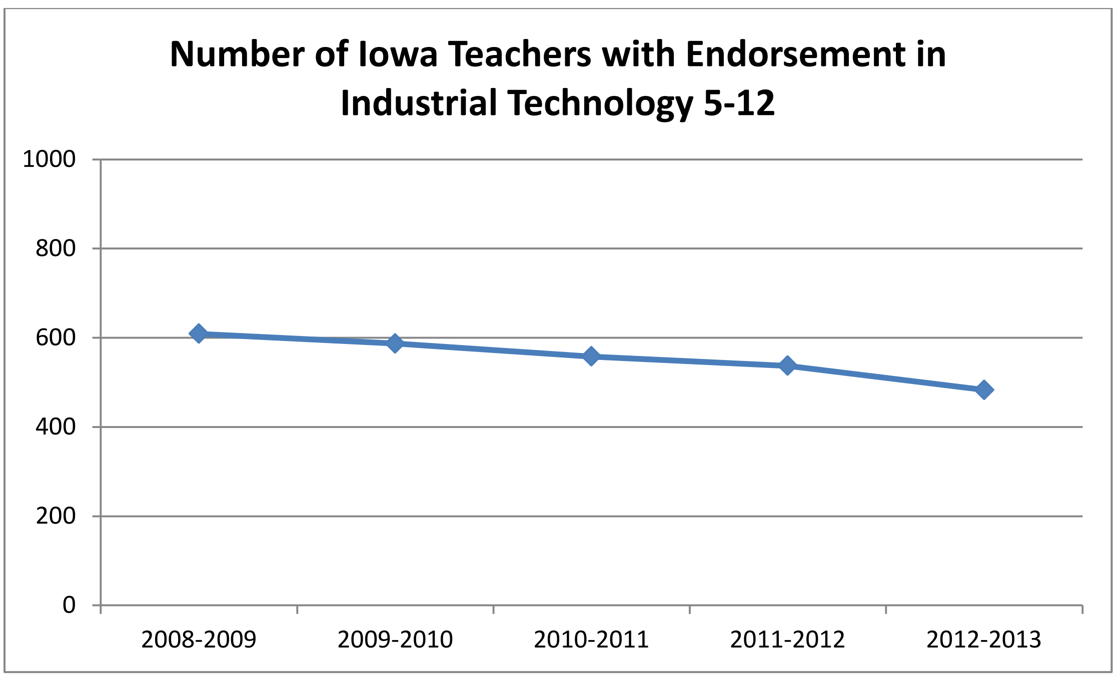
Source: Iowa Department of Education, February 2013



Source: Iowa Department of Education, February 2013



Source: Iowa Department of Education, February 2013



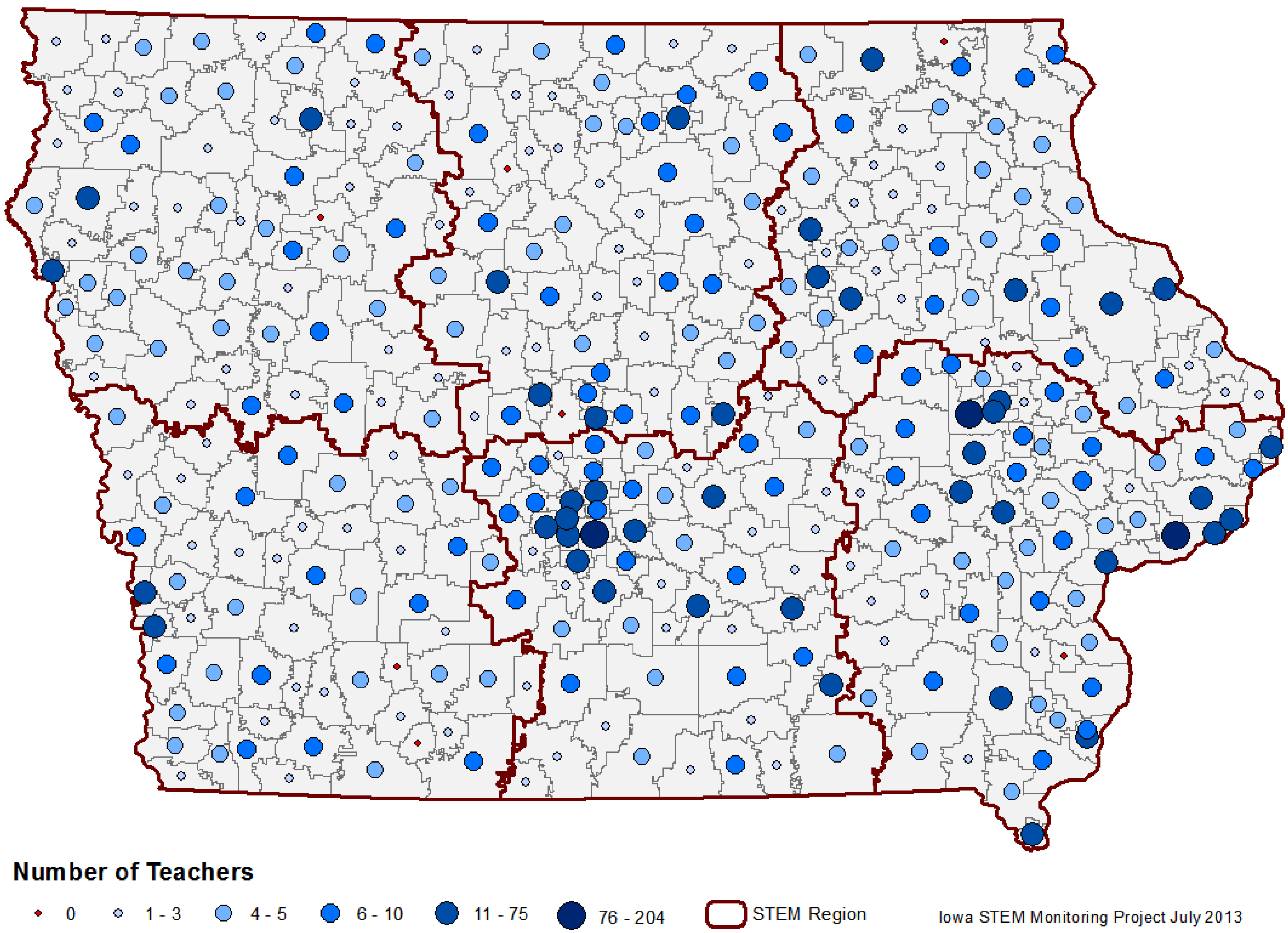
Source: Iowa Department of Education, February 2013

Appendix C: GIS Maps of Selected Teacher Endorsement Data by School District and STEM Hub Region

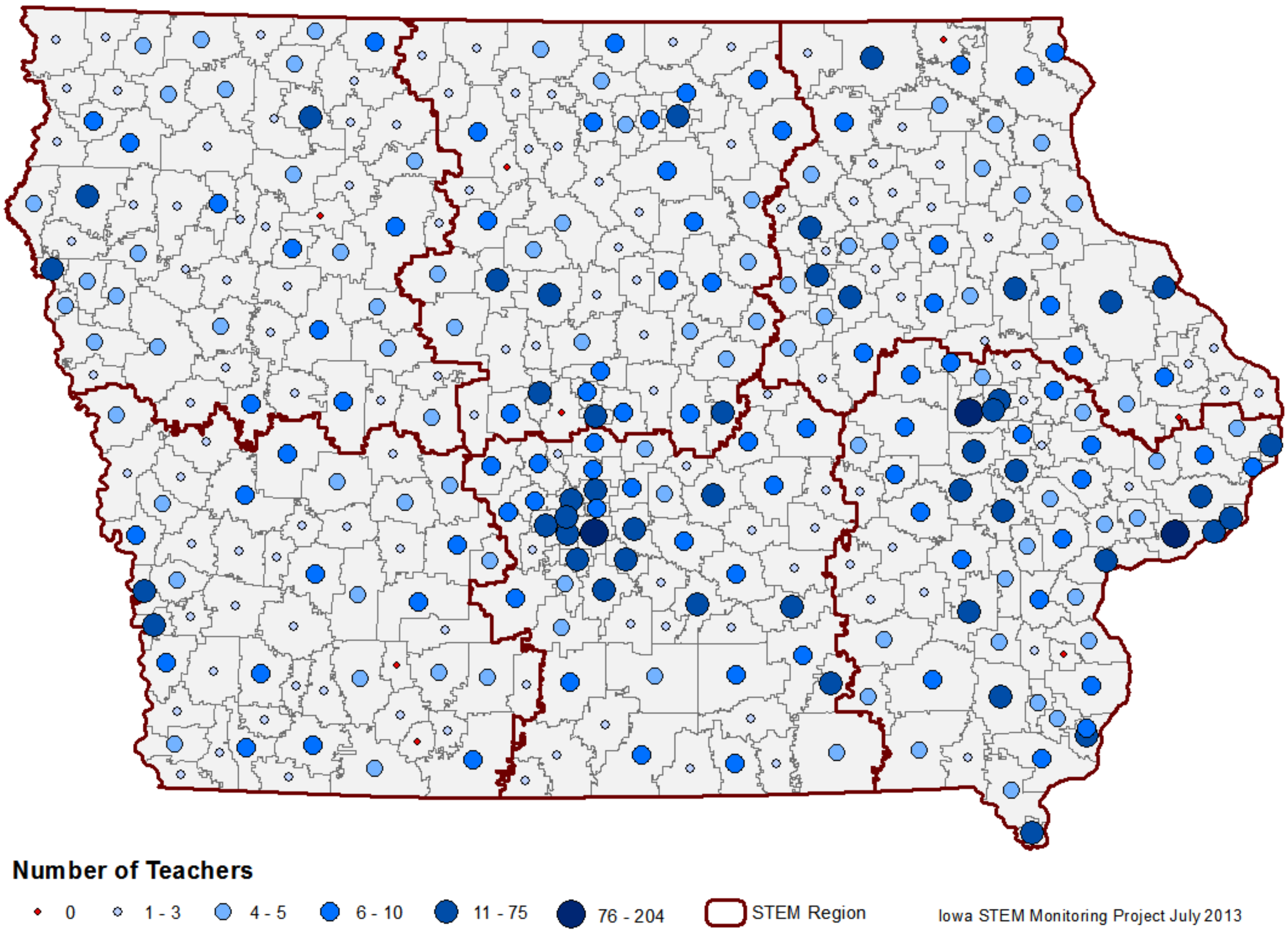
Indicator 10

Distribution of Iowa Teachers by District with Endorsements in Math or Science, 2008-2013

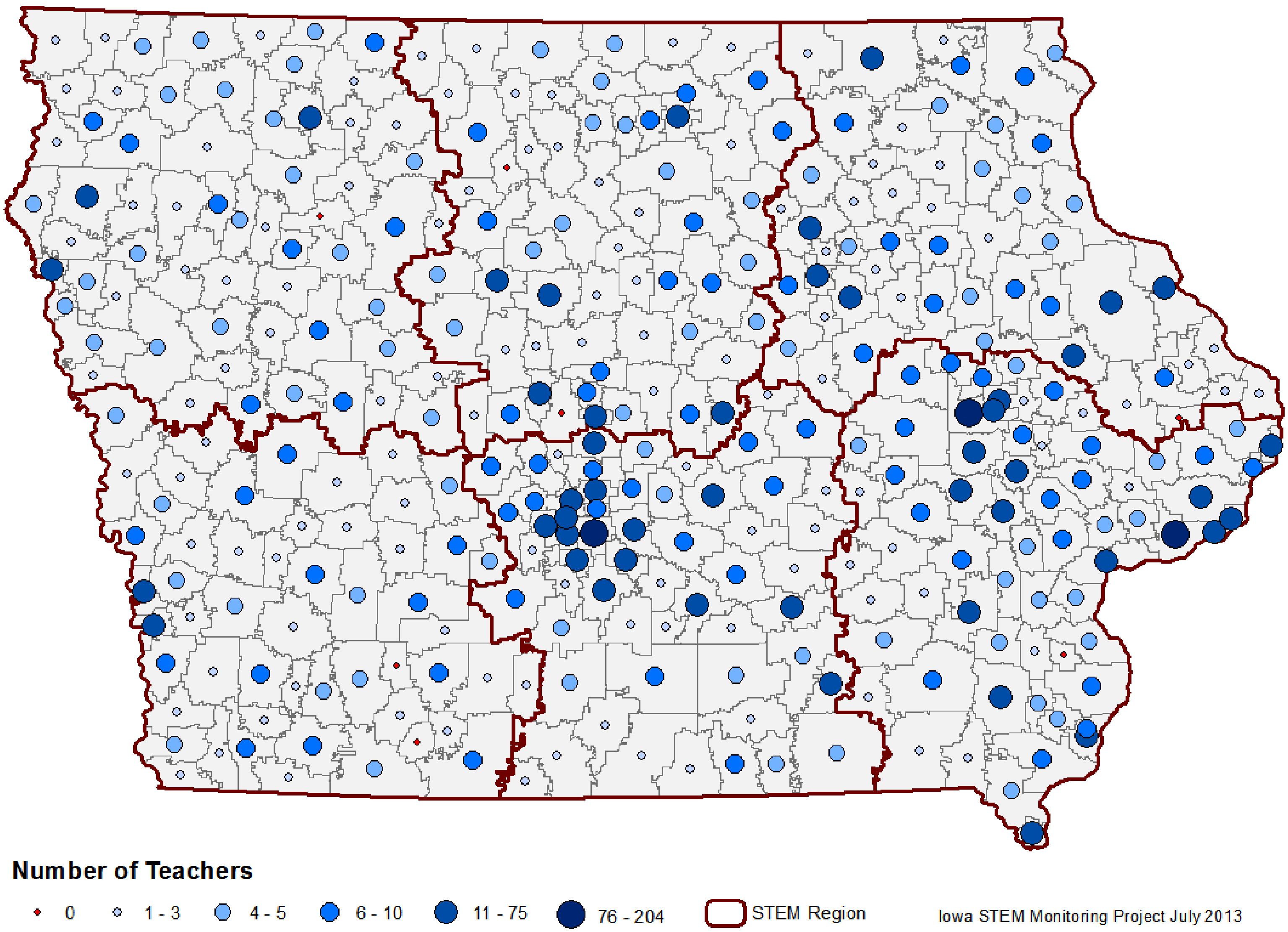
Iowa Teachers by District with Endorsements in Math 2008-09



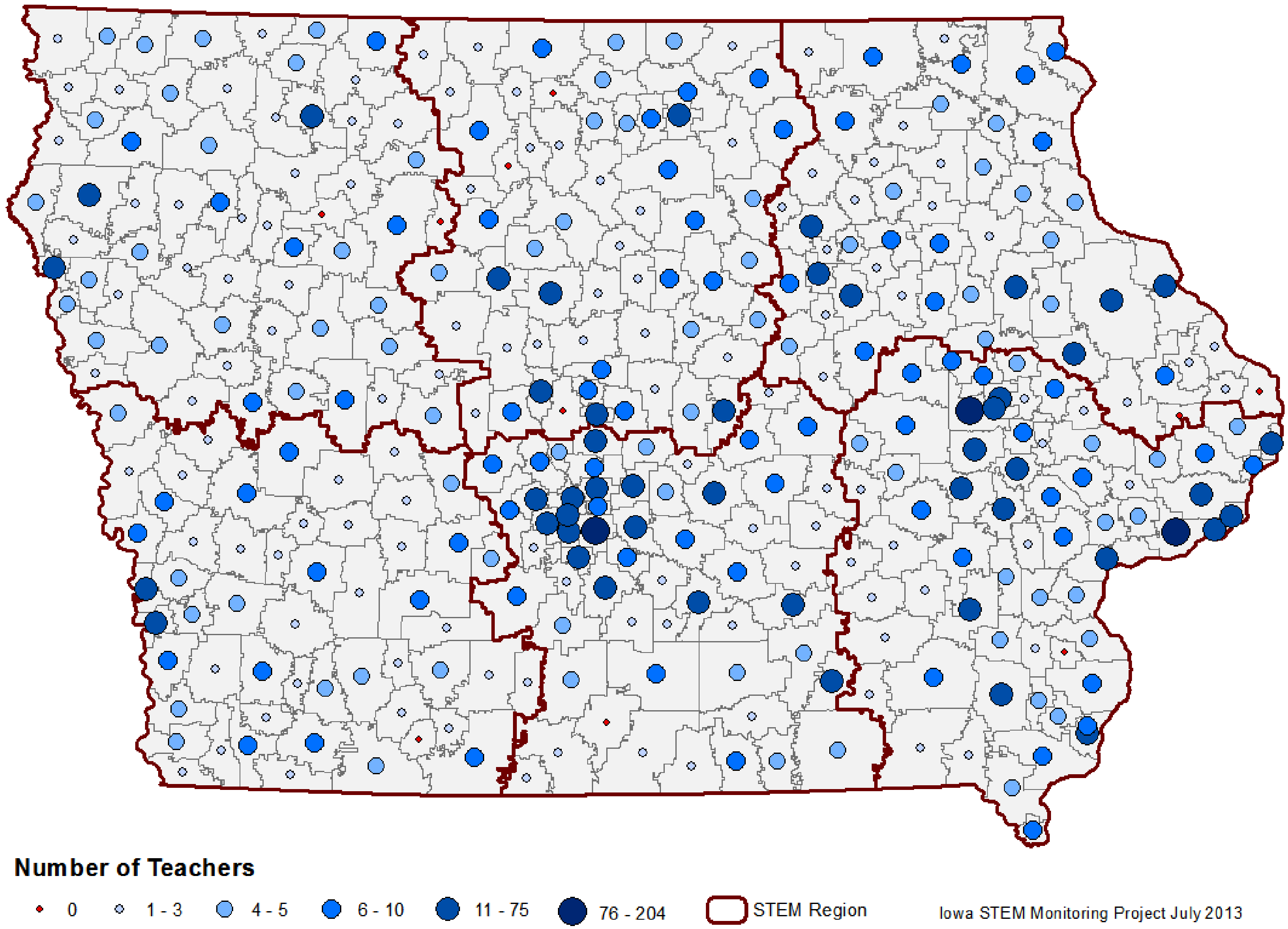
Iowa Teachers by District with Endorsements in Math 2009-10



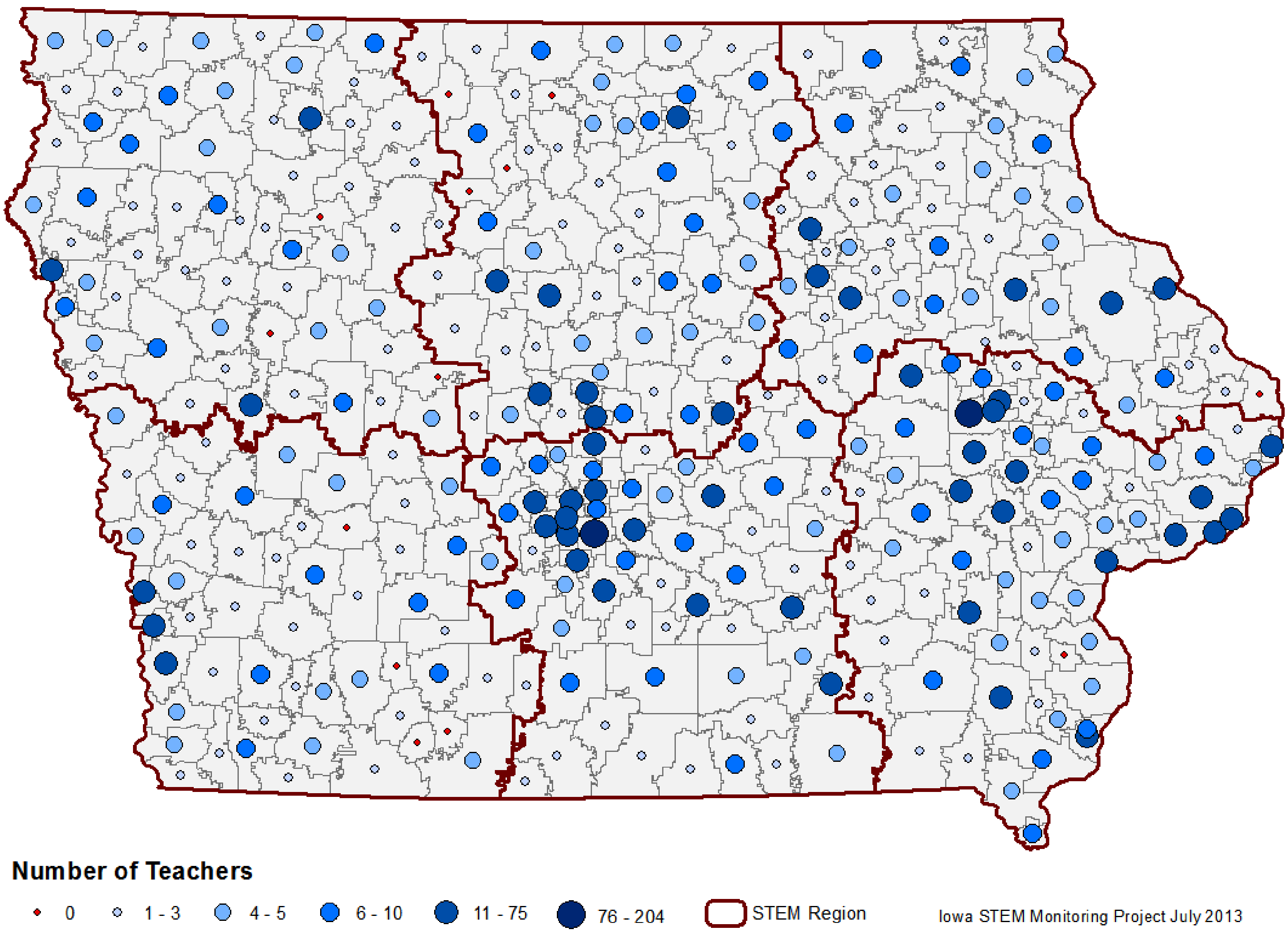
Iowa Teachers by District with Endorsements in Math 2010-11



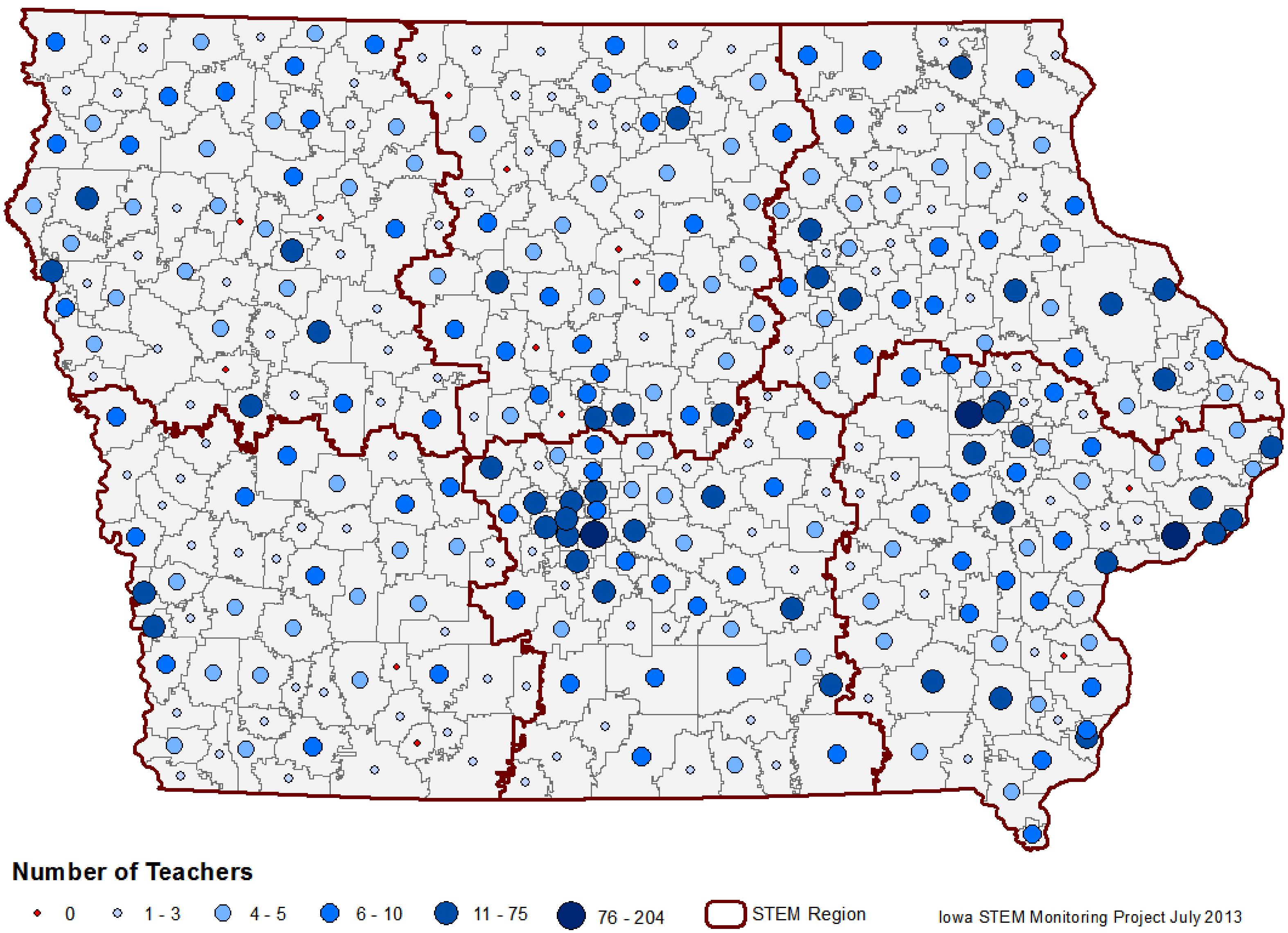
Iowa Teachers by District with Endorsements in Math 2011-12



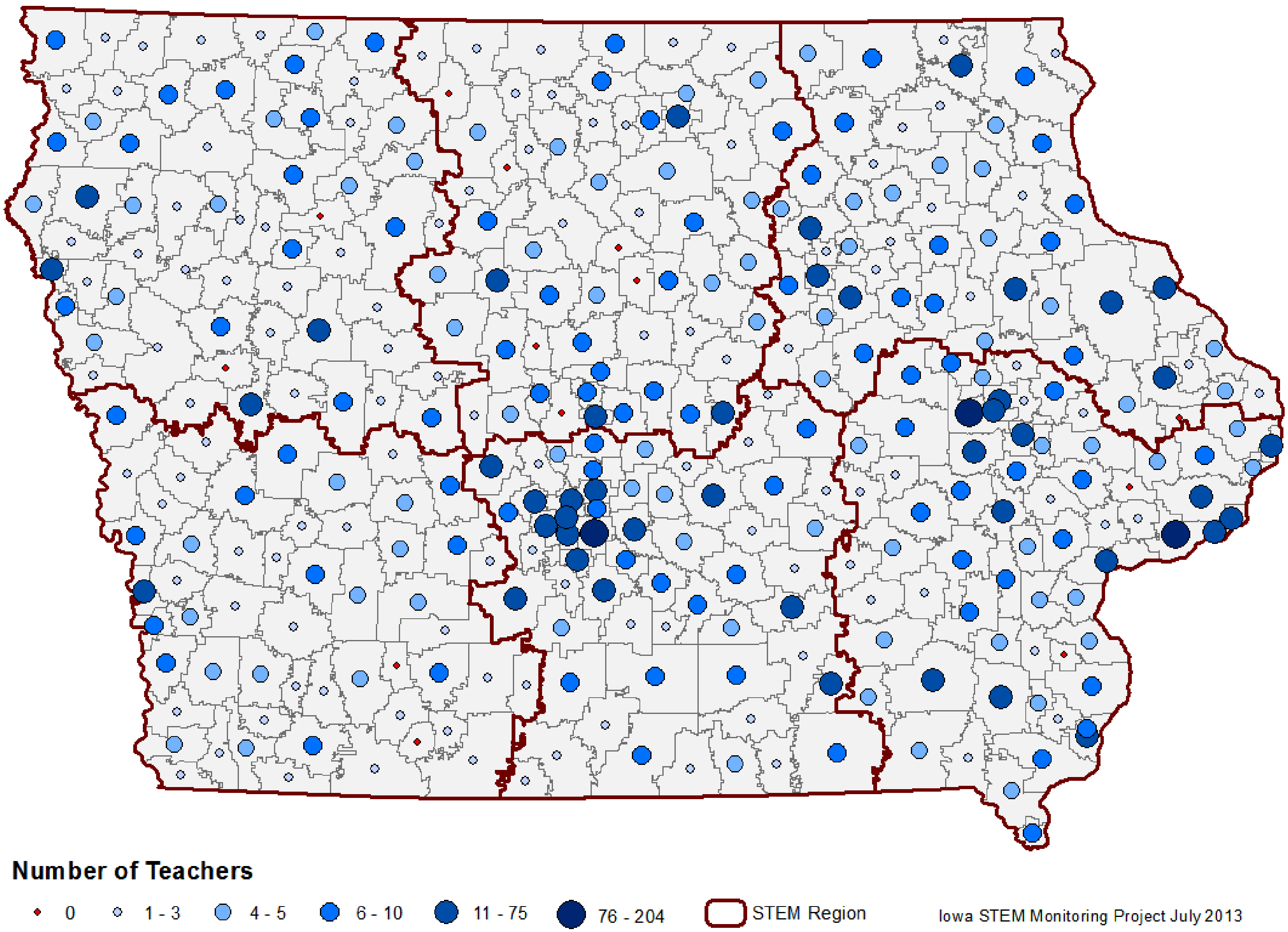
Iowa Teachers by District with Endorsements in Math 2012-13



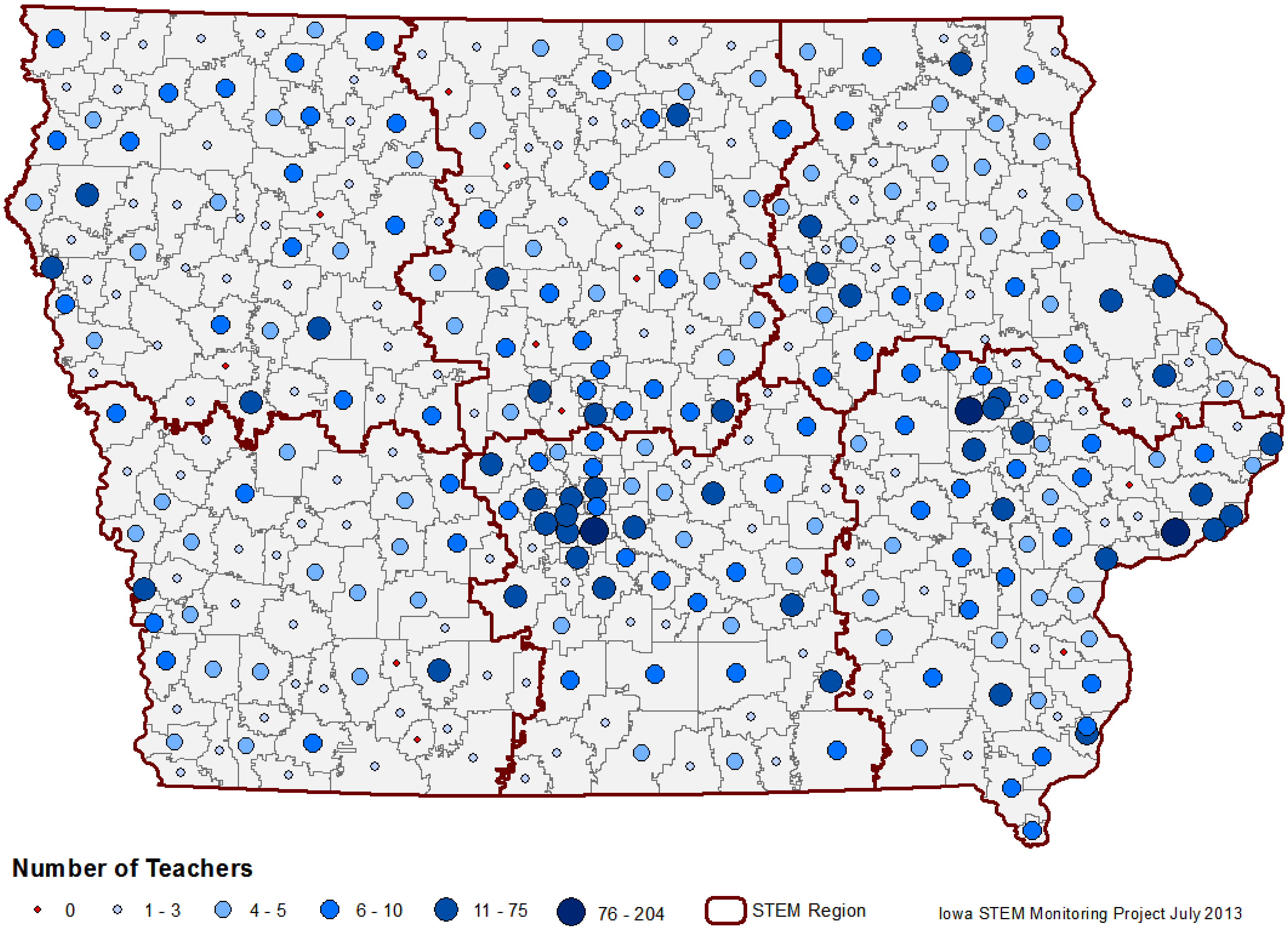
Iowa Teachers by District with Endorsements in Science 2008-09



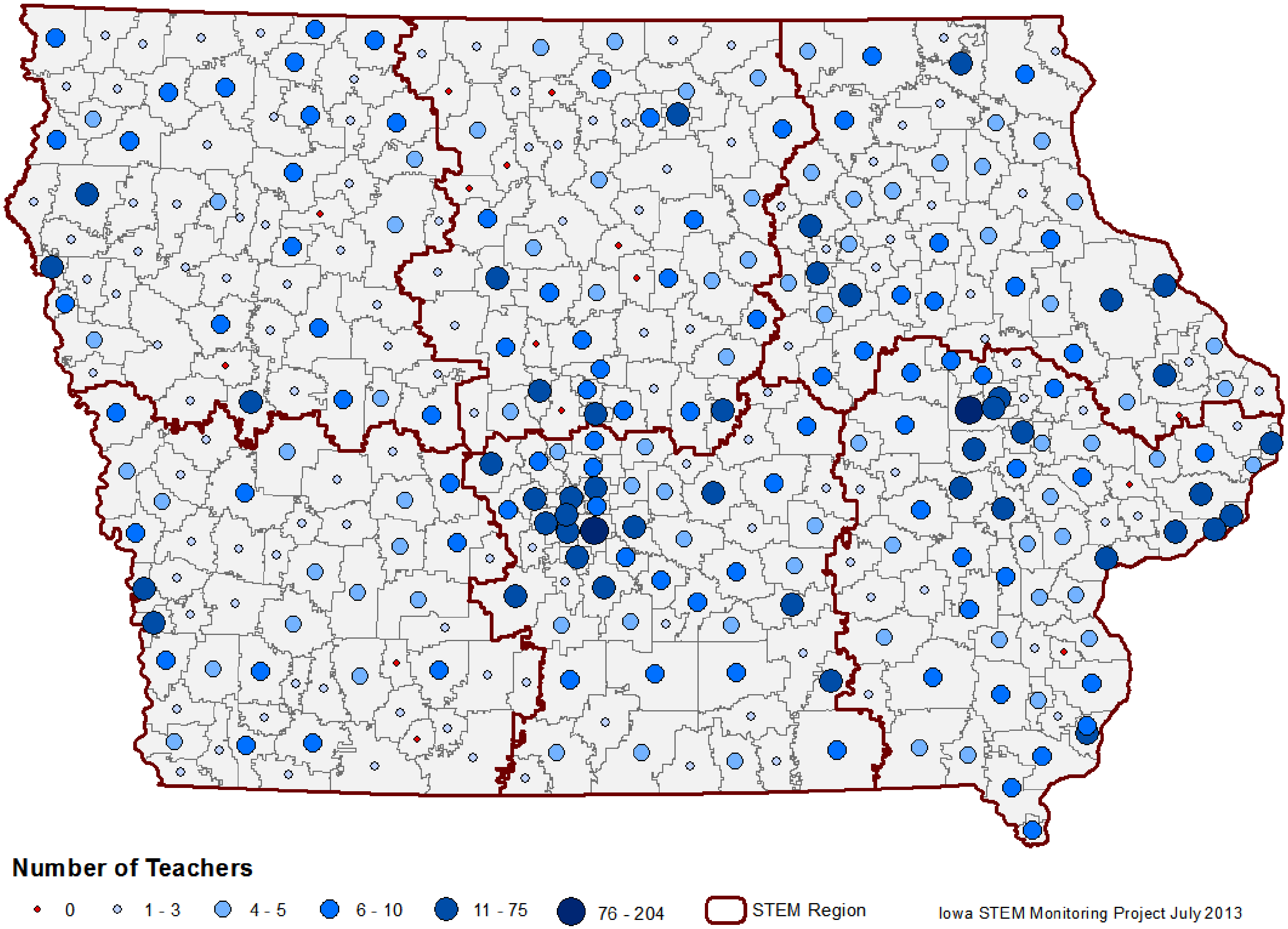
Iowa Teachers by District with Endorsements in Science 2009-10



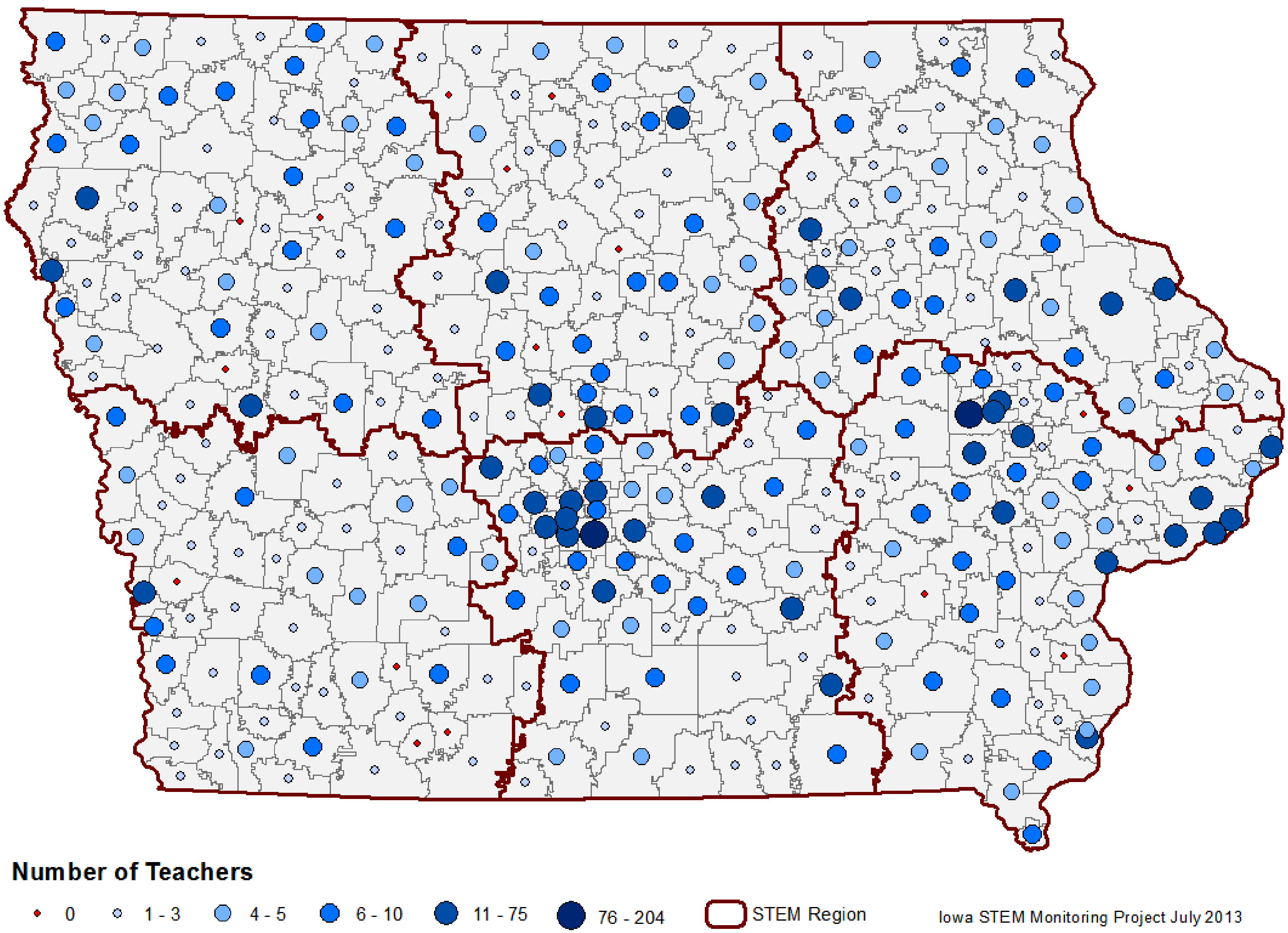
Iowa Teachers by District with Endorsements in Science 2010-11



Iowa Teachers by District with Endorsements in Science 2011-12



Iowa Teachers by District with Endorsements in Science 2012-13



Appendix D: Indicators 14 & 15_Technical Notes

Associate's degrees		
Included	Not Included	
• Northeast Iowa CC • North Iowa Area CC • Iowa Lakes CC • Northwest Iowa CC • Iowa Central CC • Iowa Valley CC • Hawkeye CC • Eastern Iowa CC • Kirkwood CC • Des Moines Area CC • Western Iowa Tech CC • Iowa Western CC • Southwestern CC • Indian Hills CC • Southeastern CC	• AIB College of Business • Allen College • Ashford University • Briar Cliff University • Brown Mackie College – Quad Cities • Clarke University • Divine Word College • Dordt College • Emmaus Bible College • Faith Baptist Bible College and Theological Seminary • Grand View University • Hamilton Technical College • ITT Technical Institute – Cedar Rapids, Clive	• Kaplan University – Cedar Falls, Cedar Rapids, Council Bluffs, Davenport, Des Moines, Mason City • Loras College • Mercy College of Health Sciences • Palmer College of Chiropractic – Davenport • St. Luke's College • Upper Iowa University • Vatterott College – Des Moines • Waldorf College • William Penn University
Bachelor's, Master's, and Doctorate degrees*		
Included	Not Included	
• Buena Vista University • Cornell University • Drake University • Grinnell University • Iowa State University • Luther College • Saint Ambrose University • Simpson College • University of Iowa • University of Northern Iowa • Upper Iowa University • Wartburg College	• AIB College of Business • Allen College • Ashford University • Briar Cliff University • Central College • Clarke University • Coe College • Des Moines University - Osteopathic Medical Center • Divine Word College • Dordt College • Emmaus Bible College • Faith Baptist Bible College and Theological Seminary • Graceland University - Lamoni • Grand View University • Hamilton Technical College • Iowa Wesleyan • ITT Technical Institute - Cedar Rapids, Clive	• Kaplan University (Cedar Falls, Cedar Rapids, Council Bluffs, Davenport, Des Moines, Mason City) • Loras College • Maharishi University of Management • Mercy College of Health Sciences • Morningside College • Mount Mercy University • Northwestern College • Palmer College of Chiropractic - Davenport • Shiloh University • University of Dubuque • University of Phoenix - Des Moines • Waldorf College • Wartburg Theological Seminary • William Penn University

*Note: Inclusion/exclusion criteria was based on population size of student enrollment and for-profit status.

Appendix E: Statewide Survey of Public Attitudes_Questionnaire

INTRODUCTION
HELLO, my name is [YOUR NAME] and I am calling from the University of Northern Iowa. This is not a political call and we are not asking for money. Researchers here have been contracted by the state of Iowa to conduct a scientific study of 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
Your phone number has been chosen randomly, and I would like to ask some questions about math and science education in Iowa. We are interested in your views, regardless of how much you might know about the topic. Participation is voluntary and your responses are anonymous. For most people the interview takes about 10 to 15 minutes. I can provide the name and telephone number of the project manager 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 in the past month.

   a. Traffic safety
   b. The Iowa economy
   c. Foreign policy
   d. Agriculture
   e. K-12 education
   f. Environmental pollution

   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 in the past month.

   a. Improving the reading scores of K-12 students
   b. Requiring high school students to pass more rigorous tests before graduating
   c. Increasing foreign language requirements
   d. Improving math, science, technology, and engineering education
   e. Maintaining local control of education policies
   f. Having tougher evaluation standards for teachers' performance

   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 each of the following in the past 12 months?

   a. An art museum?
   b. A natural history museum?
   c. A zoo or aquarium?
   d. A science or technology museum?
   e. A public library?
   f. A K-12 school?

   1 Yes
   2 No
   7 Don't know/Not sure
   9 Refused

4. Have you heard of the abbreviation "STEM" which stands for "science, technology, engineering, and mathematics"?

   1 Yes
   2 No
   7 Don't know/Not sure
   9 Refused

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

5. I'm going to ask you questions about science, technology, engineering, and math. I will often refer to these using the abbreviation "STEM." Please tell me how strongly you agree or disagree with each of the following statements.

   a. Science and technology are making our lives better.
   b. We depend too much on science and not enough on faith or religion.
   c. People would do better by living a simpler life without so much technology
   d. Many more companies would move or expand to Iowa if the state had a reputation for workers with great science and math skills.
   e. People who work in science, technology, engineering, and math jobs don't have as much fun as people who work in other jobs.
   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. There are not enough women working in science, technology, engineering and math careers.
   k. There should be more attention paid to increasing the number of Hispanics and African Americans working in STEM careers.

   Do you…
   1 Strongly agree,
   2 Agree,
   3 Agree/disagree, middle
   4 Disagree, or
   5 Strongly disagree?
   7 Don't know/No opinion
   9 Refused

6. As far as you know, compared to other states, where do you think Iowa ranks in students' standardized **math** scores?

   Would you say…
   1 Iowa is in the top third,
   2 Iowa is near the middle, or
   3 Iowa is in the bottom third?
   7 Don't know/Not sure / 9 Refused

7. As far as you know, compared to other states, where do you think Iowa ranks in students' standardized **science** scores? Would you say…

   1 Iowa is in the top third,
   2 Iowa is near the middle, or
   3 Iowa is in the bottom third?
   7 Don't know/Not sure
   9 Refused

8. As far as you know, are there more than enough, not enough, or just the right number of skilled workers in Iowa to fill the available jobs in STEM areas?
Would you say there are…

1 More than enough workers to fill the jobs,
2 Not enough workers to fill the jobs, or
3 Just the right number of workers to fill the jobs?
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? **[RANDOMIZE LIST]**

a. Mathematics
b. Science
c. Civics, history, and social studies
d. English
e. Engineering
f. Technology
g. Foreign languages
h. Art
i. Music

Would you say…
1 Excellent,
2 Good,
3 Fair, or
4 Poor?
7 Don't know/Not sure / 9 Refused

10. Do you think each of the following topics is absolutely essential, important but not essential or not important for all students to learn before graduating from high school?

a. Basic math skills
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 and skills

Would you say…
1 Absolutely essential,
2 Important but not essential, or
3 Not important?
7 Don't know/Not sure
9 Refused

11. Please tell me if the following three statements might explain why some students may do poorly in math and science. Just answer yes or no for each one.

a There are not enough really good math and science teachers.
b Students think the subject is not relevant to their lives.
c Students think math and science are too hard to learn.

1 Yes
2 No
7 Don't know/Not sure
9 Refused

12. I'm going to read some statements about STEM education. Please tell me how strongly you agree or disagree with each one.

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.

Do you…
1 Strongly agree,
2 Agree,
3 Agree/disagree, middle
4 Disagree, or
5 Strongly disagree?
7 Don't know/No opinion
9 Refused

13. Please tell me how much each of the following strategies would improve math and science education. Suppose…

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.
g. Teachers were required to enroll in professional development programs.
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.

Would that make a…

1 Major improvement,
2 Moderate improvement, or
3 Little or no improvement?
7 Don't know/Not sure
9 Refused

SECTION 4: Child selection

14. How many children, if any, aged…

a. 0-3 live in your household?
b. 4-11 live in your household?
c. 12-19 live in your household?

[ ] = number of children
99 Refused [SKIP TO Q34]

If 14b AND 14c = 0, go to Q34
If 14b + 14c = 1, go to Q15
If 14b + 14c > 1, go to Q16

15. What is the age and gender of the child in your home?

[ ] **[SKIP TO Q17]**

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 ages of 4 to 19 in your household, starting with the youngest.
[Allow respondent to identify up to 11 children]

[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]**

11.	Mother (birth/adoptive)	20.	Grandfather
12.	Father (birth/adoptive)	21.	Aunt
13.	Step-mother	22.	Uncle
14.	Step-father	23.	Cousin
15.	Foster mother	24.	Other relative
16.	Foster father	25.	Non-relative guardian
17.	Brother	26.	Roommate, husband, wife, boy/girlfriend
18.	Sister	27.	Other **[SPECIFY]**
19.	Grandmother	99.	REFUSED

IF Q17a = 11-16 or 25, SKIP TO Q18a
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 Q34]**
8 Respondent is the child **[SKIP TO Q34]**
7 Don't know/Not sure **[SKIP TO Q34]**
9 Refused **[SKIP TO Q34]**

SECTION 5: Parent module

IF CHILD IS AGE 7 OR OLDER, SKIP TO 18b

18a. Has this child started pre-school or school?

1 Yes
2 No **[SKIP TO Q34]**
7 Don't know/Not sure **[SKIP TO Q34]**
9 Refused **[SKIP TO Q34]**

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 Q34]**
7 Don't know/Not sure
9 Refused

19. Is this child in a TAG, or talented and gifted program?

1 Yes
2 No
7 Don't know/Not sure
9 Refused

20. Does this child have an IEP, or individualized education plan?

1 Yes
2 No
7 Don't know/Not sure
9 Refused

21. In general, how much interest does this child show in science, technology, engineering, and math topics? Would you say…

1 A lot of interest,
2 Some interest, or
3 Little or no interest?
7 Don't know/Not sure
9 Refused

22. How well is this child doing in these subjects? Would you say…

1 Very well,
2 Ok, or
3 Not very well?
7 Don't know/Not sure
9 Refused

23. How well is this child being prepared in these subjects by the school he or she attends? Would you say…

1 Very well-prepared,
2 Somewhat prepared, or
3 Not well-prepared?
7 Don't know/Not sure
9 Refused

If child is ages 4-11, skip to Q26

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 Work, or
6 Something else [Specify:]?
7 Don't know/Not sure
9 Refused

25. Do you think your child will pursue a career in a field related to science, technology, engineering, or math?

1 Yes
2 No
7 Don't know/Not sure 9 Refused

26. Considering future job prospects and this child's interest and abilities, would you encourage or discourage your child if they wanted to pursue a STEM career?

1 Encourage
2 Discourage
7 Don't know/Not sure
9 Refused

If child is ages 12-19, skip to Q29

27. Keeping in mind there is a limited amount of time in the school day, do you think elementary schools should increase, decrease, or keep the same, the amount of time spent on…? **[RANDOMIZE LIST]**

a. Computer and technology skills
b. Reading and writing skills
c. Hands-on science activities and other science knowledge
d. Handwriting and penmanship
e. Learning how to cooperate, share and work with other classmates
f. General math concepts such as estimation and word problems
g. Basic math such as multiplication and long division
h. Physical education
i. Social studies and geography
j. Art, music, and drama

Would you say…
1 Increase,
2 Decrease, or
3 Keep the same?
7 Don't know/Not sure
9 Refused

28. Please tell me how strongly you agree or disagree with each of the following statements.

a. It is very important to me that this child does well in math.
b. It is very important to me that this child does well in science.
c. It is very important to me that this child has some technology skills.
d. It is very important to me that this child has some exposure to engineering concepts.

Do you…
1 Strongly agree,
2 Agree,
3 Agree/disagree, middle
4 Disagree, or
5 Strongly disagree?
7 Don't know/No opinion
9 Refused

If child is ages 4-11, skip to Q 31

29. Keeping in mind there is a limited amount of time in the school day, do you think middle schools and high schools should increase, decrease, or keep the same, the amount of time spent on…? **[RANDOMIZE LIST]**

a. Computer science/programming
b. Practical math skills such as balancing a checkbook
c. Learning how to work well as part of a team
d. Basic reading and writing skills
e. Basic engineering principles
f. Basic scientific ideas and principles
g. Statistics and probability
h. Concepts taught in algebra
i. Foreign language
j. Civics and social studies
k. Advanced sciences such as physics
l. Advanced math such as calculus
m. Art, music, and drama
n. Physical education

Would you say…
1 Increase,
2 Decrease, or
3 Keep the same?
7 Don't know/Not sure
9 Refused

30. Please tell me how strongly you agree or disagree with each of the following statements.

a. It is very important to me that this child has some advanced math skills.
b. It is very important to me that this child has some advanced science skills.
c. It is very important to me that this child has some advanced technology skills.
d. It is very important to me that this child has some exposure to advanced engineering concepts.

Do you…
1 Strongly agree,
2 Agree,
3 Agree/disagree, middle
4 Disagree, or
5 Strongly disagree?
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? Would you say...(**Check all that apply)**

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 Q32; continue. Otherwise, go to Q34.

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

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

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 persons,
3. In a large town of 5,000 to less than 25,000 persons,
4. In a city of 25,000 to less than 50,000 persons, or
5. In a city of 50,000 or more persons?
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
18 Unable to work
99 Refused

If 39=1, 2, 3, 4, or 7

40. 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

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 Q41 < 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?
Would you say...(**Check all that apply)**

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 Q43; continue. Otherwise, go to Q45.

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

45. What is the primary language spoken in your home?

1 English
2 Spanish
3 Other [Specify:]
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

[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

[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

REMARKS
Is there anything else that you would like to say about STEM in Iowa?
[OPEN]

CLOSING STATEMENT
That is my last question. Everyone's answers will be combined to give us information about the opinions of people in Iowa. Thank you very much for your time and help with this study.

ENTER FIPS CODE
___ ___ ___ = FIPS

[INTERVIEWER COMMENTS]

Appendix F: Statewide Survey of Public Attitudes_Technical Notes

WEIGHTING METHODOLOGY REPORT
IOWA STEM SURVEY – 2012

Design Overview:

This study has secured a total of 2,010 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 4 to 11 and 12 to 19 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	Distribution
Landline RDD	680	33.8%
Cellular RDD	754	37.5%
Targeted List: Parents of 4-11 Year Olds	389	19.4%
Targeted List: Parents of 12-19 Year Olds	187	9.3%
Total	**2,010**	**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, reachability via 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, final weights were adjusted simultaneously along several dimensions using the *WgtAdjust* procedure of SUDAAN. The needed population totals for weighting have been obtained from the latest March supplement of the 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	71	3.5%	153,627	6.6%	65	3.2%	157,454	6.8%
25-34	98	4.9%	192,840	8.3%	102	5.1%	195,030	8.4%
35-44	182	9.1%	188,742	8.2%	245	12.2%	169,354	7.3%
45-54	214	10.6%	231,527	10.0%	254	12.6%	219,510	9.5%
55-64	159	7.9%	191,254	8.3%	198	9.9%	210,084	9.1%
65+	185	9.2%	171,271	7.4%	237	11.8%	231,238	10.0%
Total	**909**	**45.2%**	**1,129,261**	**48.8%**	**1,101**	**54.8%**	**1,182,670**	**51.2%**

Table 3. Second raking dimension for weight adjustments by gender and ethnicity

Ethnicity	Males				Females			
	Respondents		Population		Respondents		Population	
Hispanic	22	1.1%	62,304	2.7%	17	0.8%	53,049	2.3%
Others	887	44.1%	1,066,957	46.2%	1,084	53.9%	1,129,621	48.9%
Total	**909**	**45.2%**	**1,129,261**	**48.8%**	**1,101**	**54.8%**	**1,182,670**	**51.2%**

Table 4. Third raking dimension for weight adjustments by race

Race	Respondents		Population	
White	1942	96.6%	2155064	93.2%
African American	22	1.1%	62740	2.7%
Others	46	2.3%	94127	4.1%
Total	**2010**	**100.0%**	**2311931**	**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	28	1.4%	128,785	5.6%	23	1.1%	126,367	5.5%
High School or GED	225	11.2%	407,618	17.6%	202	10.0%	345,972	15.0%
College 1 year to 3 years	294	14.6%	315,488	13.6%	375	18.7%	408,436	17.7%
College 4 year or more	223	11.1%	200,648	8.7%	329	16.4%	225,317	9.7%
Graduate degree	139	6.9%	76,722	3.3%	172	8.6%	76,578	3.3%
Total	**909**	**45.2%**	**1,129,261**	**48.8%**	**1,101**	**54.8%**	**1,182,670**	**51.2%**

Table 6. Fifth raking dimension for weight adjustments by gender and place of residence

Place	Males				Females			
	Respondents		Population		Respondents		Population	
Farm	210	10.4%	244,776	10.6%	245	12.2%	227,517	9.8%
Small Town	235	11.7%	235,818	10.2%	331	16.5%	257,320	11.1%
Large Town	132	6.6%	210,307	9.1%	193	9.6%	228,683	9.9%
Small City	104	5.2%	107,970	4.7%	110	5.5%	118,832	5.1%
Large City	228	11.3%	330,390	14.3%	222	11.0%	350,318	15.2%
Total	**909**	**45.2%**	**1,129,261**	**48.8%**	**1,101**	**54.8%**	**1,182,670**	**51.2%**

Table 7. Sixth raking dimension for weight adjustments by telephone status

Telephone Status	Respondents		Population	
Cell-only	366	18.2%	538061	23.3%
Others	1644	81.8%	1773870	76.7%
Total	**2010**	**100.0%**	**2311931**	**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:

$$\delta = 1 + \frac{\sum_{i=1}^{n} \frac{(w_i - \bar{w})^2}{n-1}}{\bar{w}^2}$$

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:

$$\hat{p} - z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n-1}\left(\frac{N-n}{N}\right) \times \delta} \le P \le \hat{p} + z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n-1}\left(\frac{N-n}{N}\right) \times \delta}$$

Appendix G: Statewide Survey of Public Attitudes_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. In some cases, the number of survey respondents was too small (generally, 30 or lower) to provide estimates with sufficient confidence to conduct inferential statistical tests; in these instances, significant p-values are not reported.

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

Q1. I'm going to read a short list of topics. Please tell me how much you have about each one in the past month.

Response Options	Total n	Pop. Est.	%	Gender M %	Gender W %	Education HS/ less %	Education Some colleg e %	Education BA or more %	Parent status Not parent %	Parent status 4-11 %	Parent status 12-19 %	Location Farm/ Sm.Town %	Location Lg. town/ Sm. City %	Location Lg. City %	Race White %	Race Black %	Race Other %
a. Traffic Safety							**p=0.01			**p=0.006							
A lot	438	530,272	23.0	26.4	19.7	25.6	24.0	17.2	23.3	17.3	27.6	21.4	18.8	29.3	22.5	44.9	18.8
A little	1,092	1,223,621	53.0	49.7	56.2	48.3	54.8	59.1	54.4	52.9	40.5	55.1	53.3	49.8	52.9	37.1	66.2
Nothing	477	553,978	24.0	23.8	24.2	26.1	21.3	17.5	22.4	29.9	31.9	23.5	28.0	20.9	24.6	18.0	14.9
Total	2007	2,307,871															
b. Iowa Economy							*P=0.001										
A lot	1,256	1,326,074	57.4	53.5	61.1	49.9	61.9	64.8	56.9	59.1	59.7	56.8	60.5	55.2	58.4	52.9	37.5
A little	634	812,464	35.2	38.4	32.1	40.3	31.4	30.8	35.3	34.8	34.4	37.4	31.5	35.6	34.2	39.6	54.8
Nothing	119	172,535	7.5	8.1	6.9	9.8	6.7	4.4	7.8	6.1	5.9	5.8	8.0	9.3	7.5	7.5	7.6
Total	2,009	2,311,074															
c. Foreign Policy				*p=0.04			**p<0.001										
A lot	922	944,415	41.0	43.2	39.0	33.8	41.0	53.6	41.4	36.7	43.3	37.3	42.4	44.9	41.4	44.6	28.8
A little	800	919,727	39.9	41.6	38.4	39.5	42.5	37.5	38.9	45.5	42.4	41.7	40.5	37.0	41.2	20.0	25.5
Nothing	281	438,696	19.1	15.3	22.7	26.7	16.6	8.9	19.7	17.8	14.3	21.0	17.2	18.1	17.4	35.4	45.8
Total	2,003	2,302,838															
d. Agriculture							**p=0.006			**p=0.01			**p=0.006				
A lot	1397	1,491,357	64.6	65.6	63.7	60.1	67.3	69.2	63.2	66.8	74.9	71.8	60.1	58.9	65.8	56.2	43.8
A little	518	661,171	28.6	29.2	28.1	30.6	26.3	28.2	29.5	27.4	22.3	23.4	31.6	33.1	27.8	28.7	48.0
Nothing	93	155,648	6.7	5.2	8.2	9.4	6.4	2.7	7.3	5.8	2.8	4.8	8.4	8.0	6.4	15.1	8.2
Total	2008	2,308,175															
e. K-12 Education				**p=0.01			**p<0.001			**p=0.01							
A lot	630	638,108	27.7	23.6	31.6	24.5	26.7	34.6	25.3	42.4	31.7	24.6	26.9	33.1	27.1	46.0	30.2
A little	1039	1,166,744	50.7	51.2	50.2	46.9	53.5	53.7	51.7	44.1	50.0	53.6	51.7	45.5	51.3	33.4	47.9
Nothing	337	497,540	21.6	25.2	18.2	28.6	19.8	11.7	23.1	13.5	18.4	21.8	21.5	21.5	21.6	20.7	22.0
Total	2006	2,302,391															
f. Environmental Pollution							*p=0.05										
A lot	354	391,355	17.0	18.5	15.5	17.2	16.8	16.8	17.8	12.8	14.7	17.6	16.5	16.5	17.0	12.6	19.9
A little	1,094	1,213,538	52.6	52.1	53.1	50.1	50.8	59.3	52.3	59.0	47.1	52.1	51.0	54.9	52.9	53.6	45.4
Nothing	558	701,738	30.4	29.4	31.4	32.7	32.5	23.9	29.9	28.2	38.2	30.3	32.5	28.6	30.1	33.8	34.7
Total	2,006	2,306,631															

Gender: Larger percentage of females heard "a lot" about K-12 education

Education: Higher educational attainment was significantly associated with greater awareness of all topics

Parent status: Parents more likely than non-parents to report hearing "A lot" about K-12 education

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 in the past month.																	
				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some colleg e %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
a. Improving the reading scores of K-12 students							**p=0.01										
A lot	409	387,742	16.8	14.1	19.3	14.2	15.6	22.9	16.1	21.0	18.0	16.5	15.0	19.0	16.1	33.4	20.8
A little	882	985,316	42.7	42.6	42.7	42.1	43.7	42.4	42.1	48.4	40.5	41.2	46.3	41.3	43.5	44.4	22.6
Nothing	716	935,516	40.5	43.2	37.9	43.7	40.8	34.7	41.8	30.6	41.5	42.3	38.8	39.7	40.4	22.1	56.6
Total	2,007	2,308,573															
b. Requiring high school students to pass more rigorous tests before graduating **p=0.01																	
A lot	290	287,998	12.5	12.5	12.5	11.0	10.4	17.7	12.6	9.8	15.4	12.6	10.6	14.1	11.6	32.5	19.3
A little	793	911,225	39.5	38.2	40.8	41.4	39.5	36.2	40.3	34.2	38.5	40.5	42.5	35.2	40.8	10.0	29.8
Nothing	921	1,107,285	48.0	49.3	46.7	47.6	50.1	46.1	47.1	56.1	46.1	46.9	46.9	50.6	47.6	57.5	51.0
Total	2,004	2,306,508															
c. Increasing foreign language requirements																	
A lot	98	110,714	4.8	4.6	5.0	4.8	4.6	5.1	4.9	2.8	6.1	3.6	5.4	6.0	4.1	3.9	22.2
A little	538	642,451	27.8	28.5	27.1	31.9	23.8	25.7	28.8	22.0	26.6	29.3	28.4	25.2	27.5	37.5	29.5
Nothing	1,371	1,555,920	67.4	66.9	67.8	63.4	71.6	69.1	66.3	75.2	67.2	67.2	66.2	68.9	68.5	58.6	48.3
Total	2,007	2,309,085															
d. Improving math, science, technology, and engineering education							**p<0.001										
A lot	516	528,467	22.9	23.0	22.8	19.5	19.8	32.6	22.9	20.6	25.4	20.9	23.5	25.0	22.2	36.7	29.8
A little	895	980,286	42.5	42.0	42.9	40.6	45.2	42.2	42.3	40.4	46.1	45.5	41.6	38.9	43.2	34.9	29.6
Nothing	597	800,712	34.7	35.0	34.4	39.9	35.0	25.2	34.8	38.9	28.5	33.5	34.9	36.1	34.6	28.4	40.7
Total	2,008	2,309,464															
e. Maintaining local control of education policies				**p=0.01			**p=0.002										
A lot	233	214,944	9.3	10.1	8.6	7.8	8.2	13.4	9.6	6.8	9.6	8.5	8.3	11.5	9.0	14.6	13.8
A little	819	923,305	40.1	35.0	44.9	39.0	38.2	44.1	39.7	42.0	40.6	40.2	39.7	40.2	40.4	39.5	33.8
Nothing	954	1,166,303	50.6	55.0	46.5	53.2	53.6	42.4	50.6	51.2	49.8	51.3	52.0	48.3	50.7	45.9	52.5
Total	2,006	2,304,551															
f. Having tougher evaluation standards for teachers' performance							**p<0.001										
A lot	512	511,463	22.2	19.0	25.3	20.1	18.3	30.8	21.8	23.9	23.5	31.3	20.1	25.4	21.9	37.0	19.9
A little	920	1,013,633	44.0	46.2	41.8	42.0	46.1	44.8	44.4	44.4	39.8	47.0	42.5	41.2	44.9	25.7	34.4
Nothing	573	779,189	33.8	34.8	32.9	37.9	35.6	24.5	33.8	31.8	36.6	31.6	37.4	33.4	33.2	37.3	45.7
Total	2,005	2,304,285															

Overall, 23% of Iowans said they had heard a lot about improving math, science, technology and engineering education.
Iowans with higher levels of educational attainment were more likely to report having heard a lot about this topic than others.

Q3. Have you visited each of the following in the past 12 months? (% responding YES)																	
				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
							**p<0.001			**p<0.001			**p<0.001				
An art museum	608	579,370	25.1	22.3	27.8	14.3	27.0	41.5	23.4	33.7	29.6	18.2	28.0	32.0	24.6	38.7	27.7
							**p<0.001			**p<0.001							
A natural history museum	637	591,044	25.6	26.1	25.2	18.2	24.9	39.6	23.3	39.3	30.0	24.9	25.1	27.2	25.1	46.1	24.5
							**p<0.001			**p<0.001			*p=0.03				
A zoo or aquarium	980	1,001,305	43.4	43.5	43.3	33.0	46.3	57.9	38.9	71.2	49.8	38.2	45.5	48.7	43.8	47.8	31.7
							**p<0.001			**p<0.001							
A science or technology museum	575	532,593	23.1	24.5	21.7	12.6	22.1	42.5	19.6	41.8	31.8	19.8	25.2	25.6	23.1	26.7	19.2
				*p=0.05			**p<0.001			**p<0.001			*p=0.02				
A public library	1467	1,489,513	64.6	61.1	67.9	53.5	70.2	76.8	61.3	79.9	75.7	59.6	70.5	65.9	64.1	76.6	68.3
				*p=0.04			**p<0.001			**p<0.001							
A K-12 school	1354	1,324,504	57.4	53.8	60.9	53.2	55.4	67.2	49.5	95.3	82.5	60.5	59.0	51.5	57.8	55.6	48.3

Females were significantly more likely than males to have visited a school in the past year.
Iowans with higher educational attainment were more likely than others to have visited a school in the past year.
Parents of 4-11 year old children were the most likely to have visited a school, followed by parents of 12-19 year old children.
Significant differences by race were not found.

Q4. Have you heard of the abbreviation "STEM" which stands for "science, technology, engineering, and mathematics"? (% responding YES)																	
				Gender		Education**p<0.001			Parent status** p<0.001			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
Yes	660	602,007	26.1	25.9	26.3	17.8	21.0	47.0	23.9	34.8	35.9	23.4	27.3	28.8	25.3	39.3	36.6
No	1,343	1,704,198	73.90	74.1	73.7	82.2	79.0	53.1	76.1	65.2	64.1	76.6	72.8	71.2	74.7	60.8	63.4
Total	2,003	2,306,204															

Parents and those with higher educational attainment were more likely than others to report having heard of the abbreviation STEM. Overall, only 26% of Iowans have heard of the acronym. Recall was lowest among Iowans with a HS education or less.

Q5. I'm going to ask you questions about science, technology, engineering, and math. I will often refer to these using the abbreviation "STEM." Please tell me how strongly you agree or disagree with each of the following statements.				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
a. Science and technology are making our lives better.																	
				**p=0.004			**p<0.001			**p=0.004			*p=0.02				
Strongly agree	846	905,497	39.5	46.1	33.2	32.9	43.38	46.17	38.8	39.1	46.6	32.9	45.2	43.4	38.7	54.9	48.2
Agree	1,045	1,240,698	54.2	48.0	60.1	58.8	50.2	51.2	54.1	57.0	50.9	59.6	48.3	52.2	55.3	38.2	39.4
Neutral	26	36,685	1.6	1.4	1.8	2.6	1.0	0.7	1.9	0.1	1.2	2.0	1.3	1.4	1.4	0.0	7.5
Disagree	73	99,406	4.3	4.0	4.7	5.4	5.2	1.5	4.8	3.2	1.3	4.8	5.2	2.9	4.3	6.9	4.7
Strongly disagree	11	8,498	0.4	0.4	0.3	0.4	0.2	0.5	0.4	0.6	0.1	0.7	0.1	0.1	0.4	0.0	0.0
Total	2,001	2,290,783															
b. We depend too much on science and not enough on faith or religion.																	
				**p=0.001			**p<0.001			**p=0.01							
Strongly agree	174	209,770	9.3	7.8	10.6	11.1	8.6	7.1	9.7	8.9	6.3	10.9	8.9	7.6	8.9	17.0	12.6
Agree	649	812,052	36.1	35.3	36.8	44.5	33.2	25.0	37.5	24.0	38.3	36.7	34.2	37.0	35.4	54.6	39.1
Neutral	137	160,677	7.1	6.3	7.9	7.7	6.5	7.0	5.9	16.4	7.2	8.6	5.8	6.3	7.3	0.0	8.7
Disagree	758	812,714	36.1	38.4	33.9	28.6	40.5	43.6	35.3	38.4	40.4	34.7	39.7	34.7	36.5	28.4	32.5
Strongly disagree	239	255,870	11.4	12.0	10.8	8.0	11.3	17.3	11.6	12.3	7.8	9.3	11.4	14.3	11.9	0.0	7.2
Total	1,957	2,251,083															
c. People would do better by living a simpler life without so much technology.																	
							**p<0.001						*p=0.03				
Strongly agree	173	226,135	9.9	7.9	11.9	13.6	8.3	5.7	9.7	11.9	9.7	14.1	8.2	5.7	10.3	0.0	8.7
Agree	785	936,521	41.1	38.7	43.4	45.5	43.2	31.0	42.2	36.8	37.6	40.2	40.6	42.9	40.5	60.7	42.2
Neutral	125	139,344	6.1	5.3	6.9	5.5	6.1	7.3	5.5	7.7	9.4	7.3	6.0	4.6	6.6	0.5	0.0
Disagree	773	829,407	36.4	38.8	34.1	29.7	37.2	47.1	36.1	36.5	39.6	31.8	40.0	39.5	36.4	34.7	39.1
Strongly disagree	127	145,938	6.4	9.3	3.7	5.8	5.2	9.0	6.5	7.6	3.8	6.6	5.1	7.4	6.3	4.0	10.0
Total	1,983	2,277,345															
d. Many more companies would move or expand to Iowa if the state had a reputation for workers with great science and math skills.																	
							*p=0.04										
Strongly agree	327	340,938	15.7	16.8	14.6	12.1	17.4	19.7	15.8	13.4	18.0	13.7	16.3	17.8	15.0	31.8	20.6
Agree	1,117	1,301,815	59.9	58.9	61.0	64.6	57.9	54.4	59.4	61.5	62.5	59.9	62.5	57.3	60.9	31.7	58.3
Neutral	51	55,495	2.6	2.9	2.2	2.6	1.1	4.3	2.2	4.5	3.0	2.0	2.6	3.2	2.3	0.0	10.1
Disagree	400	453,562	20.9	20.0	21.8	19.9	22.9	20.1	21.5	19.9	16.2	23.1	17.8	20.8	20.8	36.5	11.0
Strongly disagree	19	21,138	1.0	1.4	0.6	0.8	0.7	1.5	1.2	0.7	0.3	1.2	0.7	0.9	1.1	0.0	0.0
Total	1,914	2,172,947															
e. People who work in science, technology, engineering, and math jobs don't have as much fun as people who work in other jobs.																	
							**p<0.001						**p=0.002				
Strongly agree	15	1,7145	0.8	0.8	0.8	0.3	1.6	0.6	0.7	1.2	0.7	1.1	1.1	1.1	0.8	0.0	0.0
Agree	160	272,981	12.6	12.9	12.2	20.6	7.9	5.3	13.4	11.1	6.7	10.8	11.8	15.9	11.7	19.8	29.4
Neutral	37	57,066	2.6	3.1	2.2	2.8	3.5	1.3	2.6	2.3	3.6	3.2	2.0	2.5	2.2	6.5	9.9
Disagree	1,305	1,431,301	65.8	66.8	64.9	66.7	65.0	65.5	65.0	64.7	74.4	71.3	66.6	57.1	67.1	39.5	52.2
Strongly disagree	391	396,464	18.2	16.4	19.6	9.7	22.1	27.3	18.3	20.7	14.6	13.7	19.6	23.4	18.2	34.3	8.6
Total	1,908	2,174,957															

Q5. I'm going to ask you questions about science, technology, engineering, and math. I will often refer to these using the abbreviation "STEM." Please tell me how strongly you agree or disagree with each of the following statements.																	
				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
f. Increased focus on STEM education in Iowa will improve the state economy.							**p<0.001										
Strongly agree	305	326,087	14.7	16.8	12.8	10.6	16.6	19.4	14.8	12.8	17.1	11.7	15.0	18.8	14.2	23.7	20.9
Agree	1,339	1,585,310	71.7	69.8	73.4	74.7	70.4	68.1	71.6	72.6	70.6	72.3	71.6	70.8	71.8	70.1	70.2
Neutral	71	57,904	2.6	2.8	2.4	1.6	2.1	5.0	2.3	3.5	4.8	2.4	3.5	2.1	2.7	0.0	2.6
Disagree	204	238,666	10.8	10.2	11.3	12.8	10.8	7.3	11.1	11.1	7.5	13.1	9.9	8.4	11.1	6.2	6.7
Strongly disagree	5	4,360	0.2	0.4	0.1	0.3	0.1	0.3	0.2	0.2	0.0	0.4	0.1	0.0	0.2	0.0	0.0
Total	1,924	2,212,328															
g. Advancements in science, technology, engineering and math will give more opportunities to the next generation.							*p=0.03										
Strongly agree	562	636,796	27.8	30.0	25.7	22.0	30.7	34.4	27.7	27.1	30.2	23.9	28.4	32.7	27.1	50.6	29.6
Agree	1,352	1,572,111	68.7	67.5	69.9	74.0	65.8	63.2	69.0	67.8	66.5	71.7	68.4	64.7	69.3	47.7	68.3
Neutral	23	24,334	1.1	0.5	1.6	1.2	0.9	1.0	0.8	2.2	2.4	1.1	1.3	0.8	1.1	0.0	0.0
Disagree	51	53,969	2.4	1.9	2.8	2.7	2.6	1.5	2.4	2.9	1.0	3.1	1.9	1.8	2.4	1.7	2.2
Strongly disagree	2	1,638	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0
Total	1,990	2,288,848															
h. There are more jobs available for people who have good math and science skills.																	
Strongly agree	460	545,879	24.6	26.7	22.5	20.0	25.8	30.8	24.3	25.8	25.5	20.0	27.7	28.0	24.3	46.2	15.3
Agree	1,154	1,330,514	59.9	58.5	61.3	61.6	60.7	56.0	60.8	52.3	61.1	63.0	56.5	58.8	60.4	25.7	71.6
Neutral	43	38,852	1.8	2.3	1.2	1.5	1.7	2.3	1.2	3.9	3.9	2.5	1.5	1.0	1.7	1.7	1.9
Disagree	255	293,519	13.2	12.3	14.2	16.4	10.8	10.8	13.1	17.5	9.0	13.6	13.9	12.0	12.9	26.4	11.2
Strongly disagree	10	12,575	0.6	0.3	0.9	035	1.1	0.2	0.6	0.6	0.5	0.9	0.5	0.2	0.6	0.0	0.0
Total	1,922	2,221,340															
i. There should be more STEM jobs available for rural Iowans.							*p=0.03										
Strongly agree	297	330,681	14.8	14.7	14.9	12.3	17.8	15.5	14.6	13.2	18.6	14.2	16.6	13.9	15.0	11.9	10.8
Agree	1,392	1,654,501	74.0	73.8	74.2	77.8	70.8	71.4	75.1	72.5	65.3	74.6	72.6	74.5	73.4	86.4	86.1
Neutral	68	61,514	2.8	3.3	2.2	1.6	2.2	5.4	2.3	3.2	6.0	2.3	2.8	3.4	2.9	0.0	0.6
Disagree	170	184,597	8.3	7.8	8.8	8.2	8.7	7.8	7.8	10.4	9.7	8.7	8.1	7.8	8.7	1.8	1.5
Strongly disagree	5	5,086	0.2	0.5	0.0	0.1	0.6	0.0	0.2	0.6	0.5	0.3	0.0	0.3	0.2	0.0	1.1
Total	1,932	2,236,379															

Q5. I'm going to ask you questions about science, technology, engineering, and math. I will often refer to these using the abbreviation "STEM." Please tell me how strongly you agree or disagree with each of the following statements.																	
				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some colleg e %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
j. There are not enough women working in science, technology, engineering and math careers.																	
				**p<0.001			**p<0.001										
Strongly agree	242	227,435	12.2	7.8	15.9	7.0	13.4	18.5	12.6	7.9	14.3	8.0	12.0	18.2	12.6	9.1	4.8
Agree	852	948,931	50.9	51.0	50.7	50.5	50.6	51.8	51.3	49.3	48.6	51.3	52.2	48.7	50.2	63.6	58.1
Neutral	102	104,955	5.6	8.7	3.1	4.3	4.8	8.5	5.6	5.4	6.1	5.3	5.1	5.2	5.7	0.7	7.1
Disagree	445	546,392	29.3	29.6	29.0	34.8	30.1	20.2	28.2	36.6	30.4	31.5	29.5	26.0	29.4	26.6	28.7
Strongly disagree	26	38,023	2.0	3.0	1.3	3.4	1.2	1.0	2.3	0.8	0.7	2.9	1.2	1.7	2.1	0.0	1.4
Total	1,667	1,865,736															
k. There should be more attention paid to increasing the number of Hispanics and African Americans working in STEM careers.																	
				**p=0.01			*p=0.02						**0.01				
Strongly agree	110	153,807	7.3	6.2	8.3	8.0	4.2	9.8	7.1	10.9	4.5	4.8	7.1	10.9	6.5	25.0	12.9
Agree	891	1,099,027	52.0	48.9	54.9	54.0	50.3	50.5	52.0	53.2	50.4	48.0	53.0	56.8	51.0	64.1	64.5
Neutral	125	116,819	5.5	6.9	4.3	3.9	7.1	6.5	5.5	4.5	7.1	6.3	6.3	3.8	5.8	0.0	3.1
Disagree	618	655,270	31.0	32.2	29.9	30.9	33.5	28.2	31.4	28.4	30.4	36.6	27.9	26.0	32.5	4.0	17.3
Strongly disagree	83	88,390	4.2	5.9	2.6	3.2	4.9	5.0	4.0	3.0	7.6	4.3	5.7	2.6	4.2	6.9	2.2
Total	1,827	2,113,312															

Q6. As far as you know, compared to other states, where do you think Iowa ranks in students' standardized math scores?																	
				Gender		Education**p=0.005			Parent status*p=0.04			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some colleg e %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
Iowa is in the top third	696	725,934	33.2	34.8	31.7	28.2	32.7	42.0	31.5	42.1	38.0	28.5	36.9	36.3	33.6	26.0	28.8
Iowa is near the middle	1,016	1,184,186	54.2	53.8	54.6	58.3	54.1	47.9	55.9	48.7	45.5	56.7	51.9	53.0	53.7	67.4	56.5
Iowa is in the bottom third	228	174,745	12.6	11.4	13.8	13.6	13.3	10.1	12.6	9.2	16.5	14.8	11.2	10.7	12.7	6.6	14.7
Total	1,940	2,184,866															

Overall, 54% of Iowans correctly think that Iowa is near the middle in student standardized math scores. Parents and Iowans with higher educational attainment are more likely than others to respond that Iowa is in the top third.

Q7. As far as you know, compared to other states, where do you think Iowa ranks in students' standardized science scores?																	
				Gender*p=0.04		Education**p<0.001			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
Iowa is in the top third	580	568,833	26.5	29.7	23.5	18.8	28.5	36.2	26.2	28.6	26.4	22.3	27.7	31.1	27.2	18.2	17.5
Iowa is near the middle	1,092	1,287,995	60.0	59.2	60.8	64.9	57.5	55.4	60.2	60.6	57.4	64.4	58.7	55.3	59.1	70.6	72.8
Iowa is in the bottom third	238	289,026	13.5	11.2	15.7	16.3	14.0	8.4	13.5	10.9	16.2	13.3	13.6	13.6	13.7	11.2	9.7
Total	1,910	2,145,854															

Q8. As far as you know, are there more than enough, not enough, or just the right number of skilled workers in Iowa to fill the available jobs in STEM areas? Would you say there are…																	
				Gender		Education*p=0.05			Parent status			Location*p=0.03			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
More than enough workers to fill the jobs	148	169,810	8.2	6.6	9.6	8.7	8.7	6.6	8.2	6.7	9.5	9.3	9.1	5.5	8.2	1.8	10.7
Just the right number of workers to fill the jobs	1,250	1,399,219	24.7	23.8	25.6	28.1	24.6	19.2	23.7	33.8	23.6	29.1	21.2	21.4	23.8	23.7	45.7
Not enough workers to fill the jobs	410	515,104	67.1	69.5	64.8	63.3	66.7	74.2	68.1	59.5	66.8	61.6	69.2	73.1	68.0	74.5	43.5
Total	1,808	2,084,133															

SECTION 3: STEM Education

Q9. How well do you think the schools in your community are teaching each of the following subjects?

				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
a. Mathematics										**p=0.01							
Excellent	287	299,034	13.7	13.6	13.7	13.3	14.1	13.7	13.0	12.8	20.9	13.1	15.8	12.5	13.9	7.2	13.7
Good	1,000	1,123,998	51.4	51.8	51.0	50.0	52.8	51.1	50.3	62.4	46.9	52.4	55.0	46.2	51.6	50.9	45.8
Fair	489	601,714	27.5	26.7	28.3	31.3	22.3	27.4	29.2	16.9	26.1	27.1	21.4	34.2	27.3	30.8	28.9
Poor	147	163,245	7.5	7.9	7.0	5.4	10.9	6.8	7.5	7.8	6.2	7.4	7.9	7.2	7.2	11.1	11.7
Total	1,923	2,187,990															
b. Science										**p=0.006							
Excellent	243	278,522	12.7	13.5	12.0	13.0	12.9	12.0	12.5	12.2	15.9	10.6	15.3	13.3	12.6	637	19.6
Good	1,025	1,139,286	52.0	49.5	54.5	52.8	51.7	51.1	51.3	64.4	42.9	53.9	49.4	51.9	52.7	48.3	39.5
Fair	547	658,411	30.1	30.2	29.9	29.5	30.4	30.7	31.3	18.1	34.4	30.3	29.4	30.4	29.8	29.8	37.2
Poor	108	113,110	5.2	6.8	3.7	4.7	5.0	6.2	5.0	5.4	6.8	5.2	5.8	4.4	4.9	15.2	3.8
Total	1,923	2,189,329															
c. Civics, history, and social studies																	
	188	210,584	9.8	8.2	11.2	10.0	9.8	9.2	9.1	9.6	15.3	8.6	14.2	6.9	9.4	11.7	16.0
Good	1,004	1,126,874	52.1	49.9	54.2	52.1	50.8	53.6	51.3	60.5	49.1	56.1	48.6	49.7	52.2	40.6	58.9
Fair	537	626,602	29.0	30.6	27.4	28.3	30.2	28.7	30.1	24.2	25.3	25.4	30.1	33.2	29.1	42.7	17.5
Poor	177	198,502	9.2	11.3	7.2	9.6	9.2	8.5	9.6	5.7	10.3	9.9	7.2	10.2	9.4	4.9	7.6
Total	1,906	2,162,562															
d. English										**p=0.005							
Excellent	284	361,771	16.6	15.9	17.2	20.4	15.4	11.5	16.7	12.0	21.5	15.4	20.1	14.8	15.7	9.2	41.1
Good	1,043	1,152,525	52.9	51.0	54.7	52.7	51.5	54.9	52.3	66.6	40.9	52.5	52.0	54.4	53.1	56.0	46.4
Fair	459	516,932	23.7	26.1	21.5	20.4	26.2	26.4	24.0	16.2	31.1	25.5	22.3	22.5	24.1	28.8	11.0
Poor	144	148,386	6.8	7.0	6.6	6.5	6.9	7.3	7.1	5.2	6.6	6.6	5.6	8.3	7.1	5.1	1.5
Total	1,930	2,179,615															
e. Engineering							*p=0.02						*p=0.05				
Excellent	122	165,182	8.1	7.7	8.5	9.6	8.4	5.1	8.9	5.0	7.7	3.9	13.5	9.0	7.7	9.3	16.5
Good	556	652,893	32.0	32.0	31.9	36.0	29.3	28.4	32.3	30.2	31.3	34.8	29.3	30.4	31.9	28.0	36.2
Fair	686	781,796	38.3	35.2	41.3	37.0	35.5	43.7	37.8	42.0	38.1	38.8	37.3	38.5	38.9	30.8	30.1
Poor	397	443,358	21.7	25.1	18.3	17.5	26.8	22.7	21.4	22.9	22.8	22.6	19.9	22.1	21.6	31.9	17.3
Total	1,761	2,043,229															

Q9. How well do you think the schools in your community are teaching each of the following subjects?

				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
f. Technology				**p=0.004													
Excellent	222	238,966	11.1	12.1	10.2	10.6	11.6	11.4	11.0	10.9	12.9	9.6	15.2	9.2	10.8	17.4	13.7
Good	880	967,210	45.0	39.3	50.7	46.3	43.7	44.4	44.5	53.6	38.6	47.3	39.6	47.4	45.2	30.7	51.8
Fair	625	746,789	34.8	36.7	32.8	34.5	34.3	35.8	35.2	27.6	40.6	33.0	35.5	36.7	35.2	36.1	24.4
Poor	157	194,399	9.1	11.8	6.3	8.5	10.4	8.4	9.3	7.9	8.1	10.2	9.7	6.7	8.8	15.9	10.1
Total	1,884	2,147,364															
g. Foreign languages																	
Excellent	126	139,533	6.7	5.0	8.3	6.4	6.2	7.6	6.4	4.8	11.4	4.1	9.7	7.4	6.3	0.5	18.3
Good	665	709,296	33.9	34.1	33.7	32.5	35.7	34.0	33.8	34.2	34.3	33.1	34.8	34.1	34.2	15.1	41.0
Fair	730	887,218	42.4	41.0	43.7	43.8	40.6	42.1	42.3	45.2	39.4	43.5	38.3	44.9	42.6	61.9	24.4
Poor	334	357,625	17.1	19.9	14.4	17.3	17.4	16.3	17.5	15.8	15.0	19.3	17.2	13.6	17.0	22.5	16.3
Total	1,855	2,093,672															
h. Art																	
Excellent	207	225,682	10.5	9.7	11.2	11.4	10.3	9.1	10.1	12.6	11.5	9.2	15.1	7.8	10.4	11.4	12.2
Good	844	932,681	43.3	42.7	43.9	44.7	42.4	42.8	43.0	46.4	42.0	45.9	45.3	37.7	42.9	39.0	56.2
Fair	674	771,146	35.8	36.4	35.3	34.0	36.2	38.5	35.8	32.6	40.2	36.2	32.6	38.5	36.7	23.0	25.0
Poor	170	222,290	10.3	11.1	9.6	10.2	11.1	9.6	11.1	8.3	6.3	8.7	7.1	16.0	10.0	26.6	6.7
Total	1,895	2,151,800															
i. Music													**p=0.006				
Excellent	371	361,100	16.6	13.6	19.4	13.4	19.2	19.0	15.1	23.1	21.5	16.2	20.5	13.3	17.3	2.1	11.1
Good	861	968,790	44.5	43.6	45.4	47.3	41.6	43.3	44.9	42.3	44.3	47.2	48.8	36.3	44.2	38.4	56.5
Fair	523	633,375	29.1	31.5	26.9	30.0	29.0	27.7	29.8	24.6	29.2	28.9	24.3	34.2	29.4	28.6	23.5
Poor	158	212,640	9.8	11.3	8.3	9.3	10.3	10.0	10.3	10.0	5.1	7.7	6.5	16.1	9.2	31.0	8.9
Total	1,913	2,175,904															

Q10. Do you think each of the following topics is absolutely essential, important but not essential or not important for all students to learn before graduating from high school?																	
				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
a. Basic math skills							*p=0.02			*p=0.04							
Absolutely essential	1,899	2,114,390	91.6	89.8	93.4	86.8	94.9	96.0	90.7	94.6	97.0	92.4	93.6	88.6	92.2	87.8	81.0
Important but not essential	105	185,197	8.0	10.1	6.1	12.6	4.9	4.0	8.9	5.4	3.0	7.6	6.4	10.3	7.4	12.2	19.0
Not important	2	8,028	0.4	0.1	0.6	0.7	0.2	0.0	0.4	0.0	0.0	0.0	0.0	1.2	0.4	0.0	0.0
Total	2,006	2,307,615															
b. Basic scientific ideas and principles				*p=0.02			**p=0.002										
Absolutely essential	1,441	1,595,207	69.4	65.3	73.4	63.1	72.3	76.8	67.9	75.2	76.0	67.9	72.6	68.4	70.1	62.5	57.4
Important but not essential	537	659,527	28.7	33.2	24.5	33.5	27.8	22.8	30.3	21.9	22.9	30.9	26.0	28.3	28.0	37.5	38.9
Not important	18	43,387	1.9	1.6	2.2	3.5	0.9	0.4	1.8	2.9	1.1	1.2	1.4	3.3	1.9	0.0	3.6
Total	1,996	2,298,122															
c. Advanced sciences such as physics																	
Absolutely essential	525	611,404	26.7	28.9	24.6	28.9	27.8	21.7	26.0	26.3	34.0	26.1	27.8	26.5	25.7	38.8	40.5
Important but not essential	1,345	1,535,319	67.1	65.1	68.9	63.9	66.9	72.6	67.8	67.4	59.5	67.1	65.6	68.5	67.8	61.2	53.0
Not important	122	143,215	6.3	6.0	6.5	7.2	5.4	5.7	6.2	6.3	6.5	6.8	6.7	5.0	6.4	0.0	6.5
Total	1,992	2,289,938															
d. Advanced math such as calculus							*p=0.02										
Absolutely essential	559	693,734	30.2	33.5	27.0	36.1	27.6	23.4	29.9	30.6	33.0	31.5	34.0	24.7	28.9	51.4	46.1
Important but not essential	1,270	1,414,879	61.6	58.7	64.5	55.9	64.1	68.5	62.1	61.0	58.3	59.4	59.1	67.3	62.9	36.8	49.3
Not important	167	187,733	8.2	7.8	8.5	8.1	8.4	8.1	8.1	8.3	8.7	9.2	7.0	7.9	8.2	11.7	4.6
Total	1,996	2,296,345															
e. Using technology to support learning							**p<0.001										
Absolutely essential	1,384	1,480,568	65.2	62.1	68.2	56.7	70.3	73.2	63.5	73.6	70.4	65.6	65.6	64.3	65.5	64.0	61.3
Important but not essential	567	737,105	32.5	35.4	29.8	41.1	26.2	25.8	34.0	25.4	28.0	31.9	31.6	34.2	32.2	36.1	37.5
Not important	39	51,884	2.3	2.6	2.0	2.2	3.5	1.0	2.5	1.0	1.6	2.5	2.8	1.5	2.4	0.0	1.3
Total	1,990	2,269,557															
f. Engineering and industrial technology principles and skills							**p=0.002										
Absolutely essential	669	830,396	36.6	38.8	34.3	42.3	36.4	27.1	36.1	38.1	38.9	36.7	36.7	36.2	36.2	38.8	43.9
Important but not essential	1,226	1,340,343	59.0	57.7	60.3	53.5	59.7	67.4	59.4	58.4	56.1	59.2	59.2	58.5	59.1	61.3	55.3
Not important	93	101,045	4.5	3.4	5.4	4.2	4.0	5.5	4.5	3.5	5.0	4.0	4.1	5.4	4.7	0.0	0.8
Total	1,988	2,271,784															

Q11. Please tell me if the following three statements might explain why some students may do poorly in math and science. Just answer yes or no for each one.

				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
a. There are not enough really good math and science teachers.				*p=0.03			*p=0.02										
Yes	1,076	1,167,293	51.9	48.0	55.6	46.5	54.7	57.8	53.4	42.0	50.4	52.8	49.3	53.2	52.7	32.0	46.7
No	873	108,198	48.1	52.0	44.4	53.5	45.3	42.2	46.6	58.0	49.6	47.3	50.7	46.8	47.3	68.0	53.3
Total	1,948	2,249,290															
b. Students think the subject is not relevant to their lives.							*p=0.02										
Yes	1,665	1,908,608	83.8	83.4	84.2	79.4	88.2	85.9	84.0	84.1	82.1	83.0	85.6	83.3	84.8	72.0	68.4
No	320	368,420	16.2	16.6	15.8	20.6	11.8	14.1	16.1	15.9	17.9	17.1	14.4	16.8	15.2	28.0	31.6
Total	1,985	2,277,029															
c. Students think math and science are too hard to learn.				**p=0.002													
Yes	1,536	1,780,015	78.0	73.6	82.3	74.9	79.4	81.7	77.8	83.4	73.5	76.0	78.0	81.0	78.2	74.0	76.3
No	443	500,912	22.0	26.4	17.7	25.1	20.6	18.3	22.2	16.6	26.5	24.0	22.0	19.0	21.8	26.1	23.7
Total	1,979	2,280,927															

Q12. I'm going to read some statements about STEM education. Please tell me how strongly you agree or disagree with each one.

Response Options	Total n	Pop. Est.	%	Gender: M %	W %	Education: HS/ less %	Some college %	BA or more %	Parent status: Not parent %	4-11 %	12-19 %	Location: Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	Race: White %	Black %	Other %
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.																	
				*p=0.05			*p=0.03										
Strongly agree	252	351,882	15.4	13.3	17.5	18.4	15.1	10.7	15.6	16.8	12.3	15.2	15.4	15.9	15.5	26.9	5.3
Agree	711	790,611	34.7	37.8	31.7	36.7	29.7	37.2	36.5	26.3	28.4	36.3	36.9	30.3	34.2	28.3	49.0
Neutral	87	76,635	3.4	2.3	4.4	2.4	3.8	4.5	2.8	5.5	5.8	2.9	3.3	4.1	3.6	0.0	0.0
Disagree	761	850,894	37.3	37.8	36.9	34.0	40.9	38.6	36.1	41.4	43.2	37.9	36.0	37.8	37.7	29.2	35.2
Strongly disagree	171	210,489	9.2	8.8	9.6	8.5	10.4	9.0	9.0	10.0	10.3	7.8	8.5	12.0	9.0	15.7	10.6
Total	1,982	2,280,510															
b. Advanced math and science courses teach important critical thinking skills.																	
							**p<0.001			**0.004			*p=0.02				
Strongly agree	655	668,290	29.1	31.5	26.7	21.4	29.3	42.0	27.6	32.5	38.6	25.6	30.6	32.4	28.1	44.4	41.8
Agree	1,254	1,520,117	66.1	63.0	69.1	73.4	65.6	54.1	67.2	65.3	56.8	68.8	66.6	61.7	66.9	52.8	56.9
Neutral	8	4,809	0.2	0.1	0.3	0.0	0.3	0.5	0.2	0.1	0.7	0.2	0.3	0.2	0.2	0.0	0.0
Disagree	72	90,716	3.9	4.4	3.5	4.1	4.3	3.2	4.3	1.5	3.9	4.3	1.7	5.7	4.2	0.0	1.3
Strongly disagree	13	16,543	0.7	1.1	0.4	1.1	0.5	0.3	0.8	0.6	0.0	1.1	0.8	0.1	0.7	2.8	0.0
Total	2,002	2,300,475															
c. Overall, the quality of STEM education in Iowa is high.																	
							**p<0.001										
Strongly agree	64	84,218	4.0	3.3	4.7	4.8	5.0	1.4	4.3	2.2	4.0	3.8	2.8	5.5	3.5	7.2	13.2
Agree	1,066	1,282,655	60.8	59.6	62.0	67.7	54.9	56.5	60.5	66.3	56.7	61.2	63.5	57.7	60.6	50.2	72.2
Neutral	68	69,976	3.3	3.4	3.2	2.0	3.8	4.9	3.4	2.7	3.7	3.7	3.2	2.9	3.5	0.0	1.8
Disagree	614	634,700	30.1	31.6	28.7	24.3	33.4	35.9	30.2	28.3	31.5	30.0	28.9	31.5	30.7	38.4	12.3
Strongly disagree	34	37,010	1.8	2.1	1.5	1.2	2.9	1.3	1.7	0.6	4.1	1.4	1.7	2.4	1.7	4.3	0.5
Total	1,846	2,108,560															
d. Iowa colleges and universities are doing a good job preparing STEM teachers.																	
							**p<0.001			*p=0.02							
Strongly agree	136	171,479	9.0	8.5	9.4	9.2	10.3	7.0	9.1	4.4	13.2	8.6	9.3	9.2	8.2	20.2	17.8
Agree	1,149	1,341,110	70.2	68.9	71.4	76.4	66.9	63.4	69.6	80.3	63.8	72.8	69.6	66.8	70.2	66.8	72.4
Neutral	64	68,004	3.6	3.9	3.3	3.5	2.7	4.6	3.2	3.4	7.5	3.8	4.4	2.3	3.8	0.0	0.0
Disagree	286	304,030	15.9	16.4	15.5	9.9	19.0	22.4	17.0	10.5	12.0	12.9	15.6	20.7	16.6	4.9	9.2
Strongly disagree	20	26,970	1.4	2.5	0.4	0.9	1.1	2.6	1.2	1.4	3.5	1.9	1.1	1.1	1.3	8.0	0.6
Total	1,655	1,911,593															
e. Iowa colleges and universities are doing a good job preparing students for careers in STEM fields.																	
				**p=0.01			**p=0.005										
Strongly agree	162	224,237	11.1	10.3	11.9	10.6	15.5	6.8	11.2	5.9	15.2	9.4	10.6	14.0	10.8	13.3	15.7
Agree	1,281	1,448,675	71.6	68.8	74.4	76.0	64.8	72.1	70.6	81.7	68.4	72.9	72.8	68.6	71.7	70.7	68.7
Neutral	44	53,336	2.6	2.6	2.7	2.0	2.2	4.2	2.5	1.4	5.7	3.1	2.9	1.7	2.6	0.0	4.7
Disagree	252	276,491	13.7	16.5	10.9	11.0	17.0	14.3	14.5	10.4	10.1	13.4	13.2	14.5	13.8	16.0	9.7
Strongly disagree	19	20,854	1.0	1.9	0.2	0.5	0.5	2.6	1.1	0.6	0.6	1.2	0.5	1.3	1.1	0.0	1.3
Total	1,758	2,023,594															

Q12. I'm going to read some statements about STEM education. Please tell me how strongly you agree or disagree with each one.																	
				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
f. Too few racial and ethnic minority students are encouraged to study STEM topics.																	
							**p=0.002						**0.005				
Strongly agree	83	91,980	4.8	5.0	4.6	5.6	3.2	5.3	5.0	2.7	5.5	3.2	2.5	9.1	4.2	21.9	4.6
Agree	756	926,244	48.1	46.0	50.0	57.0	40.3	42.5	49.8	40.0	42.2	47.7	43.4	53.1	47.0	45.6	73.3
Neutral	48	50,943	2.6	3.2	2.1	1.9	2.0	4.7	2.4	3.4	4.5	1.5	3.4	3.5	2.9	0.0	0.0
Disagree	689	769,785	40.0	39.8	40.1	31.4	49.8	42.4	38.6	48.9	42.0	42.8	44.8	31.4	41.5	28.2	15.1
Strongly disagree	78	87,817	4.6	6.0	3.2	4.1	4.7	5.1	4.4	5.0	5.8	4.8	5.8	3.0	4.5	4.3	6.9
Total	1,654	1,926,770															

Q13. Please tell me how much each of the following strategies would improve math and science education. Suppose…																	
				Gender		Education			Parent status			Location			Race		
Response Options	Total n	Pop. Est.	%	M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
a. Businesses provided internships so high school students can gain practical job skills.																	
Major improvement	1,111	1,272,408	55.6	53.4	57.8	56.7	56.8	52.0	54.9	61.5	54.7	54.0	55.4	58.3	54.7	69.5	68.7
Moderate improvement	777	867,374	37.9	38.6	37.3	35.5	37.5	42.7	38.4	33.3	39.1	40.6	38.5	33.6	38.5	30.5	28.6
Little /no improvement	102	147,056	6.4	8.0	5.0	7.7	5.7	5.2	6.6	5.2	6.2	5.5	6.1	8.1	6.8	0.0	2.6
Total	1,990	2,286,837															
b. 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	853	1,039,129	45.5	43.6	47.2	47.5	45.0	42.6	45.1	49.6	43.9	43.5	44.6	49.2	43.9	74.9	64.7
Moderate improvement	855	951,012	41.6	41.5	41.7	40.7	42.2	42.6	42.0	37.0	43.9	42.7	44.8	37.0	42.8	19.4	28.9
Little /no improvement	279	29,516	12.9	14.9	11.1	11.8	12.9	14.9	12.9	13.4	12.1	13.8	10.7	13.8	13.4	5.7	6.4
Total	1,987	2,285,357															
c. All high school students were required to take a science class that includes lab work.																	
													*p=0.03				
Major improvement	994	1,123,360	49.1	48.1	50.0	46.0	52.4	50.3	48.1	53.7	52.7	44.8	52.3	52.0	47.9	66.0	63.6
Moderate improvement	879	1,018,560	44.5	44.8	44.2	46.9	41.0	44.8	45.4	39.4	43.0	47.4	44.0	40.9	45.4	31.2	34.0
Little /no improvement	116	147,177	6.4	7.1	5.8	7.2	6.7	4.9	6.6	6.9	4.3	7.8	3.7	7.1	6.7	2.8	2.4
Total	1,989	2,289,097															
d. We made sure that all Iowa students have the opportunity to take a full range of math courses.																	
Major improvement	1,229	1,461,106	63.9	61.7	65.9	66.2	65.0	58.5	64.0	63.2	63.5	60.9	64.4	67.4	63.0	81.3	72.6
Moderate improvement	673	722,371	31.6	33.2	30.1	29.8	30.3	36.3	31.6	31.0	32.1	34.6	30.6	28.2	32.4	17.1	23.4
Little /no improvement	87	103,797	4.5	5.1	4.0	4.0	4.8	5.2	4.4	5.8	4.4	4.5	4.7	4.4	4.7	1.6	4.1
Total	1989	2,287,274															
e. Students were required to pass challenging tests in math and science in order to graduate from high school.																	
Major improvement	809	980,566	43.2	45.4	41.0	45.5	45.0	37.0	42.7	44.8	45.7	42.0	44.9	43.3	42.1	56.3	60.0
Moderate improvement	844	952,083	42.0	39.7	44.1	41.4	39.8	45.6	42.7	38.3	39.8	43.1	42.0	40.4	42.6	34.6	32.2
Little /no improvement	321	336,764	14.8	14.8	14.8	13.1	15.2	17.4	14.6	17.0	14.5	15.0	13.2	16.3	15.3	9.1	7.8
Total	1,974	2,269,413															
f. Fast learners were grouped together in one class and slower learners in another class.																	
							*p=0.04										
Major improvement	725	855,643	38.3	38.7	37.9	38.3	43.0	32.4	38.8	32.6	41.5	35.4	39.7	41.0	38.0	35.4	49.4
Moderate improvement	715	784,108	35.1	33.4	36.7	33.7	32.9	40.2	35.4	33.2	34.9	37.0	31.6	35.8	35.2	33.0	33.5
Little /no improvement	510	594,024	26.6	27.9	25.3	27.9	24.1	27.4	25.8	34.2	23.6	27.6	28.7	23.2	26.8	31.7	17.2
Total	1,950	2,233,775															
g. Teachers were required to enroll in professional development programs.																	
Major improvement	937	1,051,487	47.4	45.8	48.9	47.2	50.0	44.4	47.8	44.3	47.6	43.4	48.9	51.4	45.0	83.6	76.5
Moderate improvement	832	981,348	44.2	44.7	43.7	45.0	42.4	45.0	44.0	46.0	43.4	46.8	43.0	41.8	46.2	9.5	22.2
Little /no improvement	183	187,196	8.4	9.5	7.4	7.8	7.6	10.6	8.2	9.7	9.1	9.8	8.1	6.9	8.8	6.9	1.3
Total	1,952	2,220,031															

Q13. Please tell me how much each of the following strategies would improve math and science education. Suppose…

Response Options	Total n	Pop. Est.	%	Gender		Education			Parent status			Location			Race		
				M %	W %	HS/ less %	Some college %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
h. We made sure that all Iowa students have the opportunity to take a full range of science courses.																	
				*p=0.04			*p=0.04										
Major improvement	1,062	1,188,033	51.8	47.7	55.7	46.2	57.2	54.9	51.0	56.5	53.7	50.1	49.6	56.4	50.7	75.2	61.4
Moderate improvement	837	992,922	43.3	46.5	40.3	48.6	37.4	41.5	44.1	38.7	41.9	43.2	46.2	40.7	44.4	15.0	37.9
Little /no improvement	96	112,302	4.9	5.9	4.0	5.2	5.5	3.6	5.0	4.8	4.4	6.8	4.2	2.9	4.9	9.7	0.7
Total	1,995	2,293,258															
i. Math and science teachers were paid more than other teachers.																	
							**p=0.01										
Major improvement	251	280,881	12.6	12.6	12.5	14.0	8.3	15.5	12.0	16.3	12.4	11.0	12.8	14.5	12.7	7.4	12.8
Moderate improvement	719	833,119	37.2	38.9	35.7	37.0	38.1	36.6	38.0	32.4	36.1	37.7	34.0	39.7	36.8	51.4	36.1
Little /no improvement	978	1,124,915	50.2	48.5	51.9	49.0	53.7	48.0	50.0	51.3	51.5	51.3	53.3	45.8	50.5	41.3	51.1
Total	1,948	2,238,915															

SECTION 4: Child selection

Questions 14-17 reflect a series of questions used to randomly select a child from the household to identify a parent of a 4-11 year old or 12-19 year old, respectively. The child was used as the reference when answering the subsequent questions. Frequencies were not conducted for questions 14-17.

Parent of a school aged child

Response Options	n	Pop. Est.	%
Not a parent of a school aged child	1,261	1,859,795	80.4
Parent of a child 4-11 years	379	254,309	11.0
Parent of a child 12-19 years	370	197,827	8.6
Total	2,010	2,311,931	

SECTION 5: Parent module (Only parent respondents answered the following questions.)

Q18. Which of the following best describes this child's education situation?

Response Options	n	Pop. Est.	%
Has been or will be attending a public school	646	392,553	82.0
Has been or will be attending a private school	81	43,638	9.1
Is home-schooled	19	11,050	2.3
Has graduated from high school or has their GED	47	31,932	1.4
Total	2,010	478,973	

Q19. Is this child in a TAG, or talented and gifted program?

				Parent status	
Response Options	n	Pop. Est.	%	4-11 %	12-19 %
Yes	150	74,728	16.7	8.7%	27.2%
No	592	371,530	83.3	91.3%	72.8%
Total	742	446,258			

Q20.	**Does this child have an IEP, or individualized education plan?**				
				Parent status	
Response Options	n	Pop. Est.	%	4-11 %	12-19 %
Yes	113	60,811	14.2	9.7%	20.3%
No	594	367,032	85.8	90.3%	79.7%
Total	707	427,843			

Q21. In general, how much interest does this child show in science, technology, engineering, and math topics?					
				Parent status	
Response Options	n	Pop. Est.	%	4-11 %	12-19 %
A lot of interest	365	215,117	47.8	50.9%	43.9%
Some interest	282	155,298	34.5	33.5%	35.9%
Little or no interest	98	79,388	17.6	15.6%	20.2%
Total	745	449,804			

Q22.	**How well is this child doing in these subjects?**				
				Parent status	
Response Options	n	Pop. Est.	%	4-11 %	12-19 %
Very well-prepared	482	270,930	61.8	61.8%	61.8%
Somewhat prepared	221	135,963	31.0	31.2%	30.8%
Not well-prepared	33	31,733	7.2	7.0%	7.5%
Total	736	438,626			

Q23.	**How well is this child being prepared in these subjects by the school he or she attends?**									
				Parents of children ages 4-11 (NOT significant)			Parents of children ages 12-19 (Significant*p=0.02)			
				Location				Location		
Response Options	n	Pop. Est.	%	Farm/ Sm. Town	Lg. Town/ Sm. City	Lg. City	Subgrou p %	Farm/ Sm. Town	Lg. Town/ Sm. City	Lg. City
Very well-prepared	352	205,988	46.8	40.2	40.6	65.3	47.6	37.5	53.2	62.0
Somewhat prepared	320	196,981	44.8	53.9	45.1	32.2	42.9	50.6	42.2	27.2
Not well-prepared	62	36,733	8.4	5.9	14.2	2.5	9.6	11.9	4.5	10.8
Total	734	439,702								

Note: Questions 24 and 25 were answered by parents of children aged 12-19 years only.

Q24. Which of the following do you think this child will most likely do after high school graduation?						
				Location		
Response Options	n	Pop. Est.	%	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %
Attend a 4-year college or university	255	117,903	61.1	60.3	56.4	68.8
Attend a 2-year community college	66	42,525	22.0	25.4	23.3	13.5
Attend a vocational or training school	20	13,961	7.2	4.2	11.9	7.4
Enlist in the military	8	8,799	4.6	4.3	1.6	8.9
Work	5	968	0.5	0.9	0.3	0.0
Something else	10	8,848	4.6	4.9	6.5	1.5
Total	364	193,004				

Q25. Do you think your child will pursue a career in a field related to science, technology, engineering, or math?						
				Location		
Response Options	n	Pop. Est.	%	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %
Yes	206	105,278	59.3	63.9	58.4	51.4
No	125	72,236	40.7	36.1	41.6	48.6
Total	331	177,514				

Q26. Considering future job prospects and this child's interest and abilities, would you encourage or discourage your child if they wanted to pursue a STEM career?					
				Parent status	
Response Options	n	Pop. Est.	%	4-11 %	12-19 %
Encourage	728	438,527	97.3	98.0	96.5
Discourage	17	12,015	2.7	2.0	3.5
Total	745	450,542			

Note: Questions 27 and 28 were answered by parents of children aged 4-11 years only.

Q27: Keeping in mind there is a limited amount of time in the school day, do you think elementary schools should increase, decrease, or keep the same, the amount of time spent on…? (Answered by parents of an elementary child)

	n	Pop. est	Increase	Keep the same	Decrease
Computer and technology skills	376	252,948	50.2%	47.7%	2.1%
Reading and writing skills	378	254,129	44.5%	54.8%	0.7%
Hands-on science activities and other science knowledge	376	253,418	64.2%	35.8%	0.0%
Handwriting and penmanship	375	251,869	27.4%	61.9%	10.8%
Learning how to cooperate, share work with other classmates	376	253,441	29.4%	60.9%	9.7%
General math concepts such as estimation and word problems	375	251,399	45.0%	54.7%	0.3%
Basic math such as multiplication and long division	373	252,111	52.6%	45.3%	2.0%
Physical education	376	253,117	25.4%	70.6%	4.0%
Social studies and geography	376	251,822	27.7%	67.7%	4.6%
Art, music, and drama	376	253,117	21.1%	68.6%	10.6%

Q28. Please tell me how strongly you agree or disagree with each of the following statements. (Answered by parents of an elementary child)

	n	Pop. est	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
It is very important to me that this child does well in math.	379	254,309	80.6%	19.3%	0.0%	0.1%	0.0%
It is very important to me that this child does well in science.	379	254,309	71.2%	28.5%	0.1%	0.2%	0.0%
It is very important to me that this child has some technology skills.	379	254,309	65.1%	34.7%	0.0%	0.1%	0.0%
It is very important to me that this child has some exposure to engineering concepts.	378	254,309	49.5%	44.2%	0.5%	5.7%	0.1%

Note: Questions 29 and 30 were answered by parents of children 12-19 years only.

Q29. Keeping in mind there is a limited amount of time in the school day, do you think middle schools and high schools should increase, decrease, or keep the same, the amount of time spent on…? (Answered by parents of a Junior/High school child)	n	Pop. est	Increase %	Keep the same %	Decrease %
Computer science/programming	365	194,369	55.3	43.1	1.7
Practical math skills such as balancing a checkbook	367	196,786	62.8	36.3	0.9
Learning how to work well as part of a team	368	196,759	61.0	36.5	1.9
Basic reading and writing skills	370	197,827	51.7	47.7	0.5
Basic engineering principles	357	191,483	50.2	46.8	2.9
Basic scientific ideas and principles	369	197,736	43.6	56.2	0.1
Statistics and probabilities	358	189,628	31.5	4.6	63.8
Concepts taught in algebra	366	194,219	40.0	59.2	0.8
Foreign language	368	196,734	32.2	59.1	8.7
Civics and social studies	368	197,196	25.9	70.5	3.6
Advanced science such as physics	368	197,105	43.6	55.1	1.3
Advanced math such as calculus	364	196,016	39.5	54.5	6.0
Art, music and drama	368	193,269	25.9	65.1	9.0
Physical education	369	197,472	21.1	70.7	8.2

Q30. Please tell me how strongly you agree or disagree with each of the following statements. (Answered by parents of an Junior/High school child)	n	Pop. est	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
It is very important to me that this child has some advanced math skills	368	197,038	56.1%	37.2%	0.3%	6.3%	0.1%
It is very important to me that this child has some advanced science skills	366	195,432	47.4%	45.0%	0.4%	7.0%	0.1%
It is very important to me that this child has some advanced technology skills	368	197,038	47.1%	46.9%	1.3%	4.5%	0.1%
It is very important to me that this child has some exposure to advanced engineering concepts	368	197,038	26.1%	55.5%	2.8%	15.4%	0.2%

Note: Frequencies not presented for questions 31-33.

Section 6: Demographics

Q34. Are you…

Response Options	n	Pop. Est.	%
Male	909	1,129,261	48.8
Female	1,101	1,182,670	51.2
Total	2,010	2,311,931	

Q35. What is your current age?

Response Options	n	Pop. Est.	%
18-24	136	311,081	13.5
25-34	200	387,870	16.8
35-44	427	358,096	15.5
45-54	468	451,037	19.5
55-64	357	401,338	17.4
65+	422	402,509	17.4
Total	2,010	2,311,931	

Q36. What is the highest level of education you have completed?

Response Options	n	Pop. Est.	%
Less than high school graduate	51	255,152	11.0
Grade 12 or GED (high school graduate)	426	751,489	32.5
One or more years of college but no degree	358	388,089	16.8
Associate's or other 2-year degree	311	335,835	14.5
College graduate with a 4 year degree such as a BA or BS	551	425,385	18.4
Graduate degree completed (MA, MS, MFA, MBA, MD, PhD, EdD, etc.)	311	153,300	6.6
Total	2,008	2,309,250	

Q37. Do you have a degree or some form of advanced training in a field related to science, technology, engineering, or math?																		
				Gender**p= 0.001		Education**p<0.001			Parent status**p=0.01			Location			Race			
Response Options	n	Pop. Est.	%	M %	W %	HS/ less %	Some colleg e %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
Yes	702	663,840	28.8	33.6	24.2	11.5	36.9	48.8	27.0	37.6	34.7	27.1	29.5	30.6	29.2	10.9	31.1
No	1,300	1,639,726	71.2	66.4	75.8	88.5	63.1	51.3	73.0	62.4	65.3	72.9	70.5	69.4	70.8	89.1	68.9

Q38. Which of the following best describes where you live? Do you live…			
Response Options	n	Pop. Est.	%
On a farm or in an open rural area	453	471,002	20.5
In a small town of less than 5,000 persons	558	485,952	21.1
In a large town of 5,000 to less than 25,000 persons	323	437,014	19.0
In a city of 25,000 to less than 50,000 persons	214	226,802	9.9
In a city of 50,000 or more persons	448	676,972	29.5
Total	1,996	2,297,743	

Q39. Are you currently…?			
Response Options	n	Pop. Est.	%
Employed for wages	1,097	1,193,411	51.6
Self-employed	224	255,458	11.1
Out of work for more than 1 year	29	54,104	2.3
Out of work for less than 1 year	37	66,822	2.9
A Homemaker	87	103,762	4.5
A Student	62	125,244	5.4
Retired	409	419,355	18.1
Unable to work	64	93,155	4.0
Total	2,009	2,311,311	

Q40. Are you or were you recently employed in a career that significantly uses skills in science, technology, engineering, or math?																		
				Gender**p< 0.001		Education**p<0.001			Parent status*p=0.01			Location			Race**p=0.01			
Response Options	n	Pop. Est.	%	M %	W %	HS/ less %	Some colleg e %	BA or more %	Not parent %	4-11 %	12-19 %	Farm/ Sm.Town %	Lg. town/ Sm. City %	Lg. City %	White %	Black %	Other %
Yes	997	990,085	50.0	56.7	42.5	37.3	54.2	64.0	48.1	60.8	55.0	53.3	45.0	50.1	51.8	22.7	26.1
No	793	991,340	50.0	43.3	57.5	62.7	45.8	36.0	52.0	39.2	45.0	46.7	55.1	49.9	48.2	77.3	73.9

Q41. What is your annual gross household income from all sources before taxes? Is it…

Response Options	n	Pop. Est.	%
Less than $15,000	110	176,503	9.2
$15,000 to less than $25,000	113	198,017	10.3
$25,000 to less than $35,000	153	216,179	11.3
$35,000 to less than $50,000	232	264,595	13.8
$50,000 to less than $75,000	360	374,234	19.5
$75,000 to less than $100,000	289	270,971	14.1
$100,000 to less than $150,000	259	247,996	12.9
$150,000 or more	182	167,225	8.7
Total	1,698	1,915,719	
Don't Know/Refused	17% of respondents declined to answer		

Q41b. (If Q41=Don't know or refused) Can you tell me if your annual gross household income is less than, equal to, or greater than $50,000?

Response Options	n	Pop. Est.	%
Less than $50,000	86	122,310	42.7
Equal to $50,000	21	28,146	9.8
More than $50,000	111	136,301	47.5
Total	218	286,756	

Q42. Are you of Hispanic, Latino, or Spanish origin?

Response Options	n	Pop. Est.	%
Yes	39	115,353	5.0
No	1,969	2,195,986	95.5
Total	2,008	231,339	

Q43. Which one or more of the following would you say is your race?

Response Options	n	Pop. Est.	%
White	1,942	2,155,064	93.2
Black or African American	22	62,740	2.7
Other	46	94,127	4.1
Total	2,010	2,311,931	

Q44. (If more than one response to Q43) Which one of these groups would you say best represents your race?

Response Options	n	Pop. Est.	%
White	75	2,146,181	92.8
Black or African American	22	63,518	2.7
Asian	17	19,130	0.8
Native Hawaiian or Other Pacific Islander	2	1,513	0.1
American Indian or Alaska Native	18	25,319	1.1
Other	31	80,312	3.5

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	2,102	47.1%	69.1%	32.3%	36.6%	92,101	38.1%	62.8%	28.9%	20.2%
It's okay	Somewhat interested	1,500	33.6%	27.2%	39.2%	32.4%	86,685	35.9%	31.1%	40.5%	36.1%
I don't like it very much	Not very interested	863	19.3%	3.6%	28.5%	31.0%	62,741	26.0%	6.0%	30.5%	43.6%
Total		4,465					241,527				

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	1,528	34.3%	44.4%	29.1%	24.6%	69,551	28.8%	39.6%	26.7%	18.9%
It's okay	Somewhat interested	1,915	43.0%	39.2%	45.5%	44.7%	103,722	43.0%	41.9%	45.2%	41.8%
I don't like it very much	Not very interested	1,013	22.7%	16.4%	25.4%	30.7%	67,988	28.2%	18.5%	28.1%	39.3%
Total		4,456					241,261				

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	2,064	46.3%	56.7%	39.2%	41.9%	89,055	36.9%	49.4%	32.6%	27.5%	
It's okay	Somewhat interested	1,784	40.0%	34.7%	44.3%	40.3%	104,093	43.2%	38.7%	46.3%	44.8%	
I don't like it very much	Not very interested	608	13.6%	8.6%	16.5%	17.8%	47,889	19.9%	11.9%	21.0%	27.6%	
Total		4,456					241,037					

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	2,131	47.8%	64.7%	40.0%	29.3%	113,668	47.2%	67.2%	42.5%	29.4%	
It's okay	Somewhat interested	1,399	31.4%	27.6%	32.7%	37.0%	73,446	30.5%	24.6%	33.2%	34.1%	
I don't like it very much	Not very interested	927	20.8%	7.7%	27.3%	33.7%	53,926	22.4%	8.2%	24.3%	36.4%	
Total		4,457					241,040					

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	1,420	31.9%	57.3%	16.6%	14.6%	72,833	30.2%	53.2%	18.1%	17.5%
It's okay	Somewhat interested	1,701	38.2%	33.3%	43.2%	35.4%	96,243	39.9%	35.9%	44.5%	39.4%
I don't like it very much	Not very interested	1,330	29.9%	9.4%	40.2%	50.0%	71,985	29.9%	10.9%	37.4%	43.1%
Total		4,451					241,061				

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	2,444	54.9%	75.0%	42.9%	40.7%	117,720	48.9%	73.2%	42.5%	28.2%
It's okay	Somewhat interested	1,465	32.9%	20.5%	40.5%	40.6%	84,394	35.0%	21.6%	38.8%	46.0%
I don't like it very much	Not very interested	546	12.3%	4.5%	16.5%	18.7%	38,865	16.1%	5.2%	18.7%	25.7%
Total		4,455					240,979				

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	1,195	26.9%	29.3%	26.1%	23.2%	61,726	25.6%	28.2%	25.5%	22.8%
It's okay	Somewhat interested	1,915	43.1%	47.9%	40.5%	38.7%	101,982	42.3%	47.7%	40.6%	38.1%
I don't like it very much	Not very interested	1,337	30.1%	22.9%	33.4%	38.1%	77,242	32.1%	24.1%	33.9%	39.1%
Total		4,447					240,950				

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	2,117	48.2%	48.2%	46.7%	52.5%	98,882	41.6%	44.3%	42.3%	37.7%
It's okay	Somewhat interested	1,678	38.2%	36.6%	40.6%	34.5%	98,066	41.3%	39.3%	42.6%	42.1%
I don't like it very much	Not very interested	601	13.7%	15.1%	12.7%	13.0%	40,603	17.1%	16.4%	15.1%	20.1%
Total		4,396					237,551				

Appendix I: Regional Scale-Up Program_RPO instrument

All LEAs implementing Scale-Up programs are required to submit a Report of Process and Outcomes (RPO). The general purpose of the RPO is to inform the Iowa STEM Monitoring Project by providing the Monitoring Team with consistent information from all Scale-up programs implemented in the Hub Regions.

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 in your LEA. Your responses to these questions will enable us to provide a detailed story about Iowa's STEM Scale-up programs in 2012-13.

The deadline for submission of the RPO can be flexible and determined based on the Scale-Up timeline, but should be completed online by May 10, 2013. If you have questions about gathering or completing this information, please contact Mari Kemis (mrkemis@iastate.edu), Disa Cornish (disa.cornish@uni.edu), or your regional hub manager.

Please enter your name.

Please enter your email address.

Please enter your phone number.

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)
Fabulous Resource in Energy Education (FREE)
FIRST Lego League
FIRST Tech Challenge
HyperStream
iExploreSTEM
KidWind
Project HOPE
The CASE for Agriculture Education in Iowa
State Science + Technology Fair of Iowa
Partnership for Engineering and Educational Resources for Schools (PEERS)
Corridor STEM Initiative (CSI)--Engineering is Elementary (EiE) Component

Participant Demographics

Please indicate the participants in your Scale-Up program. (Check all that apply.)

- K-12 students
- Parents
- Teachers
- Other (Please describe)

Please complete the following to describe the student participants in your program.

- Total number of individual student participants
- Grade level(s) (indicate the grade or range of grades)
- Percentage male
- Percentage female

Please complete the following to describe the parent participants in your program.
Leave blank if no parents participated in your program.

- Total number of individual parent participants
- Percentage male
- Percentage female

Please complete the following to describe the teacher participants in your program.
Leave blank if no teachers participated in your program.

- Total number of individual teacher participants
- Grade level(s) (indicate the grade or range of grades)
- Percentage male
- Percentage female
- Subject(s) taught

Please complete the following to describe the other participants in your program. Leave blank if no others participated in your program.

- Total number of individual other participants
- Percentage male
- Percentage female

Implementation

In your application, you outlined an implementation timeline and plan. How closely did you adhere to your intended timeline and plan? Describe any changes in your implementation plan or timeline and provide reasons for the changes.

Did you customize the model for the Scale-Up program for your unique local needs?

Yes, I customized the model (please describe)
No

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?

Please explain if you answered "not at all" to any of the above.

Describe any challenges or barriers you faced in implementing the Scale-Up program in your LEA.

What, if anything, 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, if any, 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

Which of the following outcomes, if any, did you observe as a result of your program? (Check all that apply.)

Increased awareness in STEM topics
Increased interest in STEM topics
Increased awareness in STEM career opportunities
Increased interest in STEM career opportunities
Increased achievement in STEM topics
Increased interest in STEM educational opportunities in college
Established partnerships between schools and local businesses
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
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_Other Participants

Prepared by Research Institute for Studies in Education (RISE), Iowa State University

- 3rd - 5th Talented and Gifted Students
- Adult Mentor / Advisor
- Aide
- Because of the relative lack of communication we did not receive our materials and eventually purchased them out of other funds. We followed the FLL curriculum.
- Community member (2)
- Community Partner: Iowa State University Extension
- Community volunteer
- County 4-H Coordinator
- County Engineer (volunteer)
- Dave Johnson, our engineer-mentor
- Engineer from a partner industry
- Engineer volunteer coach
- Engineering Mentors
- Engineering resource person Iowa State University
- Engineers from John Deere
- Engineers, program staff, software programmer
- Former students
- Grades 1-2, 6-8
- Grandparent
- Industry and community volunteers
- John Deere Mentors and UNI mentor
- Mentor from business
- Mentor from John Deere
- Mentors (2)
- Mentors either studying in a specified field related to technology or are professionals within the field of technology.
- Mentors, Businesses, and Community Members
- Mentors, local industry
- NRCS, Madison County Conservation
- One volunteer
- Our technology expert employed by our school
- Para professionals
- Pre-service elementary teachers
- Pre-service teachers
- Professor Matt Frank from ISU came to class to talk about wind energy and wind turbine blade research
- Robotics Mentor - Rockwell Collins
- Second coach
- Senior citizens
- UNI Education student involved in Robotics
- University of Iowa Students WISE (Women in Science and Engineering)
- Volunteer

Appendix K: Regional Scale-Up Programs_Courses Taught by Participating Teachers

- 21st Century Skills
- 3rd grade
- 5/6 grade science, 8 physical science, earth science
- 5th, gifted K-5
- 8th grade Science and 3r-4th grade Tag
- Acoustical Engineering
- Administrator
- Ag and Science
- All (18 responses)
- All Core Subjects
- All General Education subjects
- All subjects
- All subjects elementary education
- Before and after school care
- Biology
- Chemistry, Anatomy, Physiology, and Applied Science
- Chemistry, Physics, Engineering
- Chemistry, Physics, Physical Science, Earth Science
- Computer Science
- Computer, PLTW, Mathematics
- Earth, life, physical
- EAST
- EC, Elem
- Elem Classroom
- Elementary classroom teachers, TAG, middle school science
- Elementary Ed
- Elementary Education and Gifted and Talented
- ELL (previously a Science teacher for many years), Math
- ELP/Science
- Engineering and Design, Earth Science, Physical Science
- Engineering and Special Education
- Engineering, Technology Education
- English, reading, art, ELP
- English, Science, Math
- FCS, TAG, Guidance
- Gateway to Technology
- General education
- General
- General science
- Gifted and Talented (7 responses)
- Grade 2 classroom
- Guidance
- Health
- HS Science
- Industrial Technology, TAG
- Industrial Arts
- Industrial Technology/Engineering
- Industrial Technology (3 responses)
- Industrial Technology and Talented and Gifted
- Industrial Technology and Project Lead the Way
- K-3
- Kindergarten, First Grade, STEM for grades K-5 and Health for grades K-5. Art for grades 4-5.
- Language Arts
- Library and TAG
- Life Science/Biology/Anatomy
- Life Skills, Technology, ELP
- Magnets
- Math (5 responses)
- Math and Science (10 responses)
- Math Science Social Studies Language Reading
- Math, Science, and Technology (2 responses)
- Math, exploratory
- Math, science, social studies, art, language arts, speech
- Math, Science, Social Studies, Language.
- Math/Engineering
- Mathematics/computers
- Media, Spanish, Technology, PE,
- Multimedia
- Physical Education, Student Administrative Manager
- Physical Science
- Physical Science and Physics
- Physical Science, Chemistry
- Physical Science, Geology, Biology, Astronomy
- Physics, Chemistry, General Science
- Physics, Consumer Science, Art
- Physics, Engineering
- Physics, I-Tech
- Physics, Physical Science
- PLTW
- PreK

- Programming, Google Docs, Alice, Lego Robotics, NUMEROUS IPAD APPS
- Public Librarian
- Reading, language, spelling, math, and social studies
- Reading, science
- Reading, science, math
- Reading, Writing, Spelling, Math, Science
- Reading/Writing
- Religious
- Robotics
- Science (30 responses)
- Science and Math and Autism Class
- Science and Reading (2 responses)
- Science and Social Studies
- Science and Special Education
- Science and TAG (2 responses)
- Science, Math, and Special Education (2 responses)
- Science, Computers, Technology
- Science, ELP
- Science, English, Social Studies, Exploratory (2 responses)
- Science, Industrial Technology, Social Studies, and Careers
- Science, Math, Engineering, Computer Science
- Science, Math, Language arts
- Science, Math, Literacy
- Science, Math, Reading, Language, Social Studies, Religion
- Science, Math, TAG
- Science, Reading
- Science, Technology, TAG
- Science, Writing, Special Education
- Science (elementary)
- Science, Language Arts and TAG (2 responses)
- Science/Physics
- Self-contained classroom
- Social Studies
- Social Studies, Language Arts, Talented and Gifted
- Special Education
- TAG, Social Studies, and English
- TAG, Spanish
- Talented and Gifted (7 responses)
- Technology Education (2 responses)
- Technology/TAG
- Vocational Agriculture, Industrial Technology, Technology, Talented and Gifted
- Wind Energy

Appendix L: Regional Scale-Up Program_Open-Ended Comments

Prepared by Research Institute for Studies in Education (RISE), Iowa State University

In your application, you outlined an implementation plan. How closely did you adhere to your intended timeline and plan? Describe any changes in your implementation plan or timeline and provide reasons for the changes.

- 100% on target. We participated in the regional competition as scheduled. We did not make it to the State Competition as we had hoped.
- Actual implementation timeline and plan similar to outline.
- Adhered to the timeline pretty well. I would change anything, but know if the grant was award in the summer would benefit future participants.
- Because the arrival of the kits and training were after January 1, I was unable to use the kits with the Grade 8 group as planned. That group only meets with me first semester. Instead I was able to use the kits to reach more students over a wider grade span.
- Because we started late with FIRST Lego, we continued after the competition.
- Being the first time through this I relied heavily on materials provided and trial and error.
- Changed some due to state testing but stuck close.
- Close to the intended timeline.
- Close to the plan. Added more time for practice in November, instead of 2 - 3 days per week, we practiced 4 days per week.
- Closely followed the FTC schedule/plan.
- Complete all grades at end of April. Wanted to do it at a different time but needed to do to report
- Did it later in the year than planned due to snow days.
- Did not follow the timeline and plan as hoped. We had difficulty finding a partner to help us with our gaming unit. I went ahead and taught the gaming unit without the partnership because we needed to move on to other curricular units before the end of the school year.
- Did not adhere to timeline. We didn't get our kits when we thought we would due to it being the first year and figuring out how things worked. It didn't take as much time to prepare/organize as what I had imagined because the guides are very well written and easy to follow. I plan to give myself 2 weeks to teach the unit next year. I am replacing the story with another lesson because it takes too long to read and the amount of understanding that comes from it isn't enough.
- Due to additional funding, I was able to purchase three EiE unit kits instead of just two. Therefore, I had the opportunity to teach A Slick Solution: Cleaning an Oil Spill in conjunction with our environmental changes/impact unit in January. Curriculum adjustments to adapt to an unexpected science-based field trip resulted in me teaching The Attraction is Obvious: Maglev Systems in December, which was earlier than I had planned. Weather-related school cancellations prevented me from teaching A Long Way Down: Designing Parachutes when I planned although I still plan to teach the unit at the end of May.
- Due to the lateness of the grant receipt, we began our program in December.
- Due to the later hiring of the teacher who headed up this program, our initial start was slightly delayed, but we were able to get going and adhere and remain consistent to all timeline forecasts.
- Due to the leaving of the PEERS contact person from Pella, our timeline was changed. We didn't officially receive our MOA although we talked about many possible plans prior to that date. The majority of really putting plans in place took place March through early May. Some implementation is schedule for summer. Under the circumstances, this was approved by the hub manager.
- Due to time and scheduling constraints, I implemented only one lesson to one group of students, which happened to be all male.
- Due to time management issues and Semester Break, we were able to stay close to our plan but fell behind a little bit. / The building and programming occurred later than planned because of time and activity issues of our students involved.

- Everything was implemented according to the plan. We were able to register and compete in two qualifying events, and we received all of our necessary materials in a timely manner.
- Fairly closely. Two of the AWIM kits took a lot longer to work through with the students than we anticipated, so our overall progress slowed by about 6 weeks.
- Followed it very closely.
- Followed plan for the season.
- Followed the plan except for the expected receipt of the field materials required a temporary set-up for this year. We are still waiting for the field border.
- Got a later start than expected because of waiting for the material. Basically followed the plan. However [we] increased meeting time as the qualifiers dates got closer.
- Had to alter the implementation of the program due to meeting other school requirements by the end of the year.
- I adhered as close as possible. I had the training in January. I prepared and ordered the curriculum afterwards and started the STEM unit in March. We did through March, April and finished early May.
- I adhered as planned with the exception of grade 2. I could not begin the unit until they had the FOSS kit for weather. They are just beginning that now so I am just starting this final kit at the end of the school year and have no data for that grade. I decided to purchase the books in sets for students to read outside of class time. I did not like using two class periods to read the book aloud, plus the students get antsy. I added a close reading/annotated reading piece because our district is focusing on this skill. For example, I found articles in Science World magazine that fit nicely with each unit. Third graders read an article of echolocation in the ocean for the Sound unit. Fifth graders did extra reading about oil spill effects and also acidification of coral reefs. They were a nice addition to the unit.
- I adhered pretty closely.
- I adhered to the timeline for the FTC program. I competed in the required elements and fulfilled the expectations of the MOA.
- I believe we achieved the timeline.
- I changed the timeline based on our daily schedule changes.
- I did adhere to my original time line. Because I am new teacher with new students, whom I meet with only once a week, I decided to make our timeline longer than the typical FLL schedule. We also had to build a table, add a computer, and find a room to locate our group. It was helpful for my students to attend a competition to see the big picture of FFL. They still approached their work using the same guidelines even though we did not compete.
- I did not adhere very closely to the implementation timeline and plan. I ended up not be able to utilize the activities for a few units because we were already past the time for that material. In addition, the physical science class took much longer to get through their material on chemistry this year, and we were not able to get to the AWIM stuff until the last quarter of school.
- I did not fill out an application; therefore I did not implement a timeline and plan. I received training in January on 2013, and decided I would implement this program at the end of the school year. Therefore, I have not completed the plan at this time.
- I did not start the STEM program as soon as I would have liked due to finishing up the other units I had to teach.
- I did pretty well sticking to my timeline with the students with just a few adjustments. I had HUGE plans with lots of new things I wanted to try but I just simply ran out of time! I had to drop some of the steps in my EiE kits, I had to simplify my Forensics unit, and I didn't get as many assessments in as I would have liked. The reasons for these changes were: we had several snow days (so school was canceled); many of my students are in Show Choir so I had to share days with Choir (so I got less time with the kids); and several basketball games were rescheduled on Science Club days (due to snow days) and I had less students on those days.
- I don't have it in front of me. My principal filled it out and asked if I would sign my name on the form. As far as I know, we stuck to the intended timeline but I can't say for absolutely sure.
- I don't particularly recall our timeline. I believe we adhered closely to the general flow of it. It included recruitment, participation in practices and tournaments, and fundraising/community involvement efforts, all of which we had done.

- I don't remember outlining a timeline and plan when I originally applied. We met twice a week for an average of 5 hours/week to work on developing our robot to participate in two FIRST Tech Challenge qualifying tournaments. There were no changes in our implementation plan or timeline.
- I feel a followed the timeline quite well since it was my first time implementing this material.
- I feel I did as I said I would.
- I feel we did quite well in our implementation and timeline. We actually met more often than originally thought and the students are all excited about continuing our team next year!
- I followed closely to the plan.
- I followed our plan.
- I followed the implementation timeline and plan but needed to work around the students' activity schedule and mentor's work schedule.
- I followed the original plan fairly close. We did revisit some energy topics in April that originally I had not planned to discuss because I learned about the Iowa Energy Games through Pat Higby in a workshop for FREE. I ordered some free solar car kits for the students to put together and they have had a great time problem solving and prepping for the Energy Games.
- I followed the timeline as closely as I could, but some things we skipped over due to it being repetitive.
- I followed the timeline completely.
- I had to change my timeline because there are so many great lessons in the kits I received and I want to make sure I am doing them justice! I am newly in 2nd grade after many years in 4th grade and getting used to the FOSS kits for 2nd grade took more teaching time than I had planned. I am going to use more of the Engineering is Elementary kits next fall with my students once I get the plan down!
- I have tried very hard to adhere to my original timeline but have had to deviate slightly. The changes were due to a large number of snow days. This caused an interruption in our academic calendar. I have had to shorten some of the KidWind initial explorations in order to be prepared for competition. Since it will not be effective to go back and do extension activities, which would have preceded the initial turbine build, I have decided to self-design different extension activities, which we can do in the days after the competition. I will have students comparing turbines, which have other uses than energy generation and they will be sharing their knowledge both at community presentations and with incoming Freshman. Activities may be modified further based on student ideas and inputs after our field trip to a wind farm and college wind program.
- I haven't been able to use an entire kit with my students yet but they are excited about all the resources and have liked the short introduction we've had.
- I held to the timeline.
- I held to the timeline.
- I implemented the program after my FOSS Balls and Ramps unit was completed, instead of using them together. I felt the students would be more successful with AWIM after completing the FOSS unit.
- I implemented the timeline and plan as I intended.
- I kept pretty closely to my plan.
- I pretty much stayed with my timeline and plan.
- I pretty much stuck to my timeline though some activities took more time than anticipated.
- I started the curriculum later than anticipated due to weather issues and Iowa Assessment testing. This resulted in completing the curriculum later in the year than scheduled.
- I stayed close to my timeline.
- I stayed within my timeline.
- I stuck to my outline fairly well. I did have to lengthen the amount of time a bit because some steps of the fuel cell project took a bit longer than expected.
- I stuck to my plan well. I provided plenty of time for the activities and we stayed on course.
- I stuck to my timeline with the exception of taking a week longer with the A World in Motion—Engineering Inspired by Nature unit.
- I stuck to the timeline, but didn't account for presentation of ending product so 2 weeks longer than what I initially thought.
- I think I kept fairly close to it. I was able to teach about sound before I started the STEM (EiE) program in February. We were able to do the entire program everyday for 45 minutes for 3 weeks.
- I think we followed it pretty closely.

- I took more time than the lessons stated. With younger kids, it took longer for each lesson.
- I used the last quarter of school which is what I intended to use. Instead of 4 weeks, it took me 6 weeks to complete with an additional planned Parent Night to demonstrate finished products.
- I was able to adhere to my timeline as I had some flexibility in my daily schedule.
- I was able to follow the implementation timeline as planned. One of the reasons implementation went as planned even with multiple days lost for snow was because of the initial training. I was prepared to know what the students needed to know and all activities easily fit within multiple units.
- I was able to implement all of the materials within the guidelines of the first year as planned, but the projected dates of implementation were not followed. First of all, I began implementation later than anticipated due to the required training and then waiting for materials. The training was very useful and necessary, I was just not aware of the timeline involved before submitting my original plan.
- I was able to implement the plans from the kid wind program within 2 weeks of my original plan due to length of previous unit. I followed my original plans when completing the unit.
- I was able to stay very close to my intended timeline and plan, so we could participate in our local FLL competition.
- I was hoping to implement the EiE with every unit of science that we cover. Unfortunately, because of time constraints and a new curriculum it was not possible to do so. I successfully implemented the EiE with fifth grade in each unit and have high hopes in implementing it with grades 2-4 next year since I'll have more time to dig through the EiE resources.
- I was not able to adhere to the original plans and timeline. This was due to the fact that by the time I attended the one-day training for the materials, we were already past that particular unit for the class I had intended to use it in. I did use it in another class as a 'trial' run and we are now actually using the KidWind materials in the original class.
- I was somewhat close. I didn't realize that the competitions would be so soon in the fall. My timeline was off because of the time I assumed there would be competitions. I still followed most of the steps like organizing team and beginning practices. We just haven't actually competed in a competition. We did observe one.
- I worked to make the plan fit my schedule once we received all of the materials from the grant. I was pressed for time with the robotics side of things because of the delay with the materials.
- Implementation timeline and plan was adhered to during the "season." Additionally, the team continues to meet during their "off-season." 3 females will be coming to next week's meeting and the team will be working on a robot to roam the school and perform at an assembly in an effort to promote the program.
- Implementation Timeline: February 11th - March 15th. Implementation Plan: Adjusted to accommodate acquired materials. For the original application, I did not have the materials, teaching guide, and professional development training session. After completing the training and viewing the materials I made adjusts to the timeline and expected outcomes. Students went through four stages of planning, building, informal testing, and formal testing ending with a presentation of their final JetToy.
- Implementation was a challenge because of weather and flu season. Some teachers are still working with the kits. It is a highly probable that some classes will not get the kit completed prior to the end of the school year.
- Implementation was carried out as described in the plan.
- Implementation was off due to a later start time and in receiving materials. Also had no sponsor to assist in areas outside of what I know.
- In my implementation timeline, I indicated we would begin the Engineering is Elementary unit in Oct/Nov 2012. However, the curriculum training took place later than I anticipated (Dec 2012), so we did not begin the unit until Jan 2012 (finishing in Mar 2012). In addition, completion of the unit took longer than originally planned because two sessions were cancelled due to weather.
- Initially it was planned to offer this mini science camp during Christmas break to be an entire day. However, the training was later than expected and so it was held the end of February for a week after school instead.
- Initially, when I applied for the grant, I didn't realize that the regional competitions were finished during the calendar year. We received the grant in the fall, and our competition was in December. The FIRST LEGO League teamwork went much faster than I anticipated. I had planned to let all the students use the robot and learn to program it during exploratory class. Because of the regional being in December, that didn't happen. However, since the competition, I am pleased to report, we have our LEGO field mat table set up in my

room, and it is constantly busy at the table during genius hour, which is akin to Google's 20% time. Students work on answering a question of their choice or solving a problem they want to. Signing up for our robotics center is always a favorite.

- It became difficult to stick to the plan and timeline as I had anticipated due to the late arrival of our materials, but when it did arrive we were full steam ahead and now are up and running with both Alice and the Lego Mindstorms robots!
- It took a lot longer to implement that expected. Fifteen days took almost six weeks.
- It was actually quite difficult to stay on track with timing because our testing was so closely tied to the sun being available. I suppose I have never tracked the weather as closely as I have been, but we have had literally three weeks of cloudy days and rain! Also, it was hard to plan for materials, as it was difficult both communicate and receive the supplies we needed from UNI...what may only seem like a few days can have a HUGE impact on the execution of this project.
- Maintained the timeline.
- Meet on a weekly basis or at least have it scheduled. Due to snow/weather since January. We have also had meetings more than originally plan for time periods of 4 to 5 hours. The students took more initiative in getting awareness to community.
- My classes took place after school in February and March.
- My plan changed completely. The NXT software and Mindstorms Lego Kit did not arrive until the end of October. The amount of time required for forming a team, building and programming the robot, practicing, researching a senior problem and coming up with a solution, in order to compete by the first of December, was overwhelming. The STEM Start-up teams were informed that participation in a competition was not mandatory, although encouraged, but teams were required to attend a regional or the state competition. We chose to attend the state competition in Ames on January 19th. Being able to see how the competition is run was beneficial for my team. We are still meeting twice a week after school to work on our robot and plan to demonstrate all our efforts for the student body and parents later in the spring. The team is already planning to work together for next years' competition. Starting at the beginning of the school year will allow the time for us to compete in the regionals.
- My timeline had to be extended due to snow days in our district.
- My timeline originally began in September, with goals for each month until December. Because the grants were awarded and materials were sent much later, we were unable to stick with our implementation timeline and plan. While we were not ready to participate in an FLL event, the students worked well at our school and will be presenting what they've learned to parents and community members.
- My timeline was changed. We did not receive our kits until January and I had to complete the unit I was on before starting this unit. Also, I was unable to coordinate my professional engineer to come in and speak for about a week after that. The unit also took longer than I originally planned due to excessive interruptions with our schedule at school. We started the unit the first part of March and completed it on May 1.
- N/A
- No changes were made to timeline and plan.
- No changes were made.
- No changes.
- No we did not.
- No. The timeline for implementation was followed.
- Not very close at all. I had to make drastic changes, as it was difficult to organize and learn about the program all at once. It was also difficult to get a hold of the materials to get actual productive work started on the robot.
- November was professional development. December through April bi-weekly system instruction days. April—KidWind Challenge.
- One program was rescheduled due to weather and also the reason our reporting is tardy.
- Ordering and receiving equipment/materials did not happen according to original plan. Once I received materials, pacing proceeded as I thought it would. With more time I would have finished more of my original plan.
- Originally, I planned on the students building wind turbine blades in conjunction with our Weather/Atmosphere Unit only. Since then, I have learned about the Iowa Energy Games and decided to

give the students time to redesign their wind turbines and make them fit for the contest (KidWind will be at the contest.)

- Our biggest problem was trying to raise the money so that we could buy the supplies. Money has a been very tight here, so we've been working on raising money all year.
- Our FIRST Robotics group adhered to the timeline, which was driven in great part by the dates of the events we signed up for.
- Our FTC team met weekly as well as lunch times with students to create and compete with the robots. Our goal (since we applied late in the season) was to simply compete at an event and get our feet wet. My hope for students was exposure to the program then taper off. Instead, we are continuing to work even though our season is officially over. My hope is students gain extra skills to help next year.
- Our implementation aligned closely with our plan, except for the number of participants. The kits did not arrive until March. By that time, most of the teachers who had planned to participate already had other project started and did not have time left in the year to implement the AWIM kits. Only one teacher had the class time to use the kit, and that did go according to plan. Next year, because we will have the kits right away in the fall, we will have a much wider implementation.
- Our implementation of the science fair occurred several months later than our initial outline due to us not knowing if we received the grant. This did not have any effects on our overall success of the implementation.
- Our implementation plan included attending the one-day professional development and teaching students. Then making our wind turbine and competing. We are just about on schedule with that. However, there has been one positive change to the schedule. I had a chance to teach KidWind to 15 ninth graders during their physical science class. Their teacher and I switched one class for a week. It was delightful to see the older kids work so efficiently. They made some powerful windmill blades and were able to use the advanced blade kit materials and some gears to generate more power. We all learned much!
- Our plan was to meet once a week during January, February and the first 2 weeks in March. Because of snow day cancellations and parent/teacher conferences we will probably meet until the end of March.
- Our program lasted longer than we originally thought it would. We anticipated being done in January and are now finishing in March.
- Our project was to create and deploy a website to be used as our homepage for our 1:1 initiative. We deployed our website two months ahead of schedule, meeting our goal.
- Our start was slightly delayed while waiting for parts to arrive, but overall we were able to adhere to our schedule.
- Our time line was abbreviated because of the lateness in receiving the grant information, but that was the only change.
- Our timeline and plan went just as intended. Our timeline was extended because we earned participation in the state level championship. That extended our timeline by another month.
- Our timeline was achieved.
- Our timeline was to accomplish Project Hope sometime in the spring. We did do just that and are still assessing students at this point.
- Pretty well. We participated in two qualifiers when I expected us to participate in only one.
- Program ran on schedule.
- Right on time.
- Right on track.
- Since this was our first year and we didn't know what to expect, there were many deviations from our plan. First of all, we started after all teams that had done this program before and after some other first year teams. When we finally got started, it was a slow process and huge learning curve. We didn't actually have a functioning robot until a couple days before the first competition. After the first competition we made minor modifications that improved our robot and were much more successful for the 2nd competition.
- Some lessons took a little longer than expected but I mostly stuck to the lesson guide.
- Some lessons when quicker and some went slower than expected.
- Stayed with plan.
- Stayed with the plan, happy with outcomes.
- Students had many different schedules for us to co-ordinate. For several students, sadness thwarted the progress with the death of their father. Overall we made up time by scheduling several lengthy Saturday

Sessions. I would have liked to slowed the pace down a little, but we will include some after school activities because the interest level is very high.

- Students were identified in October to be part of the FLL team. Students participated from October through February (2012-2013).
- The biggest challenge was the short time frame. Since kits did not arrive until October we had a very small window of time to prepare until the Regional Competition.
- The changes in timeline were due to not receiving materials in time, and we are still working on the skills to program the robot, in order to be ready for next year. Also, I intended to have all students with IEPs in the program, but I did end up adding two students without IEPs.
- The competition timeline did not fit into our schedule as the grant was not awarded until late November and the competition date was December 1st.
- The First Lego League team was established as an afterschool program that met twice a week after school from 3:30-5:30 pm. The team began meeting in November and continuing meeting through the month of December. The team competed at the regional competition on December 15, 2012 at West High School in Sioux City.
- The implementation of the materials was done throughout the timeframe. We had issues receiving the reimbursement prior purchasing a second round of materials that slowed our implementation down a bit.
- The implementation timeline was adhered to.
- The lessons were way too long to do in a single class period. Most teachers needed 2-3 class periods to complete a lesson.
- The material implementation and use was extended as we became more familiar with the concepts of the KIDWIND philosophy. / The kids enjoyed changing their designs and the collaboration between lab groups generated challenges to build the BEST outcome of their design.
- The original timeline was followed as planned.
- The plan was followed fairly closely, with the FIRST LEGO League season. Both participating teams qualified for the state tournament to extend their season into January.
- The schedule was generally pushed back and shortened largely for snow days and other unplanned/unforeseen curricula interruptions.
- The season went as planned. We were able to do 3-D printing with a local company so some of our purchase plans were changed. We were able to purchase more sensors and a perpetual license for RobotC.
- The students met weekly, sometimes bi-weekly, throughout the fall, until contest. They are planning to continue to meet monthly, until fall, to continue to learn from the program.
- The time line of implementation was delayed due to snow days. We intend to further use some of the kits from the AWIM materials at a Science / STEM night which will include the entire elementary and their parents.
- The time line was met. I met the time line earlier than expected. I did not know the exact time before entering this program.
- The timeline was adhered to. An afterschool KidWind team was also formed of nine interested students that met twice a week for a month for an hour at a time to help prepare for the KidWind Challenge and learn more about wind energy.
- The timeline was condensed and implementation was at the last minute. This was due to personnel requirements for the project.
- The timeline was followed as closely as possible. Our season of FTC ended with our first competition in December of 2012, but I continued to have students actively participating in FTC activities such as robot design and construction until the end of the school year. This included programming the robot and solving various challenges that were placed before them.
- The timeline was followed closely, with little deviation from the original plan.
- There were definitely some changes in the implementation plan due to getting the HyperStream clubs up and running and working with Tamara to get info together and to do the necessary steps. We started recruitment for our program in December and January and then were able to have a big recruitment day at our school in February. We were meeting in January as a club, but we needed more participants so we continued to recruit students as we had the participants already in the group working on projects. In March until the present, we have been meeting as a group and working on individual projects within the group that the students have been most interested in. Some of them have been working on game design while others were working with robotics and cyber defense. We were not able to participate in IT Olympics because of

the limited time we had once our program got moving, but we intend to participate next year. So, the conclusion of our year will be with the students continuing their work on their projects hoping to carry that knowledge into the next school year!

- There were no major changes to the implementation plan.
- Things have not followed the original since I did not know when I was going to receive the grant. I didn't get the materials until January.
- Time proved to be an issue as weather-related scheduling issues disrupted our schedule.
- Timeline followed.
- Timeline was delayed due to kit of parts and other materials on back order.
- Timeline was extended to increased involvement.
- Timeline was followed as planned in the application.
- Timeline was met.
- Timelines were fairly close. Afterschool schedule due to weather delayed it somewhat.
- University of Iowa grad students came to Fairfield Middle School for 1 week in January. FMS students visited the U of Iowa in March 2013. The timeline was as we anticipated.
- Very close to plan. We started in October and Finished in January. We took time for learning programming and research on building.
- Very closely.
- Very closely.
- Very closely.
- Very closely.
- Very closely. Driven by FIRST program and schedule.
- We added more 5th grade classes than anticipated. The timeline started later than planned, but worked out fine.
- We adhered as closely as possible. The materials were sent to us as promptly as possible and we competed in the last event possible to give us the maximum amount of build time for our robot.
- We adhered closely to our schedule, because the FTC Events were on specific dates as deadlines.
- We adhered exactly according to our timeline. We're currently at the point where we're going to take students to meet with a couple of the businesses they were supported by.
- We adhered exactly as we intended to our timeline. We both implemented a Project from the "FREE" curriculum into our respective units in 8th Science & Physical Science (9th grade) where renewable energy could be discussed and concepts could be taught about renewable energy.
- We adhered pretty closely to our plan. We were able to complete all of our objectives and participated at the FLL event in Davenport in December as planned.
- We adhered quite closely to our timeline. The inclement weather this winter lessened the number of class periods we had for this project and we didn't have time for a field trip or guest speakers.
- We adhered relatively closely to our timeline and plan. We applied based on our limited knowledge of the FTC season schedule, knowing we would compete in qualifiers in December and January, and that is indeed how we implemented our program.
- We adhered to our intended timeline and plan.
- We adhered to our intended timeline.
- We adhered to our plan. We changed a couple days due to our volunteer's schedules.
- We adhered to our projected plan and timeline.
- We adhered to our time line pretty closely. Tyler did a great job exploring options and working with the equipment we received.
- We adhered to our timeline.
- We adhered to the intended timeline and plan.
- We adhered to the timeline and plan.
- We adhered to the timeline as described in what was submitted. We did not make any changes. There are still some things to be done with the plan as the plan went through the whole school year.
- We adhered very closely to our planned implementation timeline.
- We adhered very well to our intended timeline.

- We are adhering to our implementation timeline. The team is progressing along very well. We are scheduled to compete in two FTC Regional Qualifier Tournaments (one on January 12 and one on February 9).
- We are doing well for our timeline. I have worked on the EiE unit related to sound with two groups of students, seeing them once a week in a TAG classroom setting. We will complete all components of the sound unit and finish on May 28th for one group and May 29th for the other group.
- We are following our original plan except for winter weather delays.
- We are somewhat behind on the robot challenge because of a delay in ordering the materials. Otherwise we are on track with the research part of the challenge and plan on presenting during an open house in early May.
- We are unaware of a timeline; possibly Keystone AEA submitted one.
- We changed the plan completely upon implementation. The schedule was unable to be changed. So to reach more students we expanded the grades to be used. For the junior high students, the plan was changed to small groups based on study halls. The students were pulled for one week to work with the 7th grade science teacher. One high school science teacher was also brought into the implementation to use the experiments in her high school biology and anatomy classes in the remainder of the school year and in the fall.
- We changed the target slightly. Initially, KidWind was to be one of our grades 3-5 after school STEM academy, but when we saw how effective and engaging it was during our training, we switched it to part of our school curriculum. The first group was in our HS earth science (24 kids, grades 9-10). Then, all 5th and 6th grade students (118 kids) completed it and soon our 8th grade (60 kids) will complete it. It is our intention that wind energy be part of the 5th grade curriculum permanently next year.
- We closely followed the outlined timeline and plan. We did miss a couple of sessions due to weather.
- We closely followed the timeline.
- We competed in the FTC season as it happened.
- We completed the necessary steps of the program in a timely fashion. We made no particular changes.
- We completed this in the months of March - April. We had to wait for our kit to start but it worked out fine.
- We did adhere closely to the time lines and plans that we submitted.
- We did adhere closely to the time lines and plans that we submitted.
- We did adhere to the timeline. Teachers were trained in December/January, kits were ordered late January/early February, and teachers began implementing in classrooms once they arrived.
- We did follow the plan as close as possible. We met each day during the school day when the students had free, we also met once a week outside the school day so we could all work together.
- We did not formally make a timeline. We were delayed due to delayed shipments and lack of clarity.
- We did not get the kits as soon as expected and it took a lot longer to get the required laptops. We were not far enough along to participate in the overall competition but the students did create some great projects.
- We did not get to start when we had planned. We actually started after Thanksgiving. The students did not get to build the robot that they had designed because the parts were back ordered and were not received until after the competition.
- We followed all of the steps of the plan, but it took longer than originally planned.
- We followed it fairly closely. We did run short of time before our competition and should have planned more time earlier.
- We followed it very closely and accomplished even more.
- We followed our implementation timeline and plan closely. In October we received our equipment. In October we also indicated that we would compete in two qualifying matches. We competed in the November 17, 2012 qualifying match in Cedar Falls, Iowa and in the January 26, 2013 qualifier in Ottumwa, Iowa. We were fortunate enough to compete in the Iowa State FTC Championship tournament in Iowa City. Prior to competition we met on Tuesday and Thursday afternoon and evenings as well as on Saturday morning and afternoon to construct, design, and program our robot. The week before competition we met Monday-Friday in the afternoon and evenings. We followed this plan because of our program tutoring sessions on Tuesday and Thursday. We wanted to give our students as much time as possible to work on and test the robot at least the week before a competition, which is why we expanded our practice times.

- We followed our projected timeline fairly well. We had to adjust some lessons because of district reading assessments.
- We followed our proposal very closely.
- We followed our proposed timeline.
- We followed our timeline once we acquired the materials in April. We met every Wednesday. We had issues with the program being compatible with the MacBooks and then once we had it working on the laptops then it would not load properly.
- We followed our timeline well.
- We followed our timeline with the exception of our season lasting longer because we qualified for the State tournament.
- We followed the implementation plan and timeline as closely as we could. There were a few days that were missed, which put us behind schedule (due to weather), however we completed the process on time.
- We followed the implementation plan as indicated. The only changes was that we participated in the second challenge in a different location than originally indicated.
- We followed the plan closely: Weekly STEM Science Clubs Lemme (interested 3rd-6th grade boys/girls) & Wood (3rd-4th graders enrolled in the after school Wildcat Learning Center Tutoring program (Monday 7:15-8:20am Lemme Boys/Monday pm Lemme Breckenridge Mobile Home 3:30-5:00pm/Lemme Girls Friday 3:00-4:00 and Wood Tuesday 4:30-5:30pm) pm/Thursday 4:30-5:30pm).
- We followed the time line well, and are continuing to implement First Lego League activities even though the regional competition is over. Schools have set up practice times to use the FLL material with children that did not get a chance to be a part of the FLL team. We had all six of our local Dubuque Community Schools teams actively participate in the regional competition.
- We followed the timeline almost exactly.
- We followed the timeline as spelled out in the FLL competitive season. We started meeting in September and concluded activities formally in February.
- We followed the timeline but added additional practices to help students achieve their goal.
- We followed the timeline closely. This year we have been practicing and learning about Lego League. We observed the competition and continue to learn this spring. We look forward to competing next fall.
- We had no trouble meeting our timeline and plan.
- We had outlined that we would teach our AWIM STEM Challenge Units during the second semester of the 2012-13 school year. Our staff was trained in December and received our materials in January. Kindergarten and first grade taught their challenge unit in February. Second, third, fourth, and fifth grade teachers taught their unit in March. We planned a spring community and parent open house to showcase our units and other STEM projects. This will be held on May 14th, 2013.
- We had to alter our projected dates because of lack of information and support from the STEM grant
- We had to make changes due to the fact that we did not receive our robot until about a month before the competition. Therefore we worked a lot on team building and also our presentation.
- We had to move things back due to the fact that we did not receive the materials on time.
- We hit the timeline very well.
- We implemented our plan fairly true to our timeline.
- We implemented the timeline pretty much as planned. We got started a little later in January than anticipated.
- We lengthened the FLL season, in order to maximize the hands-on learning time students would have in the first year of this program at our school. Instead of competing in a tournament in December, we have planned an Expo for late April.
- We met 3 times at the end of the year and that was our plan to kind of roll out the program and test it out.
- We met our plan and timeline. In fact we participated in the very first FTC qualifier this year.
- We met our timeline in application but we will start sooner next fall and possibly add another coach or business mentor
- We modified the timeline to meet more frequently. Instead of once monthly, we began meeting twice weekly in late January. We are continuing to meet after school two nights a week even though we've completed the Engineering is Elementary module.
- We started late because we waited for materials and board to be made. Because of illnesses, only a few students were able to participate in the Saturday workdays and competition.

- We stayed pretty close to our timeline, within 2-3 days. We may have adjusted the due dates of materials to allow more time for students to complete them. The instruction was adjusted to address questions many students were having and to bring clarity to required materials.
- We stayed pretty close to the time line and plan for our program.
- We stayed pretty close to the timeline and plan. A couple unforeseen events affected the plan, but we were able to make up time later in the plan.
- We stayed pretty true to our timeline. We did spend more time programming the robot than we expected.
- We stuck to that timeline pretty well. Although, we had our first competition in December, which came up on us quicker than we intended. I did not build a due date for ordering everything into our timeline. We ended up having to wait for parts at the last minute, and we had to pull late nights the week of December. I also did not do scholarships like I intended. We ended up showing our robot off to a lot of community events during the post-qualifier period. We have been working to make improvements onto our robot to enter it into a tech fair this coming May. I would like to make sure we do scholarships next year during the post season.
- We stuck to the plan, and did not vary from it.
- We stuck to the timeline for the most part. We stretched out the deadline a little bit since it took awhile to get off and running once our materials arrived.
- We stuck very closely to the timeline. The activities were completed in the month of April with the presentations from the students the last week of April.
- We successfully built a functioning robot for FTC that allowed us to move on to the state meet for FTC.
- We wanted to meet every week once a week and we did that. If I could change one thing it would have been pushing the tournament back a bit. Felt like we were a bit rushed for time.
- We were able to adhere to the timeline that we developed.
- We were able to adhere to the timeline.
- We were able to adhere very closely to our implementation plan, with the exception of the date we could start programming our robot. It took awhile to receive all the necessary materials, and even longer to get the computer from our tech department, as they were experiencing difficulty. We were still able to participate in a regional event, as we had hoped.
- We were able to compete in a challenge in January. With the earlier heads up, I expect we'll be ready to go sooner next school year.
- We were able to follow our intended timeline.
- We were able to follow our plan and fit in our activities which we had laid out.
- We were able to follow our timeline fairly well. The lessons took more time than I had anticipated so the implementation period lasted longer than expected.
- We were able to stick with our timeline since the program we participated in had deadlines to meet.
- We were close to our predicted timeline.
- We were extremely close to the implementation and timeline.
- We were funded by KidWind, not by Iowa STEM, but Our application was for use in an after school program with 5-8 students. We are still in the process of using KidWind materials.
- We were held up slightly because we were waiting to be matched with our mentors.
- We were only able to complete 6 of the 7 weeks in the first session, due to weather cancellations. We extended that session by 1 week, so that we could at least have 6 weeks of learning. Because of the extension, 2nd session will not be completed until May 7, but we will have 7 meeting times.
- We were preparing for the IT-Olympics. We attended and competed in this competition and so we were right on time.
- We were pretty close to our timeline; we got started late because of the timeframe of hearing about our funding.
- We were required to stick to the timeline because of the way the FTC season is set up. We attended the scrimmage as scheduled, the regional event as scheduled, and the state competition as scheduled.
- We were right on schedule since this is our fourth year participating. Our Jr. Lego League team did not attend an event due to distance of travel and my team making it to state.
- We were very close to finishing our unit on time. We were slightly delayed due to the length of another science unit.

- We worked on solar cars but we completed against our peers. We did not go to Elkader because I team taught with the kid wind program and we had several of those students along for that event.
- We, the first and second grade team, followed the implementation timeline exactly as planned.
- We're on track to compete at a qualifier this weekend. I plan to sign up for continuing education program offered through FIRST so we can extend our robotics program and continue FTC and FLL competition in the future.
- When we made our outline, we did not know much about FTC. Our timeline did not follow the timeline outlined by FTC. We had to adapt and make things flow with FTC. This was very fast paced but we made it work.

Did you customize the model for the Scale-Up program for your unique local needs? If Yes, please describe.

- 8th grade only and modified our schedule on days we implemented.
- A longer time frame.
- Adjusted lessons to fit grade levels.
- Adjusted the amount of class time/lessons based upon availability of 5th grade students.
- Did not follow the lessons, some of them were difficult to follow how they intended them to be used, so we spent much of this year, just exploring the materials.
- Due to reduced amount of time I did pick and choose what missions we took part in and since we did not compete against another team we had less pressure in terms of competition.
- Due to time constraints, I scaled back some of the program components in order to expose students to more material.
- Followed State and Intel Rules.
- For the Rolling Things, we customized the use of the wolf in the activity to make it more measurable.
- I adjusted lesson times and removed/added particular lesson components based on the prior knowledge and learning needs of my students.
- I adjusted the lessons and skipped over the repetitive portions that we already went over.
- I already had the basic supplies. I applied to the program for the stipend because I volunteer my time.
- I am utilizing the robots in the 7th grade TAG students and Alice Software with the 8th grade young men.
- I coached the FLL and Jr. FLL teams based upon the individuals' strengths.
- I customized a design log for the students to use for their four stages of planning, building, informal testing, and formal testing.
- I did customize the workshop information to fit into the Solar System unit that I normally teach in 8th grade Earth Science class. Instead of dropping my normal curriculum, I tweaked the information and included the solar information I learned about and made the lessons I normally teach deeper and richer for content.
- I did not do all the lessons for the 2nd-3rd grade (Engineering Inspired by Nature) due to time constraints. I focused on the helicopter/spinner component and testing the rotor length and paperclip weight to decide what the ideal helicopter would be. For fourth and fifth grade we did the Skimmer unit and Kindergarten and First Grade did the Rolling Things unit. For both I followed AWIM curriculum pretty closely.
- I did not follow the entire implementation outlined in the guide.
- I fit it in with my seed unit.
- I had a teacher's aide prepare the helicopters for our program. This was not fine motor appropriate for our first grade students.
- I had to add activities to some of the kit's lessons (needed more of a challenge) and I had to buy equipment that was not furnished in the kits (for example, large plastic bins).
- I had to help some of the 6th grades understand a lot of the graphing and wording used.
- I have three teams—all utilized the scale-up funding.
- I included activities that allowed the students to graph their results. I also developed two written assessments for the students to complete.

- I included two grade levels. We met after school.
- I incorporated it throughout the normal science unit and added more constraints to make the program more difficult.
- I integrated it into my Physics curriculum.
- I made the model fit to our needs and supplemented elsewhere.
- I modified some of the activities to incorporate specific skills based upon student needs and added additional technology components to aid in the development of new skills.
- I used other resources to keep the students engaged.
- I used the coach stipend funds to purchase Jr. FLL materials.
- I used the program to help supplement what I currently did with solar ovens.
- In an effort to win the Iowa Energy Games, I invited an Iowa State University professor to visit with us and help the students with their designs. I observed several group's blade designs improve dramatically—only the design process took longer than I thought.
- Made arrangements to have a limnologist from UI work with students and a field trip to waste water treatment plant.
- Model was customized to offer insight into the desire to add wind energy to our school once completed. Students prepared/presented a debate panel discussing all reasons. Students have voiced a desire to present their findings and ideas at a community forum and desire to raise funds to build/install a turbine within the next 2 school years at Boone High School.
- Much of our work happened after the competition.
- Only the time line for the kits was changed. Since I do not meet with the pull-out groups daily, I needed to make some calendar changes.
- Organized each FLL session based on our own goals, background, expertise and student needs.
- Our population at Scavo is not a constant one and we have students entering and leaving our high school throughout the year. I tried to make the program of FTC available throughout the whole year, until the end of school.
- Our solution was using computerized pillbox.
- Our weekly teen program is held on a drop-by basis in the public library. To accommodate this setting, our group as developed shorter multi-media projects that students can complete within one or two club meetings rather than over the course of a semester.
- Pre-service teachers were able to work through the materials more quickly than middle schoolers and they had several opportunities to apply their learning with children.
- Reach out to local business/industries to help sustain your team and go engineers involved with our team.
- Registered too close to time of competition, so we weren't able to compete.
- Scheduling was altered due to weather and scheduling. One class added a measurement pre-unit, and another added a car competition at the end.
- Since we're are an out-of-school program, one of our HyperStream 4-H clubs met afterschool and one met early evening.
- Slightly - we incorporate FLL as part of a TAG experience, but we are opening up robotic programming and participation to between 20-30 additional, non-tag students who are interested in the experience. We had a generous donation of an additional robot to make this happen.
- Some lessons had to be abbreviated due to time constraints.
- Some older students required some adjustments in the program. We are in the process of designing a machinery tool for an in town business. With the help of the Iowa State person, we believe we can get this accomplished.
- Students learned to use Photoshop, html code, program Lego Robotics, use Alice Game Maker, and used numerous iPad Apps to build Google Passion Project sites.
- Students made sure to use local stores to get outside materials.
- Students were not able to attend both days of the fair because we did not have the funding to pay for the hotels.
- The facilitators did extra lessons on different forms and transfer of energy after an introduction and before using the kits.
- The number of days to complete the kits were modified to accommodate schedules, student needs, etc,

- The Rolling Things kits was first modeled by an Engineer from a local industry, We also included a lab sheet for testing and measurements.
- The students completed a model, presentation, and programmed the robot. The students programmed the robot to complete 3 of the 14 table tasks.
- There were some options in terms of activities for the students to fill out related to our unit; I chose the activities that I thought fit the best needs of my TAG students to challenge them.
- Used as an extension for a lesson taught in the science curriculum
- Used during church youth groups. Added biblical application to the story and followed the outline for outcomes.
- Used it as part of the computer science class.
- Used local NRCS and Madison County Conservation officials to implement the plan.
- Used/referenced local resources like Luther's new wind turbine.
- We added a field trip to a farm with wind turbines.
- We adjusted due to time constraints and to make the content grade appropriate for high school students.
- We altered the model to include more real world connections for example we used the oil spill experiment and discussed various other real world applications (i.e., BP Oil Spill). The students were also asked to investigate engineering opportunities in the surrounding community.
- We are in the process of customizing.
- We combined some of the directions to modify time to fit schedule.
- We compared the pollution to the story with the Iowa and Mississippi Rivers.
- We connected the module "Water, Water Everywhere" to our wetlands and our local water quality issues. We took a field trip to the Waterloo Water Treatment Center.
- We customized our model by working with low-income, first-generation prospective college students through the University of Northern Iowa Classic Upward Bound program. We offered our FTC team two rooms at the Center for Urban Education in Waterloo; one serving as a lab for construction, design, and programming, another as a practice room to maneuver the robot on a constructed practice pit. We recruited John Deere engineers who had experience with FTC robotics and our students. We also recruited a high school teacher with experience with our students in the classroom.
- We did not plan to compete this year.
- We did not use gears on our turbines. We used the generators supplied by KidWind.
- We ended up with a huge group of kids so we had to plan a little differently.
- We fit it into our curriculum, schedule, and needs.
- We had AWIM as a whole grade level in our cafeteria and broke into groups there with all teachers present.
- We had to condense what we were able to cover this year, but would like to spend even more time next year.
- We have made small adaptations to the program: marketing earlier in the program, adding SKYPE for focus groups, and condensed testing time.
- We hosted workshops and mentored several teams while developing our robotics programming.
- We implemented the program into the classroom rather than an after school program.
- We included all 8th grade students in this program.
- We made it more individualized based on needs.
- We only meet during class time and study hall time since all of my students are actively involved in sports at other activities, which caused a time conflict.
- We planned as a district how we would implement our energy games, and were able to order supplies we thought we might need for our own classrooms.
- We team-taught the challenge units in multi-age groups.
- We used the EiE materials in conjunction with Foss to further implement a deep level of understanding of the engineering process.
- We used the funds to pay for STEM field trips/EiE manuals/storybooks, and used volunteer STEM teachers trained by VAST Center
- We utilized the FLL scale up for the main part of the 4-H club activities for the fall. In the spring we have continued to meet to investigate STEM careers, problem-solving activities in our local community and prepare for the coming year's FLL competition.
- We visited ILCC Estherville campus to learn about the wind turbine program.

- We visited ILCC wind turbine program.
- We visited our local Water Treatment facility for our field trip. Since it is only a few blocks away, no money was used for the trip. This session, we also hope to visit the creek that runs through our prairie at the school, to check the water quality.
- We were awarded 3 field trips and 3 kits. Again, because the original PEERS contact left, much time was taken on behalf of the hub/scale up as to what to do. Thus, some kits were purchased kits such as Kid Wind supplies and Solar Bots. For our day camps we melded a variety of lessons for the day-long experience and purchased supplies to meet the lesson needs.
- We worked with the interests of our students.
- With a small class I used a variety of materials.
- Yes, with the longer schedule, I took the opportunity to have guest speakers. An older adult from our community and two residents from Des Moines University came to speak. The students applied for positions, learned about collaboration, marketing, product design, and building a website while working on FFL requirements.

Please give us your opinions about working with your service provider. To what extent 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, and did your partnership with the service provider meet your overall expectations? Please explain if you answered "not at all" to any of the above.

- Again, because the PEERS contact was no longer there, my communication was with the hub coordinator. After a number of conversations over the months, we were able to work out plans to fulfill programming using the PEERS model, but did not use Pella PEERS kits. The programming we decided on has been well received and appreciated by youth and parent participants.
- Did not receive the materials until April. Also the program did not work on our MacBooks. Thank goodness for the tech guy!!!
- Do not have a service provider yet.
- Equipment was received after the season had ended.
- I applied for the grant in the early Fall, attended the training in early December, but did not receive the materials until mid February.
- I found this project to be kind of frustrating as an educator because I constantly felt disorganized due to communication issues. Not only did we NOT receive our materials on time, it was also difficult to know what was expected of us as participants. After ordering our supplies online via the CEEE website, it was difficult to tell 1) if I had indeed sent the request in correctly, and 2) when the materials were coming to Hoover...it was kind of nerve racking as a teacher with so many unknowns (i.e., when were we going to get our materials to start etc.). Had I planned to start the day I ordered the materials to arrive, I would not have been able to start...my materials came two days after I ordered them to be there. Also, when I attempted to order more solar panels for our open competition, they came over a week late (I sent an e-mail out the Monday after our materials did not arrive the week before, and did not receive a response until Friday—our materials now almost two weeks late). A day or a week may not seem like a big deal, but in a K-12 classroom setting, it can be, especially when we have to spin our wheels waiting for our materials to arrive. Also, at our meeting in the fall, it felt like we were told something different...that many of the details were not hammered out/that things were added on later. As time progressed, it felt like things were being tacked on to our task load...like the student attitudes survey we were asked to give. The survey was something we were not aware of until it was basically due...something that seemed slipped in at the end, as if it was a graduate's study they needed to complete before the end of the semester). I feel this project was WAY more work than what it initially seemed (I realize some of the changes came because we are not going to meet face-to-face for out last meeting, but even so, the cancellation of our dinner changed without our knowledge). When we met to touch base a second time in the spring (at Central), there were things discussed that we needed to complete that were not mentioned at our first meeting, like not one, but TWO presentations we have to send to show how we implemented the FREE energy program, the survey, parent

letter, etc. While I will probably do something like this in the future (I think it really had an impact on our students in a positive way) I WILL NOT GO THROUGH PAT HIGBY or the FREE ENERGY PROGRAM again!

- I wish we could use the extra money to cover other costs. I had 3 teams that I registered, but I could only use the money to cover one team. I already had 15 robots and kits and a mobile lab. I also didn't need a travel expense. My parents drove their kids. The food factor didn't work for me either. How could I decide which of my 30 kids should get lunch expenses?
- I'm not sure who was considered the service provider—I assume it was my contact person.
- In response to "receive materials and resources in a timely manner," I marked "some of the time" because there were some missing items from the kit.
- It took too long to get our basic start-up kits, so we really didn't know what we were working with.
- It was almost impossible to reach any of four grant contact individuals at ISU. I still have emails 3 months old that have never been responded to, voicemails not responded to. I'm awaiting receipt for reimbursement (it's been 7 weeks)—no information. The only person who did/does respond is Lynne Campbell.
- It would have been better if we could have had some flexibility to customize, within reason, the scale-up funding to meet our local needs, rather than being so tightly regimented.
- Jim Thorton, Kim Martin and Rebecca Whitaker were very helpful and supportive! The EiE training from Yukiko Hill, Lori Kriz and Jeanne Bancroft at the VAST Center was outstanding! Very helpful!
- N/A
- None.
- Notification of receiving the grant came so late that there was a terrible rush to acquire materials and complete the project before the competition season started.
- Only time was a "training" session, which wasn't that helpful to all of us.
- Our curriculum director ordered the resources and managed that end of the grant for us. I did not talk to the service people during that process.
- Our school improvement coordinator ordered the kits we told her we wanted. I didn't talk to the company but the materials came quickly and in excellent condition.
- Our supplies did not arrive until late November.
- Sent several emails to Mrs. Schroder only to never get a reply for them. These contained questions that I needed answered.
- The materials were received to late for us to get to compete. I blame this on receiving the grant late in the scale-up season.
- The parts ordered took forever to show up—in fact, many times we were having meetings with not much to do because of waiting for parts. A few important pieces (namely the competition field) didn't show up until well after the season was over. Because of this, practice was slim.
- The service provider was great. We did not have a need to contact after receiving the kits.
- The STEM coordinator, Kris Kilbarda, was incredible. She helped me every step of the way. I did not use the typical PEERS modules.
- There was very little communication, no response to repeated emails about the purchase of the Mindstorms kit, which was integral to the success of the program. In mid-February, after no response to my emails, I sought other funding for the program.
- We could not order materials until after the training, which did not take place until January. Then there was a delay of several weeks between when we ordered them and when they arrived.
- We did not receive our robots until about a month before the competition.
- We had problems ordering parts and getting materials in a timely manner. At this time we still do not have parts that we ordered.
- We received our materials very late in the fall, due to the fact, I believe, that grants were not awarded in a timely fashion.

Describe any challenges and barriers you faced in implementing the Scale-Up program in your LEA.

- We lined up the middle school computer lab in Marshalltown to hold our afterschool club. Unfortunately, we quickly learned that we would not be allowed to load any new programs on the computers, which rendered the computer lab useless for us. Our ambassador business stepped up and donated used laptops and the group moved to a different location in the school. 2) Participation dropped at the Marshalltown club at various meetings depending on what sports activities that youth were involved in were taking place at the same time. Fortunately, the Story/Boone County club maintained consistent participation. 3) After the HyperStream coordinator and LEA representatives met the first time with the ambassador business for our Story/Boone County club; the lead person left to go back to further his education. Fortunately, other individuals fulfilled their commitment, but unfortunately they were not knowledgeable about any of the programs. I also don't think they had much experience working with and planning for educational lessons youth groups. Thus, I don't think the participants gained as much as they could have. A need ambassador company will need to be secured for next year. Training for ambassador businesses on robotics, game design and multi-media would be very beneficial in the future. 4) Securing computers for the Story/Boone site was challenging. IT-Adventures graciously donated four old desktop models, but rarely did all four work at any given session. 5) We had hoped to have secured volunteers to take over leadership for both sites (instead of Extension field staff and the AmeriCorps member), but did not accomplish this. We need to continue to seek volunteers to make the clubs sustainable. This year was a learning experience. Despite the challenges, I am looking forward to continuing the clubs next year and hopefully increasing participation.
- A big challenge for me is knowing what to stop doing when new (and better) things come to our school.
- Always running out of time, but we live so far from other schools, it would have been nice to collaborate with other groups and share " how to."
- As a first-time coach, it was overwhelming, and we didn't really know where to start. But we had a lot of fun and the students were great.
- As a new coach without an engineering background, I often felt that the Tetrix lessons were somewhat incomplete. Barriers: getting the field control system to work (not yet accomplished). Additionally, the team did not have an experienced mentor.
- At first it was finding the time, but when I saw I could incorporate it with my Science and Math, it worked really well!
- Because of the delay, we did not get to implement the materials in as many classrooms as we planned. Also, the teacher manuals arrived on CD-ROM, and most teachers would have preferred paper. One teacher stated that she did not use the kit because she felt she did not have enough planning time to scroll through the electronic manual to find what she needed.
- Because our school is located in a rural community, we found our access to gaming resources and support very limited.
- Because there was not a vacant room in which to set up, I had to have everything in my classroom. I had to be mindful of curious older students who use the room during the day, and keep it all under wraps as much as possible.
- Because we didn't implement the Scale-Up program until the end of January and it now will not end until May 7, it has been difficult to meet some deadlines in a timely manner. Sometimes I've felt frustrated when I've had questions about terminology and acronyms used, and could only communicate via email. Having a phone number to use in extreme cases would have been very useful. Sometimes, I have been unsure of who I should contact about various questions also. Finding consistent help for the meetings has also been a challenge. The participants counted above consisted of a parent, grandparent, a 6th grader and his 10th grade brother. This is the first year I haven't had more parental involvement.
- Biggest challenge was the timing of the grant award notification. Our particular program (FLL) had to be registered for before the awards were confirmed, thus creating a potential financial problem if one registered and then didn't receive a grant. In fact, registration closed early this year.
- Building Robots with LEGO Mindstorms is not 6th grade reading level. Trouble contacting and lack of participation with mentor.

- Challenge: having enough meeting time. The team often met in school during a 20-minute study hall and once a week after school. The team has discussed (and is interested in) meeting more often next year.
- Challenges was of our own making, class time limits. The space required us to maintain a workspace. My being new to the curriculum and initial introduction. These challenges helped me and my class to become better planners and problem solvers.
- Challenges were primarily due to time constraints.
- Consumable supplies need to be readily available for purchase. It is unreasonable to expect districts to re-purchase and entire kit just to get consumable supplies. The rocket kit requiring straws is a good example. We spent hours attempting to find straws that meet the kit specifications. We were unable to locate the correct sizes.
- Did not encounter any.
- Did not face any challenges or barriers to implementation.
- Due to the newness of the program and magnitude of teams involved in the process, we found obtaining materials was rather difficult. especially the field set-up which was a crucial part of preparing for the meets.
- Equipment was back-ordered. Guidelines and MOA were given late and expectations were unclear in beginning.
- Everything went very well.
- Finding room for the jet cars to race was a challenge. The Pinball unit was implemented by the first grade. It was difficult for them, but they got done.
- Getting middle schools to participate.
- Getting started with no experience was our only challenge
- Getting timely answers to questions about the grant or FLL/Jr. FLL from Iowa State.
- Had a difficult time working with my district business office.
- Having enough time to do all the activities.
- Having enough time to meet with the students and understanding the materials myself. I know that there were sessions in which we could call in but the only problem was that I could never attend these informational classes. It would have been nice to have a recording of it posted somewhere. Maybe there was one but there was often times a barrage of messages sent all at once.
- I am frustrated in the lack of females staying with the program. There were 5 females that joined but soon dropped out. I have recruited two young ladies and they are planning on attending an all girls robotic camp this summer. They are reaching out to their friends also.
- I did not feel that the fine motor expectations for the seed unit were appropriate for first grade students.
- I did not have any challenges locally. My administrative team was fully supportive and came to observe often; the regional STEM coordinator was helpful and understanding of the different configurations of groups using the materials; the AWIM curriculum contacts were helpful also (I needed links to YouTube videos because a DVD did not work).
- I felt like things were rushed into place before they were completely ready and so we were always a bit behind. For example: we were to get field perimeters and tiles with the grant and those arrived after the competition season was over. We also got the student survey after the season when I no longer had contact with the students.
- I found it to be more time-consuming than other extracurricular programs, but with the help of our mentor, we managed to get tasks completed on time.
- I had support from the LEA and my local school district, so my own time was the biggest challenge.
- I had to do a fair amount of learning myself since I am a new science teacher. I did have to do a lot of trial and error with some of the products in the fuel cell car kit. A few of the fuel cells did not work and some of the holes in the chassis were not drilled correctly.
- I loved it, it was challenging, but too challenging for our 6th graders. I think 8th grade would be better next time.
- I mentioned help from 2 parents. This help was relatively sparse. When working with ten, young girls, it was a challenge to keep them productively engaged when the ratio was 10:1.
- I probably should start sooner in the school year and not quite so close to the end of the school year. I actually could have spent more time finishing up data with the Gravity Cruisers with 6th grade.

- I really didn't have any barriers with this grant. The communication was great. I loved the in-person training day. That helped tremendously and got me excited to bring it back to my students. It's been my students' favorite lessons so far this year!
- I struggled to get things purchased because I had to work through our book keeping office.
- I teach science half of the year and social studies half of the year. So when the kits came in I was in my social studies curriculum. I didn't start the unit that went along with my kit until the spring. So it was a challenge to meet the documentation deadlines. I will be changing this to the beginning next year, so I hope the kits come in time to accomplish this task.
- I think now that we have a season under our belt, and we understand the system, we'll be hopefully quicker and more organized.
- I thought that the program went very well with the Kindergarten and First Grade group as well as the Second and Third Grade group. The Fourth and Fifth grade group did not get as interested into the Skimmer project for some reason. I am not sure why that is. I think it was more of the groups I made and not the fault of the curriculum.
- I was at the mercy of the classroom teacher sending students to my class. Setting up for the "labs" took time and space, so when students didn't come it was frustrating. I could not use the units until the teachers taught the FOSS kit lessons, so I was at the mercy of the science curriculum for each grade level too. :) I would probably only have one STEMS unit going at a time. It was overwhelming having 1st, 3rd and 5th going on simultaneously. This had to happen because my materials did not arrive until February. Next year I will spread this out more.
- I was challenged by the time needed for prep of a unit and the length of implementation sessions.
- I wish I could have implemented this course of study earlier in the school year rather than so late in the school year.
- I would have liked to have done more activities if funding would have allowed it. More Kits, and include it into our regular learning times so that all student would benefit.
- I would prefer a program where the grant was not reimbursing, but would pay, initially, as to not affect the budget in our county office. This has made implementing the program difficult. Ordering from an FLL catalog with 'credit' would fulfill our needs, better.
- Implementing this program took a lot of classroom time. That time had to come from other subject areas. Balancing Science instruction with literacy instruction is challenging.
- In the past, Lincoln Elementary has been a 4-6 building. This year we transitioned to a 3-5 building. We have always selected half 5th graders and half 6th graders to have some continuity on the team. This year we had 10 new 5th graders because the 6th graders were at the middle school. It was a change not having the experience.
- It is difficult to balance big projects like this and Iowa Core requirements. A block schedule would be an asset.
- It is difficult to cover cost of equipment and expenses or several months before getting reimbursed.
- It seemed each week something new was thrown at us. It was hard to feel competent because we were constantly struggling to get things done—surveys, ordering, PO's, etc.—for the grant.
- It took a lot of prep time and clean up time.
- It took a lot of time for setting up the activities.
- It was difficult to access information at times. Not having phone numbers to call to get answers was frustrating as e-mail is not always timely.
- It was difficult to schedule time with the kids due to busy school activity schedules.
- It was hard to fully implement all of the units purchased because the training and materials were given out so late in the year.
- It was very hard to get started without all of the materials up front. We still have yet to get to the programming on our robot because of the late notice of the MOA and having to order the materials.
- It would be nice to include the teacher manuals with the kits. Had we not known to order them separately, I think it would have made it even more challenging! I am glad the trainer told us to get the manuals.
- It would have been easier had we been able to start earlier in the year.
- I've felt overwhelmed with the amount of time required to make the first year a success.
- Just getting used to the materials was the biggest challenge.
- Just the technical learning curve associated with being able to learn and then teach the technology.

- Just time on top of regular teaching duties.
- Knowing earlier would be beneficial. It felt once we had the grant it was a mad dash to get things going and not lose valuable time.
- Lack of communication hampered implementation.
- Lack of information—waiting until last minute to have us complete tasks.
- Late arrival of a few things. Not really a problem.
- Late distribution of materials was really the only thing.
- Late start implementing the program due to late notification of funding and receipt of parts.
- Local area experts are a challenge for us. We had to coordinate online chats to trouble shoot programming issues. We could not find any engineers in our community to help with design.
- Mostly just not being familiar with the materials.
- My greatest challenge was that my brother died in November. This was right around the time that I would have attended some of the telephone conferences for training. I actually missed all of these, so I was behind. The quick time line was also difficult. We received the grant and our LEGO kit and set up field early in October, and by the middle of December we were competing. My fall was really busy trying to learn and teach so much that needed to be done for the LEGO challenge. (I'm looking forward to our second year, as I know it will be better!)
- N/A
- No challenges except time allotted for seeing students at my school.
- No challenges or barriers.
- No challenges; it has been a great experience for the kids to be exposed to the engineering design process.
- No major challenges encountered beyond the standard paperwork.
- No money or time compensation was given by either Scale-Up program or my own system/school. Why isn't there a stipend provided within the grant for the extra time I put into giving this opportunity to my students. The state (of Iowa) and my system are the same—we want higher math and science scores but don't want to pay teachers to do it. Very frustrating!
- No problems at all.
- No problems.
- None (11 responses)
- None—everyone was very supportive and answered whatever question I had.
- None—it was very efficient and well communicated.
- None that I can think of.
- None! We had total support the entire time.
- None, the lessons were well organized.
- None. I felt I was very well trained and was able to implement my specific Scale-Up program the way it was designed.
- None. We had a great experience.
- Not fully understanding the services. The majority of the information we used came directly from the FLL website.
- Not receiving our robots on time, and we didn't even have our kit to build the table until about 3 weeks into the program.
- One challenge was just being a new coach with no experience and crunched for time on making the competition in December. I did not get the group ready in time, so the deadline of the exact date hasn't been there for our practices this spring. The time it takes to become a good coach at anything was something I wasn't able to put in at the time we needed. I was already involved in coaching another sport when I began the teams in the fall. We weren't able to have practices consistently until my winter sport was over.
- One of our biggest barriers was the building of the robot. A request was made for two engineers to assist us, and even after follow-up requests we were provided with no assistance. Another challenge was since I had no experience with FLL, I didn't know what to expect at the regional competition, despite that we had a good experience at the regionals.
- One of the biggest challenges we faced was making sure our students understood the time commitment with working on the robot as many of our students work after school and into the evening to help their

families defray family expenses. We also faced the challenge of the students being present at practices but not fully participating in the robotics program during the entirety of practice.

- Only challenge was the weather because we implementing it later than when we wanted to.
- Only time this year. Because of when we applied, we were 2 months into FTC season before getting materials. Students had minimal time to learn and prepare for this season's competition. It's more of a baptism by fire.
- Other than having a delay in materials, the biggest challenges was know what to expect. We got a lot of information and even watched videos but until we went to an event we had no idea what we were really into. Be able to go to multiple qualifiers was a big help.
- Our barrier is mainly in staffing support and classroom space.
- Our biggest challenge was finding a mentor to help us with cyber security. Once Hyperstream located a mentor we were on our way.
- Our biggest challenge was procuring materials for our program. Setting up all the proper accounts, transferring PO's, completing all steps in the proper order to utilize the multiple grants, and ordering the materials from Lego took much more time than anticipated, particularly the last of these issues. Once we received materials, our participants worked hard and had some great successes.
- Our biggest challenge was recruiting individual students.
- Our biggest challenge was the communication between FLL, Scale-up Committee and us as a LEA. It was very rushed in the fall, and we were not always sure of funding or what was funded. For example, our MOA was sent on Nov. 21st, and our regional competition was already Dec. 8th. We were able to host the regional competition (in partnership with John Deere), but solidification of the Scale-Up details earlier would have made planning for the teams much easier.
- Our biggest issue was recruiting students. Our big recruitment day was extremely successful and we had much interest, but the next two weeks we had snow days on our scheduled meeting day. Therefore, we continued to struggle to get more students involved because the ones that showed initial interest after our recruitment day, in my opinion, forgot about coming to the meetings again after they had talked to us about coming. I believe this is a barrier easily broken for the next school year, as we will have a better idea of how everything works and how to get more students involved right away in the beginning of the year.
- Our inexperience was our biggest challenge, but we had great help to overcome it. We had a lot of questions where we were not sure about things, like rules for the challenge or we would get stuck with our programming not working right, BUT we had a lot of resources. Rebecca Whitaker was outstanding and provided herself as a great resource to our questions. We also were directed to other resources like Jonathan Cole for expertise in computer programming. This is where we ran into the most questions because of never working with programming before. A challenge for me now is to work robotics into my classrooms. I would like to start making activities around the robotics experience, such as teaching fractions and applying it to gear ratios for example. I need to take the time to bring the STEM mission into my classrooms.
- Our only challenge was figuring out how to execute in the district since this was the first time participating in the program.
- Our school district had never had a science fair and we were the first to implement it in out district. The other science teacher and I had little experience with a science fair and how it should run. We were completely unfamiliar with the process and the expectations. Many of the rules outlined by the ISEF and the SSTFI were confusing. The webinars were time consuming and usually didn't answer my questions and even provided conflicting information that even furthered my confusion. I was told that the grant only paid for transportation then it ended up paying for subs, hotel rooms, and the transportation. Basically I felt like a fish out of water and people relied on me to provide accurate information that was hard for me to understand. I asked for help on creating a SRC and never received assistance. Honestly, I am still confused on that topic.
- Our setting has presented some challenges as students are not required to attend our weekly programming and new students are encouraged to join during the school year.
- Our student population at Scavo High School changes throughout the year. It was a challenge to have continuity in my FTC team as members came and left for periods of time.
- Our timeline seemed to short. We weren't ready to participate in the regional event, but went as observers.
- Overall, we thought the communication from GSAC was excellent.

- Please continue to allow us to use STEM funds for STEM field trips instead of salaries. STEM field trips are very important for kids to see scientists working at their job sites.
- Receiving robotic building materials in an untimely manner slowed us down at the beginning of the year.
- Recruiting students, time to meet. We struggled to get the older students (high school aged) interested but hopefully as these current students age they continue to stay out.
- Resources were not provided in a timely manner to order NXT parts and supplies with grant funds. It would be nice to know before the October FLL deadline whether or not we were approved for funding. / The paperwork was difficult to return via pdf. I do not have access to a scanner and our fax was having issues. Is there an electronic form that can be completed online?
- Scheduling was a major challenge. We were barely able to meet during the school day and many student have practices after school. Often we met before school and had several practices a week where students could attend as their scheduled allowed. We hardly ever had the whole team together.
- Scheduling. All kids didn't get to participate.
- Since this was intended for after school, the fluxuation of students from one week to the next posed some difficulty for all students having a similar experience. Due to the timing of the grant being second semester, our work with the students was later in the year. This is not a concern, just difficult to report out.
- Some difficulty with scheduling to allow all students to participate regularly due to conflicts with school activities.
- Some of the design problems were challenging. Fortunately, I had two engineers coming in to help troubleshoot problems for the students.
- Some of the materials were repetitive when we switched over from one binder to another.
- Some of the skills were a challenge. Finding room to run as most of the building is carpeted.
- Some of the students thought that FLL meant simply "playing with legos" and they weren't as responsive to meeting the challenge as I'd hoped. Another issue dealt with having parent involvement because of their schedules since the only time we could meet was after school once a week on Mondays. Every now and again we did work on Saturday if it worked with schedules. Student schedules were also difficult to organize since many of the students were involved in several other activities.
- Sometimes finding knowledgeable outside sources for questions that the students had proved challenging.
- Student interest has been difficult to generate and initially the administration was not on board (they had decided to not seek the grant, unbeknownst to me).
- Student recruitment.
- Students have little time to devote to projects like this. Also, we were very rushed before our first competition due to the kit being on back order.
- Students having conflicts with other activities.
- Students were not used to "thinking for themselves", critical thinking and problem solving. Grades dropped at first but then went up as the project progressed.
- The actual program materials and training were good. The other parts of the process with applying, contacting people, and receiving money were very confusing. The way the money was given to the school was extremely confusing. The money to cover the sub and the money used for the stipend for the teacher attending the training should be separate. The other paperwork involved in this process was so time consuming and confusing that I would not recommend for other teachers to apply for this grant.
- The attendance of the students.
- The biggest barrier I faced was finding time and freedom in the student's schedule. It was also initially hard to get students interested, but once word spread and we started implementing the grant more students became interested.
- The biggest barrier was communication. With this being the first time implementing the program, my students and I often needed clarification and more information, which was difficult to obtain. I wish there was an opportunity to have the provider actually visit the classroom and offer insight/suggestions. Our initial training was amazing. The leaders have a vast wealth of knowledge/experience which would make a huge impact in the classroom if they were able to visit. Maybe even virtual interaction would have helped. We are preparing to compete for the first time and are unsure of expectations and procedures. This is a tremendous program that has hugely impacted all learners and I would like to see the impacts reach even farther.

- The biggest barrier was the scheduling of science time. The EiE program is best implemented in larger chunks of time. My shorter class meeting times made it harder to implement. It seemed like the activities were getting "chopped up" a lot.
- The biggest challenge is the same complaint: I ran out of time and I needed more supplies!
- The buzzers in the kit did not work well.
- The challenge was staying with the outlined timeline. The participants did a great job of keeping the project going.
- The challenges that I have had are finding enough room to test the gravity cruiser and the jet toy. We get a little crowded when the groups are each testing.
- The cost of the projects and the travel to the fair was totally under estimated. We needed more funding for research supplies, travel, housing, meals, etc. There was not enough curricular support for how to teach research skills to students.
- The curriculum I am teaching from now until the end of the year in Science does not match the AWIM lesson. I chose to implement the lesson with a smaller group of students during flex time.
- The equipment was not received at all or in a timely manner. The program materials are received from different providers and the access to information seems disjointed and hard to follow.
- The grant award was not announced until late in the fall and materials were sent even later.
- The initial expectations of my club and I were vague. After we switched to a programming code club with an ambassador, we lost a lot of students (particularly the female population). A week after switching, it became apparent to me that the initial project of designing Google sites for our passions and local business with embedded video creations made with iPad apps, that the gratifying work we had been doing was sufficient. The push to have an Ambassador sort of highjacked our plan.
- The kids thought the book was too long.
- The kit arrived in late October and the Regional was Dec. 1. It would have helped to have a regional in our area later on in Dec or in early January. Tech support for Mac users was difficult at times.
- The largest challenge I have had is the putting together of a Hyperstream College and Career Day, it is coming along and will happen on April 24. Please see below for more info on the event: / / Learning Objectives: / / To provide Meadows' students first contact with post-secondary institute representatives in order to gain personal incite on programs and majors that align with the student's career cluster choice from www.IHaveaPlanIowa.gov. / To provide Meadows' students with career information, resume advice, and simulated interviews with business professionals from the Principal Financial Group. / / Location: / Meadows Gym, Booth Style Atmosphere / / Schedule: / / April 24th, 2013 / / 1:00 - 2:00pm: 8th Grade, 170 students. / 2:00 - 2:15: Transition Time / 2:15 - 3:15: 9th Grade, 170 students. / / Student Requirement: / / Speak with each advisor about programs offered that align to the students career cluster choice from www.IHaveaPlanIowa.gov. Upon successful completion receive a stamp from each advisor. / Speak with a Principal Financial Group HyperStream Member and review resume and participate in a mock interview. Upon successful completion receive a stamp for participation. / / Interview and Resume Participants: / Principal Financial Group HyperStream Members List Coming Soon / / Post-Secondary Participants: / / Tammy Krock, secretary / Iowa State University; Also representing University of Northern Iowa, and University of Iowa / Office of Admissions / / Beau Williams '12 / Admission Counselor / Central College / / Brittany Preston / Assistant Director / Office of Admissions / Simpson College / / Melanie Ellison / DMACC Academic Advisor / / Jessica Winter / ITT Tech Academic Advisor.
- The main challenge I faced was finding time to implement all of the units I ordered for the program due to snow cancellations and other unexpected schedule changes.
- The main obstacle we found was in finding help in learning more about the computer software.
- The major challenge we faced in trying to implement the program was that the members of the Boys & Girls Club (at least at our specific site) are not exposed to science during their school curriculums. Thus, a lot of the information was new to them, which made some of the bits a little harder for them to grasp.
- The number of snow days made it difficult to have all of our classes and stay on time.
- The only barrier was the issue of time. By the time grant awards were determined and the materials arrived, there was only about 8 weeks to prepare for the FLL competition. Being a first time coach, it was a little overwhelming, but the benefits of the program far outweighed this issue.
- The only challenge faced was lack of regional competitions for the AWIM curriculum. Students wanted to showcase their learning and learn from other schools.

- The only challenge was not having the training/exposure to materials as early as I had planned to catch kids while they were off for Christmas but this worked fine. I was nervous when the reporting information was not being sent because it was crucial to have that when we had the camp—tracking kids down after the fact is difficult, etc.
- The only challenge we face is the initial upfront investment in the FTC program. However, reimbursement from the Scale-Up program will be a huge help in getting our program off of the ground in Johnston.
- The only challenge we had was the timing of getting started. We weren't able to compete, but enjoyed the experience of going to one of the competitions. As our culminating project we had the students present at our school's technology. They shared their experience and robots with other students, parents, teachers, and community members.
- The only thing we had a challenge with was the playing field. We did not have it. Also trying to find a space that we can set that up is a challenge for next year. Trying to find a time where all team members could meet together.
- The program I completed required the dropping of parachutes. The ceiling height in my classroom was too low to collect adequate data so arrangements were made to complete testing in the Gym.
- The ramps we had for our program were not as sturdy as I would like to see. One ramp arrived broken.
- The requirements and acronyms tended to be confusing...LEA, RPI, RPO—is it possible to use normal everyday language? Also, the requirements seemed to be thought up at the last minute and I had to guess as to sub times, etc...trying to anticipate when I would need to be gone. I am guessing this has a lot to do with this being the first time STEM activities have been initiated state wide! I get that, but it was challenging at times trying to understand what was required of me. Perhaps more frequent communication from the STEM Scale-Up coordinator checking on understanding of requirements and asking if we needed anything.
- The requirements and acronyms were confusing to me. An easier to understand requirement list and checklist in plain English would reduce the challenges. I didn't face any real "barriers."
- The Scale-Up program started in the middle of the typical robot build season, so we were behind from the beginning. We are satisfied with the progress we have made this year, but if the program continues next year, I'd advise schools to get going as soon as school begins in the fall.
- The Scale-up process went pretty smooth for the most part. The only thing our team had trouble with was waiting on parts or game field elements that were back ordered, and also knowing what to order. Some things come automatically, others you have to order, others you don't have to have. It was a little confusing.
- The science methods course meets twice a week. Often the weather did not cooperate, i.e., no sun on solar oven day.
- The weather and schedule conflicts.
- The weather, and missed class periods resulting from it, reduced the number of class period for this project and thus the activities we were able to do.
- There seemed to be a problem with timing; by the time we received our materials, the FLL season was already well under way.
- There was a learning curve when communicating between our district admin, myself, and scale-up rep. The main communication problems can from our side.
- There was so much material. I felt I should not spend as much time as I did with all the other Iowa core materials to cover.
- There was some delayed information or not explicit enough directions. At times too much information. Information distributed needs to be simple and easy. Putting things in a check list or bulleted might make things easier. Receiving the MOA before starting the process instead at the end would be helpful. It let me know expectations and funding. I did not have any of that information until the end of the process.
- There was very little time between the time we received the materials and the time of the regional event to get our robot built and programmed.
- There were no barriers to implementing the program.
- This group meets one time per week for 1.5 hours so time was a factor but over 2 weeks we covered the material and objectives.
- This was my lack of communication. I needed to leave town for a family emergency. All other communications were timely and professional.
- This was our first year of participation in the program. The biggest challenge was our inexperience. We hope to use this year's participation experience to improve for next year.

- This was our first year. We are learning the process and requirements.   It took awhile before we were matched to some mentors.
- Thought it has gone well thus far and hope for a better start next year
- Time and getting the students opportunities to work with the equipment.
- Time for the students to work together was a challenge sometimes.
- Time out side of class to meet. General organization of the program.
- Time was the biggest challenge and reading and digesting all of the materials available for First Lego League.
- Time was the biggest.
- Time with students is a challenging factor. I am faced with that with all of my GATE students though—outside of FFL.
- Time! This was the only challenge of implementation. After the training in December, it was getting material ordered, put into teachers' hands, and also providing them time to implement. The timelines should have been longer in order for materials to be implemented.
- Time. As always in the world of education, time is a major factor. This would include the concern with time for planning the activities and implementing them fully and effectively followed by proper evaluation, and the available class time with an already full curriculum.
- Time. Once we got started, the competition was just a few shorts weeks away. This did not allow us to compete. We decided to take our time and do everything with a little more time and understanding.
- Timeline: A significant challenge the team encountered was the timeline to prepare for the regional competition. The team did not receive the materials till the beginning of November and regional competition was scheduled for December. The team met only ten times after school. The limited time the students could meet afterschool and the prior knowledge of computer programming the students were two challenges the students discussed during the regional competition. Regardless of the barriers the students learned a great deal about engineering and began to understand the difference between computer programming and remote control. The students shared the same amount of prior knowledge and were eager to learn something completely new—this is what assisted in building an enthusiastic LEGO team. Teacher Prior Knowledge of the First Lego League: As a teacher, the greatest barrier was only having the opportunity to meet after school for just a few weeks prior to competition. I also found it a challenge, yet a great experience to dive into a topic with little experience. It was helpful to be invited to conference calls to learn more about LEGO League—however the calls were during school hours. I did reference the website often—however it would have been more helpful to be in touch with a local coach with experience in coaching First Lego League.
- Timely communication and understanding qualifying expenses.
- Time—we are already pressed for time and completing our curriculum. Adding/implementing another kit/program makes it difficult.
- Timing in terms of equipment getting here on time.
- Timing of the scale up and the timing of the grant. We did not receive materials until the beginning of November when the competition was over in December.
- Timing....one barrier was in trying to coordinate students schedules for FLL meetings, especially with 9th graders involved this year.
- Too many kids interested, it makes it a lot more work to plan when there are only 3 teachers helping (1 has to be with each lab each time we meet).
- Trying to raise money so that we could buy the parts, and get the grant. We tried not to borrow money, but in the end, we had to borrow some.
- Trying to work around the activities my students were involved in.
- Typical challenges related to scheduling something new into our curriculum.
- Very short timeline. Had to work very fast. Winter break was tough for us.
- We are a small school, so time is an issue when the students are involved in so many other things. We had more initial interest in the program than number of participants indicates because students couldn't attend work sessions due to other commitments. We have already secured commitments from some female students for next year, so I am really excited about that.

- We did not receive the parts that the students needed until after the competition and the timeline was too short for the students to be able to build the robot that they really wanted. We also had conflicts on the day of competition, so some of the students were not able to attend.
- We did not receive the practice field until two weeks after our competition. I felt a little overwhelmed sorting through all the information out there to find the basics I needed to function as a coach.
- We do not have a mentor so getting started has been a challenge. We have partnered with another school that is experienced with Lego League and have asked them many questions.
- We found that there were possible design flaws with the ramp used in AWIM.
- We found the instructions for the AWIM kits rather confusing. It was necessary for us to build the models ourselves and then reconstruct instructions for the kids.
- We had a low turnout of student interested in the science fair club.
- We had lots of very short deadlines. I was always busy working on getting things in on time. It did not help that I also had a lot going on at home at the same time. The biggest problem would have to have been time.
- We had to work around a snow day, which led to shorter class periods. We also had to adjust to the availability of our engineer.
- We have difficulties with room and storage at this time as well as administrative awareness.
- We implemented into our before and after school program. So there were days we wish we had more time.
- We lacked storage space for all the materials that we received, especially the playing field.
- We needed more materials than expected and the service provider came through for us.
- We received so much of the materials late that it was difficult to plan properly. That coupled with this being new for our kids was quite a challenge.
- We skipped ahead due to repetition in the different binder subjects.
- We started later than most groups.
- We were a 1st year team and were not familiar with what we had to do.
- Weather for using solar cars.
- Weather, earlier outs, late starts, and missed days.
- Work out a better time schedule for shorter times in classes.

What, if anything, did you find helpful during the implementation and would recommend to others? This might include helpful partners, administrative support, training, or unique local circumstances.

- Tamara Kenworthy with Technology Associations of Iowa/HyperStream contact was excellent to work with. She answered questions promptly. She helped us find a field trip location when our usually meeting place was not available for one session. 2) Fisher Controls in Marshalltown donating laptops. They were also good about doing a teleconference with our staff prior to each meeting. 3) Not having to pay for use of the school or ISU Extension 4-H Building for our meetings. Some sites we checked into were cost prohibitive.
- A BIG hint: ALWAYS do a thorough preparation for the EiE kits so you are ready for the students AND you can enjoy the time with the kids!! Also, use your local businesses and Nature Centers because there are a lot of great resources in your own community if you put in a little time in making those connections/communications. Also, don't forget your area colleges! Finally, take advantages of ANY and ALL training offered by your provider!
- A network locally would be helpful, to answer questions and provide guidance.
- Administrative support from my Hub was great as well as AEA support.
- Alice resources were really good.
- All of the materials were easily accessible and very helpful!
- All the hands on activities were nice and beneficial but the course requirements for the class weren't stated clearly and lots of surprises keep coming our way!

- Allow the kids to work on their own timeline and not yours.
- Allowed plenty of time to organize team and get going.
- Attending the KidWind conference at Howard Winneshiek.
- Attending the training and going through an example of one of the kits was helpful. The teachers' manual was very well thought out and written. I liked the different ideas they gave for extensions.
- Before starting the program time needs to be addressed. This program requires great communication and time for all to meet. Many of the students in the program are involved in other programs and was difficult to schedule meetings. Also, was difficult for myself to find the time as more work has assigned to me as a teacher.
- Being able to attend a competition without competing helped us the most.
- Being very organized to accommodate 141 students. They were divided into 38 different teams. I used additional funds to provide storage bins and 3 ring binders to collect all work. This was extremely helpful. Industry Volunteer was very motivational to the students. And Physics Teacher to help teach levers, fulcrums, weights.
- Collaboration between HS and MS. Work in partnership with another teacher. The creativity of the kids was so incredible to witness. Our inquires of location in NW Iowa door kids to see the value beyond school. The turbines on Buffalo Ridge and the relay station to be built have created an enthusiasm from the kids because they see the real life connection. The STEM initiative and this KIDWIND opportunity is exactly what a small rural district appreciates. To have had the assistance from ILCC and Kari Webb and Joe Rand is very much appreciated by HMS. I was able to use the KIDWIND as focal point for my Earth Science class. Having the models designed and displayed creates conversation about technology. The available curriculum to use as a guide was well developed for all grade levels. The real world application has generated interest in our local community college as a possible life choice do career. So, meeting the 21st century standards of my classroom is meeting needs that help develop innovative and inspiring lessons for my kids.
- Complete support from the school superintendent, making all of the logistical challenges be a non issue.
- Computer Program: The computer program used to program the robot was easily learned by the middle school students. The students were very interested in the program and are looking forward to participating again. It was helpful to reference the First Lego League website. I would recommend collaborating with other schools to share ideas and offer assistance. Although our team could reference the handbook and websites, it would have been beneficial to have visited a well established program. Parent Support: It was very helpful to have the parent support for the Lego team. Not only did the parents attend the regional competition, but were able make accommodations for the students to stay after school twice a week.
- Conference call was very helpful.
- Connected with the Solon High School Robotics club to get helpful tips and help.
- Consultants available to me were excellent.
- Contacting other coaches was a lifesaver. Also going to as many workshops as possible, that was a great help. Other coaches were great—lists of materials, helpful hints, etc.
- Contacts for other teams in our region and state to connect with each other for support
- Continual email communication. Thank you for all of your support.
- Don't wait until the last minute!
- Find a space to have things set-up so less time is spent each time setting up and taking down.
- Finding a good engineer(s) early on.
- Finding resources were awesome, and reaching out to other teams.
- FTC program itself has many great resources in preparing adult to coach (tutorials, books, website, conference calls, etc.). Additionally, the Iowa FTC regional partner is extremely responsive and helpful.
- Get help from everyone, I talked with other coaches, go to scrimmages, get engineer to come in and help the students.
- Get started early.
- Great program and kit had everything I needed. Students were easily motivated to be "engineers." Be prepared for lots of extra "man" hours to implement.
- Having a good mentor—Craig Martinson (Rockwell).
- Having administrative support really helped us out. Also reach out to other teams in your local area because they are very good resources.

- Having an experienced contact to field questions was very helpful, and going to workshops put on my more experienced teams was extremely helpful in figuring out how things worked.
- Having another staff member to help implement.
- Having another team nearby was invaluable. We had two other local teams that helped our teams get on their feet.
- Having professional mentors has been extremely helpful for us as a group and getting local professionals into the club to work with our students. It has also been beneficial for our program to have the support of the administration so that they are able to talk about it with others in the community.
- Having the engineer from the community was very helpful. He was great with the kids and helping them make modifications that engineers think of.
- Heartland AEA let a couple of our teachers attend training in the Des Moines area, as the dates of the NWAEA training did not work for my staff.
- High parachute dropping areas are necessary for collecting quality data
- I appreciated that expectations were laid out at the beginning and were easy to follow.
- I appreciated the flexibility in options to fulfill our goals as an out-of-school time organization. We don't have the advantage of having a ready audience as does a school classroom. We have to recruit participants for the field trips, workshops and day camps which takes additional lead time. Our programs needed to occur during non-school time (weekends, evenings and summer) when youth, and parents in some cases, were available. Our programming included individuals from four counties because we offered them on a regional level, which added to planning and coordination that school settings don't require. Our field trip partners were excellent and provided new opportunities to the participants. Some of our ideas for field trips could not be fulfilled because we couldn't do them during weekdays, so we had to find Saturday options.
- I contacted Jeff at IHCC multiple times for help. I think that it would be good for each new person to be assigned a mentor. That way that would not have to go and search out a mentor.
- I found a coach in a neighboring district that has done this for several years and he was very helpful.
- I found local resources such as another local program as well as on-site administration people to be the most helpful. For other first-time programs, I would recommend starting as early as possible, as the process of starting up takes a lot of administrative time and energy.
- I found that giving teachers time to look through the materials on their own during school time using substitutes worked great. The teachers were able to implement form thoroughly using this process.
- I found the books helpful and the curriculum was well laid out. The materials were provided for in a timely fashion. The only thing I would change would be for the Design by Nature unit to have better samples of the seeds. The maple seeds were not very good and were crunched into the containers. I would recommend better Maple Seeds or telling teachers to go outside and find their own.
- I found the EiE training beneficial. It enabled me to experience sample activities, view the curriculum for various units, and hear suggestions from the teachers providing the training.
- I found the emailed information very helpful. Whenever I didn't understand something about the program, I knew I could contact Kris Kilibarda or Camille Schreoder. Our mentor visited with other school program coaches and provided us with much help from those "partners." He also got help for us from his company, Pioneer.
- I found the workshop that I attended to be very helpful. I plan to hold our own workshops next fall.
- I had Iowa State engineering students as a "pen pal buddy" to answer any questions we had along the way. For instance, the 5th graders wanted to know if the pH testing was as simplistic as we were doing. The Iowa State reps sent pictures of the more advanced device they use and gave a description of its strengths. This was exciting for the students to see and hear from "the experts".
- I had wonderful administrative support at my building level (junior high).
- I have created some other tasks/worksheets for students to do if they are waiting to test or if they finish early. I do not want them sitting around being off task.
- I have great administrative and community support. We have a man in our school community who has a windmill on his farm. He was a great resource. Again, the training day was invaluable. I don't think I could have done it without that.
- I haven't had a lot of helpful things besides the kids being great self-starters.
- I liked the variety of resources supplied with my kit and the training I received was very good. The students seemed to respond well to the activities.

- I loved everything. I loved that the curriculum was broken down so specifically. It made planning so much easier.
- I really felt our training was superb! They did a great job explaining each part in the program and I felt very confident implementing it in my classroom. I also liked how the book that is provided with the kits (EiE). They were VERY helpful and outlined EVERYTHING! Great curriculum tools!
- I recommend the training. We learned a lot about the kits and which ones suited our classrooms best.
- I think the program was good overall. The team at ISU was very helpful and I would highly recommend others to apply for the Scale Up grants!
- I thought that the training that we did back in December with all of the other educators, AEA representatives, and our STEM Hub regional manager was very helpful in getting an idea of how to lay out the work for myself.
- I thought there was a lot of help offered when we were at competition, which was fantastic.
- I was so pleased with this program I've encouraged my colleagues to apply for a Waterloo Community Foundation grant to purchase Engineering is Elementary kits for every elementary school in our district. Although we haven't been "officially" notified we received the grant, I know we are included in the list of grant awardees. Our district has also hired a STEM Coordinator and that's been a great help as well.
- I wish I would have had administrative support.
- I wish that we had reached out to local partners sooner.
- I would also encourage coaches to go to a training session in the fall. The learning curve for FTC is huge!
- I would always say be positive and have fun. I would also recommend participating in as many of the offered FTC opportunities as possible. This includes scrimmages and competitions. We participated in one competition and my group of students wanted to participate in another due the all they learned from the first time. We registered for a second competition and therefore could not compete again this last year.
- I would find more local connections to engineering. This helped spark the student's interest and they became more engaged overall.
- I would have liked to have been connected with other teachers who were also implementing a science fair and following the state guidelines. It would have been helpful to get their input and help with some of the problems I ran across.
- I would just say do not be afraid to ask questions. Jonathan Cole was wonderful to us. The whole experience of how other teams and coaches would jump to help you was absolutely met. Rebecca was also wonderful
- I would recommend printing the manuals for the teachers.
- I would recommend that the advisor take as much training as possible.
- I would recommend that you start early with your team so that way at the end you are not scrambling to get all of your work done. But with the grant we could only do so much because some of the stuff didn't arrive until it was close to the regional event.
- In our region, I found that NEICC wind tech facility and instructors are a great resource, as well as other teachers from the region.
- It is beneficial to have a support person. Two heads are always better than one!
- It really helped to go through the curriculum as instructors before trying it with students.
- It was great to have the local 4-H Staff (Cindy Cleveringa and Wade Weber) available to get info from and bounce ideas off of. They also did a good job with a kind of wrap-up FLL/Stem Science Focus Event for youth at Dordt College in February, which we appreciated.
- It was great too have the in-service time with the engineer that STEM provided. It was nice to have our local engineer on hand as he gave helpful hints throughout the process.
- It was helpful to have access to other teams. Training was helpful. It would be better to have someone else to team up with to facilitate the project.
- It was helpful to have contact with Michael Arquin when needed. Michael and Asia conducted a wonderful professional development class that helped set the stage for implementing this scale program.
- It was helpful to have parents that encouraged their sons/daughters to participate.
- It was nice to have all of the support such as other teachers, para educators, and our engineer on hand.
- It was very, very helpful to be able to lease the kit from Grant Wood AEA. / Our visit to the Water Treatment plant was really interesting for students as well as the adults. It's amazing to see all the updated technology a little town like Shellsburg has been able to use in their new plant.

- John Deere was very generous with the time of our community volunteer, a control systems engineer.
- Just doing the activities is the only way you really get a feel for the program.
- Keep teams smaller than ten participants. It helps let the kids learn and stay focused to work together as a team.
- Kid Wind trainers are awesome. The materials they provided me supported the unit I taught. Kids were very interested and highly motivated to participate in these labs.
- Kidwind.org included very useful resources and links to teach about wind energy.
- Kits should be selected and distributed earlier in the school year to avoid the weather-related delays that we experienced.
- Letter of commitment that students had to sign.
- LOVED the Catching the Wind kit. Kids would experiment for DAYS! Because we met for several days back to back I was able to take pictures along the way. I made a poster for them to take home at the end as a 'certificate of completion' and keepsake. They enjoyed that.
- Make the learning fun. The kits are designed to bring variety to their learning and puts the learning "ball" so to speak in the students' courts.
- Most classes started with a little review each day to help build on prior knowledge.
- Move the competition back a bit after the current date.
- My recommendation to others would be to take time outside of the hectic school year to make a solid plan and to make contacts for support so the teacher is not so overwhelmed during the process.
- My students utilized the FLL training in the Computer Science Student Network from Carnegie Mellon Robotics Academy / www.cs2n.org.
- No suggestions.
- None.(2)
- Nothing.
- Online videos.
- Our 4H club provides volunteers and administrative help.
- Our industry volunteers enrich the experience, as well as working across the curriculum with all of the grade 7-8 teachers and students. We also invite all the younger students to the exhibition day. At the end of the program, our teachers and volunteers meet to evaluate and plan for the following AWIM glider unit.
- Our team was fortunate to partner with the American Association of Women Podiatrists from Des Moines University--appropriate for the Senior Solutions theme. The members of this group were of tremendous assistance in working with the team on their project, while I was able to work with them on their robot. The other significant partner was the Boys and Girls Club of Central Iowa at First Christian Church, which provided snacks, a meeting space, transportation, internet access, and other services.
- Partnering with engineers from our local CNH (CASE) Company was very helpful in understanding the programming and robot strategy.
- Partnership with Jason Martin-Hiner at AEA 1 was instrumental in the success of KidWind in our school district. We also collaborated with Krisin Kriener, our ELP teacher.
- Pat Higby does an amazing job of customizing her workshops to the needs of individual groups.
- Promoting the club through the local media helped to give it a boost from the community.
- Quick responses by service provider was excellent and would encourage others to contact other local coaches for advice during the process
- Rebecca Whitaker is an angel and should be honored by the First Program. We also found help from a few engineers at Pella Windows and Doors.
- Rebecca Whitaker was a great resource for me in the Southeast IA region. She answered my questions quickly and to the best of her knowledge. She was very helpful as we felt a little lost this year being our first time. The FIRST website and the STEM websites were also helpful to find a majority of information.
- Rebecca Whitaker was very persistent in getting things done on time and encourage our team to do the same
- Rebecca Whitaker was VERY supportive and willing to answer questions. She provided good updates and information.
- Seeing the local competition was very helpful.
- Strong administrative support, lots of checklists for all the paper work, and access to a person who helped answer the millions of questions I had.

- Students, staff, and parents were very communicative about other commitments going on so that we could more easily coordinate our schedules.
- Support and assistance from our coaches who worked with a team previously.
- Tamara and Jennifer have been wonderful and I should have utilized them early on with presentations and programming. I do feel that we have a GREAT start and with this being my first year, it has been a good thing to sort of "start slow" and get a feel for what we need to do with the program.
- Tamara was very helpful in answering questions or found someone who could.
- Team-teaching the unit to a combined multi-age group was a great way to allow students to work with additional students other than just their classmates. It was also helpful to have a teacher to team-teach with to provide additional assistance and supervision of the activities.
- The "webinar" was really helpful.
- The 1 day trainings to use the materials were very helpful. In addition, some of the online resources were great tools to help explain things. The CD's were also helpful.
- The activities certainly can be adapted to older or younger students. Letting them just "play" with the items for a short time helps to get their focus onto the actual task at hand when doing the instruction.
- The AEA kit training was helpful so that I had a better understanding of what we were getting and which kit I wanted to order.
- The AEA volunteer, Rosemary Peck, made herself available and worked well with the students.
- The competition experience made a WORLD of difference for the team. Teams and mentors graciously gave assistance and mentoring. My team came to the competition confused and not really looking forward to it. They left inspired and thinking about what to do next. My co-coach and I will be working with other area teams to hold scrimmages.
- The curriculum training was very helpful. I also found it helpful to discuss the program with another local implementer.
- The earlier you can start meeting with the kids, the better.
- The EiE Training and resource meeting from the VAST Center from Jeanne Bancroft, Yukiko Hill, Lori Kriz, Jim Thorton and Kim Martin was very helpful. They allowed us to share ideas and resources with each other. The EiE kits would not have been successful without the VAST Center Training. Jim and Kim were always, always very helpful with budget questions and this support was very helpful! Janet Martin at the Iowa State Extension Office is also very helpful!!!
- The e-mails were very helpful to me and kept me on track. I was not able to listen to the phone calls, but did make time to listen to them when it was convenient for me.
- The first year of the FLL program is extremely difficult, due to the three parts to the competition (Gracious professionalism, project and the table competition). New coaches need to absorb a lot of information to have a team that is able to fulfill all parts of the activity, so they need to start early. Also they should visit other groups or clubs and talk to their coaches. And don't quit—I had a few teachers say they won't do it again, but then a few weeks after the competition, after reflecting, wanted to be signed up to be coach again next year.
- The FLL webinars and telephone conferences were very helpful and their website.
- The grant application was simple which I liked. We were able to get resources quickly.
- The handouts were very helpful.
- The initial training and conversations with teachers who HAD actual experience implementing components in their classroom was priceless. My trainer shared what worked, helpful suggestions, and even pictures of activities being implemented. I was able to lead the training confident on HOW I could implement the program. This allowed me the confidence to tailor the activities and roles specifically to my students. My students not only had specific engineering roles and manufactured the vehicles, they also had to create a marketing presentation and commercial. Through these activities not only was curriculum taught, relevant skills necessary for career advancement were developed. Students were able to problem solve and see the relevance in their pursuit.
- The KidWind training was by far (and I relayed this to the KidWind trainer) the best PD I and the other teacher completed. It was great!
- The KidWind workshop was very helpful and the supplies were/are awesome! The workshop and supporting materials I would definitely recommend.

- The local professionals were extremely cooperative. Administrators were supportive every step of the way, also.
- The manual was very helpful.
- The materials and instructions.
- The most helpful aspect of working with FIRST Tech Challenge this year was the experience of our veteran team to help our rookie team. Also being involved with the state coordinators was also very helpful.
- The most helpful thing was the initial training. I wish there was a way to provide students with the wealth of knowledge/experience we received from Joe. I also found it helpful to have actually have completed some of the activities at the training as I found the online activities to be difficult to understand. I recommend the program to everyone who is wishing to instruct/explore both wind and alternative energy sources. The extension possibilities are endless. I look forward to making some changes and implementing this program with even more students and community members next year.
- The network of existing coaches, the Iowa FIRST Tech Challenge website, forums.
- The NW Iowa Stem Hub manager was very helpful in working through issues with the LEA and managing on the ground realities with volunteers in the scale up.
- The on line professional development workshop was helpful (I listened to taped versions). The conference call with ISU outlining MOA's was very helpful. Camille Schroeder and Kris Kilabarda were very helpful.
- The on line videos were very helpful.
- The online lesson plans and tutorials were helpful.
- The online Webinars were helpful as a new coach. Hollie Webber at Central Lee was a great mentor and was always willing to give guidance through our first year.
- The prep time was needed. I had no problem following the guide the first time using it.
- The professional development training session with AWIM representatives was extremely helpful. This allowed me to view the materials ahead of time, construct the JetToy, and collaborate of what we could effectively modify from the program.
- The professional development was very helpful. I was able to get a view of a variety of the kits to be able to decide which one fit my needs. I would also advise having professional community members come in to speak with the kids. This was very interesting and helpful.
- The scrimmage was a life-saver for our team. Sargeant Bluff put together a very educational day for us.
- The STEM board members Rebecca Whitaker and Craig Martinson were very helpful. I would recommend to others that they not avoid reaching out to them for assistance.
- The students' enthusiasm was something that I greatly appreciated it. In addition some of the students really got into the idea of programming the robot and that was nice to see.
- The support from Beth Kulow was amazing. She answered every one of my questions.
- The time line to make sure we stayed on course.
- The training at the beginning.
- The training I received was helpful. I also found the teacher manuals to be very informational.
- The training in Sioux City in which we experienced a kit was very helpful when implementing the kits I used.
- The training of the kit was awesome. Great resources given and contact information to help with my questions.
- The training offered by the service providers was the most helpful, followed by the CD's included with the products. Oh, and it was helpful to have some of the extras provided (like glue guns, glue sticks, etc).
- The training session in Spencer was really helpful.
- The training session was helpful.
- The training was excellent.
- The training was very good; however I wish it had been longer and I could have attended all grade-level sessions.
- The training was very informative! I highly benefited from it.
- The training was wonderful. I wish it might have been closer to the time I implemented the program, since it was all fresh in my mind, and after training, I would/should have started it.
- The training. Teachers implementing the program should go to the training.

- The University of Iowa grad students were very helpful and engaged student interest while teaching during the week in January. Students loved the field trip to the University of Iowa for the simulations in various health science areas.
- The webinars were very helpful to understanding the process for all the paperwork and the fair itself.
- The website we went back to again and again for motivation.
- The workshop for learning the activities was good.
- The workshop was great for me to have hands on experiences with the materials and to see the connections.
- The workshops I found to be the most helpful and useful in implementation. The workshops really helped me learn about the materials that were given to the students to use.
- There was a phone conference that was conducted at Iowa State that was helpful in answering questions regarding implementation of the grant, procedures to complete, etc.
- This program could not have proceeded without our tech guy helping us.
- This would be a good thing to do in the spring (apply) so you could use the summer months to train and go over the materials and plan to teach with the kits.
- Training is a must! Utilize the Kidwind Website.
- Use the resources that were given and there should be no problem.
- Using parent volunteers who are interested in the area of study or can provide background on an occupation that is related.
- Very age appropriate instruction. Hands on activities were good for this grade level. Trip to Iowa City was good.
- Videoing the students using the kits has been a positive. It serves a documentation of implementation, helps students to review concepts, can be used by the teacher in his/her portfolio, etc.
- Volunteers with engineering backgrounds are extremely helpful not only to explain the concepts but to troubleshoot some of the design problems. Also, the training was very helpful as I was able to make and test a Gravity Cruiser myself. Had I tried to do that just following the lesson plans, it would have been much more difficult.
- We both really liked how the students could take their projects to the "Energy Games" competition to find out how they did in comparison to other groups of students. They were excited to see the ideas of others and had thoughts on how they could modify their existing devices.
- We found a local school. Ossian De Sales that helped us a lot.
- We found it very beneficial to recruit mentors and coaches that were dedicated to go the extra mile to work with young people from low-income families. We also were able to recruit mentors and a coach who were able to work with students from diverse backgrounds and family environments.
- We found the activity booklets helpful and easy to follow for the progression of the learning. We had volunteers who helped which were a must in order to accommodate more children and keep it running smoothly.
- We had an engineering club started at our school before we found out about FIRST and Scale-up funds. It was helpful to have some internal structure for the students to operate in.
- We have a network of TAG teachers in the Keystone AEA region and I answered LOTS of questions via email and teaching another team how to program. It is important to me to help other people along in the process because I know how difficult it was for me to get started 5 years ago. The funding was very much appreciated because it is an expensive program to maintain.
- We increased our connection to business and others.
- We invited a group of pilots to help with the AWIM glider project, and found that the students' comprehension of that model was a lot higher than the other AWIM models. Instead of just following directions to build something, the volunteers helped the students learn about how airplanes fly, the aerodynamics involved, and all sorts of real-world examples that made the project much more engaging.
- We loved the tour of the ILCC campus.
- We met with our mentors before they came to an actual meeting.
- We went to the regional competition and observed. This was helpful for me and my students. Possibly setting up a mentoring program for new schools would help. We loved our experience but would have benefitted from the experience of others.
- We worked with a team in a neighboring town. They really showed us how and what to do. We couldn't have done it without them.

- We would like to see more professional engineers involved in the process. Students love to see the hands on activities they / provide.
- Web sites and blogs about FLL.
- What I found most helpful was that our regional advisor was always willing to answer all of my questions. He was very helpful and always returned emails and calls in a timely manner. This helped keep my stress level low, and I always knew I had someone to depend on when questions needed to be answered.
- Without our mentors from Farm Bureau we would have really struggled this year. Finding experts in industry are highly recommended.
- Working with other teachers.

What groups, if any, did you collaborate with in the implementation of the Scale-Up program?

Collaboration with In-School Groups

- 3rd, 4th, and 5th grade teachers
- 6th grade math instructor
- 8th grade and 9th grade Science classes.
- A monthly radio spot about school events.
- Administration, counselor, teachers
- Administration, teachers
- Administration, teachers
- Administration, transportation
- Advance Website Development, 8th Grade Computers
- Ag Department and Kitchen.
- Art, Math, Theatre, the library, 21st Century Writing, and career connections classes.
- Asked other teachers to adjust their schedules to provide us a longer working period.
- Building Trades class
- Central Community School
- Classroom teachers
- Collaborating teachers in grade level and switched rooms to teach the other program
- Collaboration with my high school colleagues helped with questions and ideas to apply the processes to multiple areas.
- Colleagues and administration
- Community School District Home School Assistance Program
- Computer Science class
- Coordinated use of facilities for testing glider flights
- Co-teachers
- District technology committee
- Drake University supplied support and also science practicum students to help with the implementation.
- Food services
- Fourth grade, TAG, and environmental students all worked together to do an energy assessment & build solar cars.
- Gifted and talented teacher
- Grade level team of teachers
- High school helpers
- High School occupational committee
- High school science teacher
- HS Physics and MS science, problem solving and TAG
- I am the G/T coordinator and I worked with the Science teacher.
- Industrial Arts (including Project Lead the Way) students were informed and recruited. School paper reporters wrote stories on the team.
- Industrial Tech Teacher, Vocational Teacher, Maintenance staff
- Industrial technology program built our First Lego League table.
- Janitorial staff
- Kristin Kriener, extended learning program teacher
- Lorrinda Kisley, teacher
- Math department
- Middle school principal, school superintendent and elementary GATE teacher
- My teaching colleagues
- North Winneshiek Middle School
- Other 1st grade teachers
- Other grade level teacher
- Other k teachers
- Other physical science classroom.
- Other staff members were involved.
- Other teachers
- Other teachers during In-service training
- Our financial department, specifically Dawn Kelly

- Our industrial tech. teacher who teaches a LEGO unit to other age groups.
- Our program was held in the school library after school, so we worked with librarians, custodians. We went on a field trip so we worked with school transportation director. Two teachers led the program. Worked with the building principal and secretary for planning, advertising, etc.
- Our Technology Department for ordering materials and setting up our laptop.
- Parent Teacher Association, Sudlow Teachers and Principals
- Parents
- Patti Bond (school accountant), Jim Mollison (principal)
- Physics class
- Principal
- Principal—Ralph Plagman—support
- Professional Development Team and Coordinator
- Project Lead the Way
- Project Lead the Way teachers
- Regina and the Regina Science Department
- Robotics team
- Robotics Team
- Science Club
- Science department, Industrial Technology, Math department, Superintendent
- Science teachers, industrial technology, special education
- Science Technology Engineering and Mathematics Club
- Spirit Lake Community School
- STEM committee
- Student participants, ELP teachers
- Students and staff
- TAG students with the verbal support of parents who attended a presentation early this year.
- TAG teacher facilitated
- Talented and Gifted program, FLL
- Talented and Gifted program, study hall time for meeting.
- Talented and Gifted
- Talented and Gifted Program
- Talented and Gifted Program, Transportation Department Keokuk Schools
- Teachers
- Teachers
- Teachers (Science, writing, math, and special ed.) Administration
- Teachers from the third, fourth and fifth grade classrooms
- Teaching staff, board of education, parents and support staff
- Tech services
- Technology Department
- The agriculture teacher and I collaborated
- The district central office at my school.
- The engineering club grew for the 4th consecutive year
- Third grade classroom to test pinball designs
- This is where I pulled my members from and recruited
- Three teachers who served as audience for skit about product
- University of Iowa grad psychology students
- Use of district facilities for meetings, building, practicing and events
- Used in the science classroom as an extension
- Waterloo Community School District
- We collaborated with the International Club, whose students were very interested in being a part of HyperStream.
- We did not this year, but I will maybe work with the industrial technology teacher next year to collaborate our math and small engines lessons.
- We discussed some of our problems with the computer software with our tech coordinator. We also had help from previous FTC members.
- Williamsburg High School used study hall and homeroom time to work and coordinate with students
- Worked with Harris Lake Park schools to advertise and get a team together

Collaboration with Out-of-School Groups

- 4-H (2)
- 4-H and Iowa State University Extension and Outreach
- 4-H program in Blackhawk County
- AEA science consultant (2)
- All of our practices were after school
- Assisted Valley of Elgin and Cresco Schools
- Beta (FTC Team 3550) and their coach, Emmaly Burklund
- Beth Kulow
- Cresco Chamber of Commerce and various businesses who worked with us to let us design their Google Sites.
- Des Moines University Educational Support
- Engineers at Rockwell-Collins
- Families helped with supplies and knowledge, Rockwell Collins helped with funding.
- First Tech Challenge of Iowa
- First Tech Challenge team Beta from West Des Moines. Waukee High School First Tech Challenge team Binary Addiction
- Geriatric Doctor
- Girl Scouts of Greater Iowa; Boys and Girls Club of Central Iowa (First Christian Church)
- Heartland 11 Area Education Agency
- Heartland Technology helped us with our recycling project. Farm Bureau Financial helped our Cyber and Game design teams
- Helped many other schools
- High school peer helpers
- High School students came and helped from East High, Director of Education of Sioux City Schools helped with the planning, Superintendent of Sioux city Schools attended and helped at the event.
- I used the PBS kids outline for inventions when teaching the engineering and technology portion.
- ILCC / ILCC college staff
- Industry Volunteer from Wind Turbine Company
- ISU Women in Engineering and Science
- IT Adventures
- Jason Martin-Hiner, Area Education Agency 1 science consultant
- John Deere
- John Deere, Rockwell Collins, the University of Northern Iowa, The University of Northern Iowa Center for Urban Education, The Community Foundation of Northeast Iowa, Iowa Governor's STEM Advisory Council
- John Deere, Rockwell Collins, UNI Upward Bound Program Staff and UNI Educational Talent Search Staff
- Local Catholic School
- Local newspaper ran 3 separate articles about us.
- Local Wind Energy Company.
- Louisa County Extension 4-H
- Luther College Faculty as personal resource
- Meet two times a week and had engineers there to work with students
- Norman Borlaug Inspire Day
- Nursing Home (theme)
- Other teachers
- Other teachers that were also involved in the FTC.
- Parents, service provider, vendors, local teams from area
- Partnership at Winterset Schools (PAWS) Afterschool Program
- Pella Windows and Doors
- Physical therapists, nursing home, furniture store
- Retired principal
- Rockwell Collins (facility tour and event attendance), Langford Teams Training, CRCSD Art Show
- Science Center of Iowa
- Spurgeon Manor Retirement Center, Edgewater Rehabilitation Center
- Students talked to their own grandparents.
- Team Beta, Mt. Vernon, Linn Mar
- This was implemented in a after school program
- Van Meter
- Various wind production companies and community college programs (ILCC)
- Waterloo Water Treatment Center, ISU Extension
- Wilt's Wiring and Fabrication Shop in town. The owners of this business are the mom and dad of one of the students in robotics. The dad will actually become a mentor next year to the team.
- Workers from Case New Holland in Burlington, IA

Collaboration with Community Groups

- 132nd Fight Wind Air National Guard, BECOM Biomass Facility, AmeriCorps
- 4-H
- 4-H Cindy Cleveringa's office, Landsmeer Ridge (senior partners at this nursing care center & their director), Northwestern College (interviewed Dr. Davis about neurology)
- A local farmer with a windmill on his farm.
- A parent who helps with my FFL program—Jim Wittry
- a public speaking coach
- Ambassador companies for each site—Fisher Controls in Marshalltown and Harrisvaccines in Ames
- An engineer from the Dept of Transportation and an engineer from the City of Cedar Rapids explained gear systems
- An Orange City FIRST LEGO team was invaluable help to us as we were so new.
- Boy Scouts
- Businesses with robotic components
- CASE provided engineering mentors and we presented our project to residents at the nursing home
- Clay County 4H
- Collaborated with City Council, Small Business Development Center, Pioneer, John Deere, National Instruments, KCL Engineering
- Community utility company
- Coordinated use of facilities for testing glider flights
- Demonstrations
- Des Moines Pilots Association
- Engineer from Tri-Mark Corporation
- EPioneer, Johnston Senior Dining Site at Crown Point, American Association of Retired Persons of Iowa, Iowa Ortho Center at Mercy Medical Center, Johnston Mercy Clinic
- First Lutheran Church
- Fund raising
- Fund raising
- Girl Scouts of Greater Iowa
- Girl Scouts; 4-H
- Greenfield Lumber
- Habitat for Humanity ReStore, Optomists, Rotary, McGrath Auto, NewBo City Market, 2 graphic design companies, storm steale, True Value, SNK enterprises inc, United Way, Schneider Electric, Theatre Cedar Rapids, Barnes and Noble
- Had an engineer from a local company talk with students and toured their facility.
- Had two engineers speak to class
- Hawkeye Pedershaab helped us machine parts and their engineers gave us some ideas
- I tried to connect with our local Lutheran Retirement Home, but they did not return my calls or emails.
- Indian Hills Community College
- Iowa State Extension Office- engineering students
- Iowa State Person in the field of engineering
- Iowa State University professor Matt Frank helped with wind turbine blade understanding. (As a side note, it cracks me up that I am specifically asked to not use acronyms!)
- ISU Extension
- ISU Extension Council of Louisa Count
- John Deere Mentors
- Johnston Youth Sports, Polk County Senior Congregate Meal Site (Johnston)
- Ledford Engineering, Scheels, Towncrest Pharmacy and St. Francis Veterinary Clinic were all helpful in getting what we needed.
- Local business
- Local business partners and marketing directors
- Local companies - Pioneer (mentor) and John Deere (additional funding to support costs not covered by Scale Up funding).
- Local media/radio for pre-releases and post releases.
- Luther College PALS program
- Neighboring Town Hardware store
- North Scott Press
- NRCS, Madison County Conservation
- Nursing home
- Ogden Manor/ (local care center) Ogden Legacy—service organization in community
- Optimist Club, Rotarian Club and Cub Scouts
- Other FLL teams and coaches.
- Parent and grandparent of one of my students
- Parents who are also community business owners specifically hardware stores.
- Partner at Iowa State University Extension
- Presentation to Halycon House Retirement Home
- Professor Matt Frank from Iowa State University came in to talk to the students about how wind turbine blades are made and the current research and problems currently studied.
- Rick Robertson, City of Shellsburg Water Treatment plant

- Rockwell Collins Inc.—rookie team grant for robotic kit; volunteers from local businesses in engineering field
- Rockwell Collins, Iowa State University, Ossian Senior Hospice, parents, and grandparents
- Rockwell Collins; Indian Creek Nature Center
- Senior Citizen
- Senior Citizens including grandparents and our local senior center
- Spirit Lake City Hall
- Sudenga Industries engineer Cory Maxwell
- University of Iowa
- VAST Center Staff—Jim Thorton/Kim Martin/Jeanne Bancroft/Yukiko Hill/Lori Kriz, Wood Wildcat Learning Center Dir. Jarrod DiRooiJohnson County Neighborhood Center Staff Iowa State Extension Office Janet Martin
- We attempted to find volunteers to help us with the computer programming, but we were unsuccessful.
- We contacted our paper to cover an article for us and take a picture for our local paper.
- We displayed our work during parent-teacher conferences.
- We had to have the community donate supplies as the MOA was so late getting to us.
- We involved a senior citizens home and a doctor and his staff.
- We welcomed a mentor onto our team after the season started. That was very helpful.
- We were able to use the American Legion basement to host our practices
- Web Designs (Not an acronym, but the owner's first name spelled backwards) Cori Petersen
- Women's engineering club
- Work with area business in sponsoring and funding robot

Collaboration with Volunteer Groups

- 2 parents
- 4-H
- All of our coaches
- American Association of Women Podiatrists at Des Moines University
- An engineer and a pilot
- An engineer who will be coming to class and visiting with the students.
- Andy Marshall
- Bridget Hendrickson, parent and Mark Grau, grandparent, Grant and Riley Ries, former students
- Carmen Wadden, Lutheran Social Services
- Chaperone
- Coaches
- Collaboration with other FTC teams/mentors in the area
- Cory Maxwell
- County Engineer
- County engineer who is also a parent of one of our students
- Dr. Jacobs, UIU Professor
- Engineers from John Deere, Retired engineer, Software Programmer
- Experts on gliding
- Former High School Physics Teacher
- FTC event volunteerism
- Grandmother of a student
- Grandparent, parent
- Grandparents
- Great Prairie AEA
- Had engineers come in and work with students
- Had great volunteers that helped with the program.
- High School students/ John Deere employees / local college students / parents and teachers
- I had two parents who came on the field trip with us to the University of Iowa
- Industry volunteers facilitated classes and were panel members the day of exhibition; engineers, business/marketing, community council member
- John Deere
- John Deere
- John Deere, The Waterloo Community School District, The University of Northern Iowa
- Local farmer, John Gent, led us around his farm with wind turbines for our field trip.
- Many of the parents were adult volunteers and supervisors.
- Many parents volunteered in the 4th grade
- Mentor---ISU engineering student
- Mr. Bob Windt, retired aeronautical engineer and Mr. David Moritz, electrical engineer
- My volunteers were instrumental in planning.
- Myself—I gave a lot of money.
- One adult volunteer assisted at the Story/Boone Club
- One of the boy's father was a huge help to us. He encouraged and helped the team and provided transportation.
- Ongoing parent support
- Parents (4 responses)
- Parent involvement
- Parent made the table for us
- Parent volunteer to help with the engineering part
- Parent volunteers Julie Gross-Louis, Chris Cheatum, Brad Wilson, Shawn McCall
- Parent volunteers to help judge the final presentations
- Parent volunteers who served as the purchasing firm
- Parents helped organize and support our students.
- Parents with engineering backgrounds who were interested in the program
- Retirees
- Rockwell Collins employee
- Rockwell Collins—Steve Carnesi and Andrew Dibble
- Scott Wiley
- Technology person that owns his own computer business
- Tom Patterson, Mentor
- Two parent volunteers from Rockwell Collins. They were both engineers and great help.
- We collaborated with an elderly gentleman in our community.
- We had a parent work with our team in constructing the field set up.

Collaboration with Other Groups

- Arts and the Mind, a PBS documentary on how all forms of art help keep the brain active and healthy
- Beta Team from Des Moines
- Bill Mattaliano from Solon High School FTC team.
- I did collaborate with one other science teacher.
- Iowa State University for use of facility and for computers from IT-Adventures
- Kent Park Naturalist Brad Friedhoff, UI Macbride School of Wild Dir. Ed Saehler, Mississippi River Museum staff, UI Geology Collection Dir. Tiffany Andrain, UI Mini Medical School, UI College of Engineering, UI Biology Dept., UI Archeology Dept, UI Natural History Museum
- LabView trainer
- Medequip Services (for club tour about community projects and innovative solutions)
- Paslode and Musco
- Pioneer Valley 4H Club
- Platteville University of WI
- School Administration
- SKYPE, video/face to face conference with other schools for focus group study/ surveys
- South Winn Community School District Lego League students
- Stem Coordinator for the Davenport School District
- Todd Knobloch, Junior High Principal
- Two parent volunteers. One was an engineer.

Which of the following outcomes, if any, did you observe as a result of your program—Other?

- An annual engineering contest that will challenge our students each year that we can compete in with reasonable annual expenses.
- Character and other skills development.
- Continued partnership between college education program and local elementary school
- Increased acknowledgment and appreciation of students learning outside of school.
- Increased awareness of autism and abilities of autistic students. Increased ability to accept all students for their abilities and talents.
- Increased awareness of science and technology abilities.
- Increased interest in technology education classes, students want to know how to manipulate material and produce custom products.
- Increased resources for teaching STEM topics.
- Much high self confidence for kids and teacher!
- Parental support is increasing each year.
- Partnerships through STEM Field trips to UI Mini Medical School, UI Geology Dept.,, UI Macbride School of the Wild, UI State Archeology Dept., UI Biology Dept., UI College of Engineering, UI Chemistry Dept.
- Relationships and communication skills increased among students.
- Role of technology in industry and beyond.
- School promoted students' successes outside of athletics.
- Student self confidence and motivation.
- Students’ problem solving skills rose dramatically.
- Teamwork and collaboration. Strategic thinking skills.

Please provide one or two examples of the impact the program has had on participation.

- The students really enjoyed the lessons and activities. Had adults come in and help was great.
- The kids enjoyed the hands-on activities.
- Participants learned to cooperate and work together as a team to complete the project. Students learned some science vocabulary words while working on STEM projects, such as ricochet and propel
- Have them pushing for even more questions that made them want to keep learning.
- Students are begging to do more STEM focused activities. We have built several additional teacher-created ones into our curriculum this year to continue to expose and engage our students to these areas.
- Overall enthusiasm of the engineering field was increased due to the STEM Project.
- Students really enjoyed the hands-on, trial and error aspect of the program
- The teamwork and design process is a real life experience that touches on many communication, technology, and employability essential skills and concepts.
- The students really enjoy engaging, interesting activities. When I informed the students that I had seen that there are scholarships available for those interested in STEM careers, a few were very interested.
- The children learned some new vocabulary and seemed to enjoy the topics. They are interested in trying some other kits.
- Students became more excited about science time. The teachers enjoyed having extra hands on activities for the students.
- First graders absolutely love the interaction with the books, ramps and cars, as well as working with their peers! It's the most exciting science unit we've had this year.
- This was the first exposure that our students have even had to STEM topics. Before beginning AWIM, our students did not even know what STEM stood for. Now the students not only know what STEM is, but they are interested in continuing to learn more about it.
- Learning how to design, overcome failures and to work in teams.
- Several students want to be engineers (specifically at John Deere) when they grow up! Parents commented that their children were talking about our science lessons at home.
- Student interest in STEM and specifically STEM careers was increased based upon students being able to "try on" the roles of various engineers. Students experienced all stages of product development, manufacturing, marketing, and retail design. Students were excited to share their knowledge and completed numerous hours of out-of-school research and design. We would be happy to share the tremendous marketing presentations and commercials that were a part of this. Students began to see how STEM allows them not only control their environment but to change the world.
- Students became very interested in designing new kinds of seeds. I thought they were very creative...
- We worked with a 5th grade teacher who now intends to apply for his own scale-up grant for next year.
- Realized that there are different types of fuel and they were able to see it work.
- I have taught physical science for 16 years. Although I have tried to increase interest with hands on activities, the materials provided in the AWIM program were much more conducive for student engagement which stimulated awareness. As a result I certainly observed an increase in interest in career opportunities in these areas.
- Teachers "comfort levels" with physical science instruction has improved with the training and the AWIM kits. Students have been exposed to topics not related to the biology side of science.
- They were excited about the activities, measuring and experimenting with different weights.
- This process made my students have to really think critically. They also had a real-life situation where they had to problem solve and endure in the process to come up with a solution. They also were able to use their creativity when making designs for their toy cars.
- Students are now able to see a clearer partnership between math and science. / Students are more proficient at problem solving and learning from mistakes.
- Excitement at home and school about the project. Parents’ comments.
- The kids LOVED everything. They look at force and motion in a whole different way now.
- Overall increase in motivation and interest in what we were doing compared to other subjects taught. / I noticed that it engaged students at all academic levels. /
- They have loved to explore with cars and ramps. They were very excited for science time.

- Students made connections between the STEM activity and the real world. Students make connections between the STEM activities and other science activities and concepts.
- Learning the design process has had an impact on my students. We now abstract the process to other work in class. The design process of deciding what issue they are trying to resolve, agreeing on who the audience is, brainstorming ideas, making a prototype, getting feedback, and revising applies to other areas as well. We have talked about how it applies to making presentations and problem solving.
- Students realized how math can be applied to real life problems. The design process involves many steps with constant refinement.
- My Kindergarten kids became highly interested in predictions and exploration.
- Students did enjoy designing and constructing their projects in my second and third grade groups. They learned to conduct experiments and that they need to do multiple trials to find the answer. 2. The Kindergarten and First Grade group found the Rolling Things Unit fascinating and they learned about ramps and the speed of objects. They quickly learned that the steeper the ramp the quicker the object will roll and vice versa. 3. The fourth and fifth grade groups learned that just like real engineers they need to first make a plan or design, construct it and then test it out. They didn't like having to fill out so much paperwork but I think it is important for them to see that part of the process is important. The hardest thing they had [to do] was trying to figure out the sail area.
- Students enjoyed exploring the ramps and crash boxes to discover relationships between gravity, the ramps, and the cars. They improved their conceptualization of what gravity is.
- A student who is usually very vocal is working extremely well with his group (not being loud) and his group compliments him whenever he is doing well. Nice to see.
- Parents were extremely impressed with what the students were sharing and discussing with them at home. Many students took to designing their own devices at home and testing them in an attempt to achieve certain performance goals. Students were engaged throughout the program and presented with many learning opportunities. These learning opportunities varied greatly from group to group and students also learned how to respond to successes and failures of their designs.
- Students have been very preoccupied with making improvements to their cars, and have been eager to get working on the project. One student had some brilliant ideas about how to solve an engineering problem on his car.
- My program is still in process at this time.
- Students are beginning to see how these skills might translate into careers for them in the future and the overall interest in design engineering has grown from the beginning of the unit.
- The students loved learning using AWIM! They were excited, focused and willing to learn more. Many of them did not know what engineering was and after working with the AWIM curriculum thay have had a positive experience and interest engineering concepts.
- Students used their math skills more during the investigation. Students were also asking, "what if we did this" type of questions to their partners.
- Students were able to plan, create, and execute a toy model. As they were doing so, their interest level in the mechanics of the design and creativity increased as noted by their response to the activity.
- The kindergarten students were always looking forward to "science time" and seemed quite interested in the topic.
- I noticed that the girls in our program really enjoyed the glider project specifically. Our pilot volunteers helped create context and real-world applicability that seemed to connect with the girls involved. We did an end of project boys vs. girls glider Olympics competition, and the girls won!
- Several of the female students found that they really enjoyed the hands on activities and got a lot of satisfaction from putting the materials together. In addition, I had a lot of good discussions with individual students while they were working, which allowed me time to discover misconceptions or in one case, push the students understanding further than the rest of the class.
- When doing the Watts Your Consumption activity, my students learned about energy usage in a concrete way and it really made an impression on them. The students had fun while learning about what blades were more effective in generating energy with wind turbines. They had fun trying out new ideas.....and they gained confidence trying things out and making mistakes and then trying again. Very important.
- Some fourth grade students sought out the STEM festival at NICC. Their interest in science is higher than the start of the school year. All students were more aware of energy waste in the school too. Overall more conscientious of energy use.

- Brought the girls' interest up and we had quiet students working harder.
- The students enjoyed working on their projects and didn't realize how they could do something like this for a living in working with renewable energy sources. Now they do as a result and quite a few are interested in future career opportunities that tie together renewable energy and technology. Several students were surprised at how renewable energy sources and being energy efficient could help them save lots of money in the future for when they have their own home and how it can help the planet/mankind in the long run.
- Students really enjoyed learning and had fun, but it also challenged them.
- Overall, I would say that the students really enjoyed working on these projects, and it was cool for them to be able to understand not only how energy from the sun is transferred to Earth, but also provided a hands-on way for them to experiment with the capabilities of solar engineering.
- My students are very interested in Wind Energy and want to continue researching after completing this program.
- The kids were able to participate in hands-on learning experience that takes some time to implement in a larger classroom.
- The students loved that it was real life issues. They loved all of the hands-on projects and worked hard to solve problems.
- Building their wind generators and solar powered cars had made them stretch their skills. They had to think through the how to and experiment with the process.
- Pre-service teachers learned the content and taught the content to children. First they used the materials to reach about 250 attendees at the Luther College PALS Science Fun Day. Then they reached another 220 5th graders at the Borlaug Inspire Day/
- I have seen the students who do not listen well (or turn in homework, etc.) work diligently on building and designing blades. I can leave the room and return and no one is off task! The students have worked at problem solving and commented on the many variables needed to build and operate a wind turbine or solar car. They have learned the design process repeats itself and is never ending - nothing is perfect!
- I had a parent stop me at the regional competition and specifically thank me for helping get the project started. This is the only activity her son has ever been involved in at school and he was finding major success. Students wanted to continue meeting after the regional competition to try new ideas and implement new attachments to their robots. They did not just end when the competition was over.
- Students in Lego-League bonded as a team, learned about engineering, and most importantly became a community willing to stand up for each other and demonstrate gracious professionalism.
- This program is building confidence and new friendships that will carry over into 7th grade when they all come together.
- I think it is really neat that I have two students pursuing the Innovation Award. They have been advertising and spreading the word about our invention. This is the first year I have had students convinced that their innovation can impact our larger community. The kids have gotten lots of good feedback from people in the community about the validity of their product. After doing a showcase for the school, the rest of the school community was very excited about being able to participate in Lego League in the future. It certainly is a pride point of our community!
- Students really worked on collaboration and problem solving skills. They used these on a daily basis to complete the tasks for the day.
- Our students are fully engaged and often meet on their own to complete projects and programming of school grounds. Collaboration and friendships seem to have blossomed as well as an awareness of skills or unique skills that others have
- The students were excited about programming and most of them had never been exposed to it before FLL.
- This program drew seven individuals into a team. They did not care to work with others on projects at the beginning of the year, but by the time of the state competition, they were much more aware of each other's needs and feelings, as well as each other's strengths. All members got to try their hands at programming the robots, and this was a completely new experience for many of them.
- The students became more aware of the topics and implement the core values of STEM.
- Student motivation for this project was very high. For that reason, they were able to achieve a great deal in a short time period. They got experience with programming that is not provided in any other part of our school curriculum.
- Interest in engineering as a career choice. Interest in attending a four year college.

- One of the greatest impacts of the program was the development of Core values. The team really jelled, and this was demonstrated in their enthusiasm and positive outlook at the regional competition.
- This program gave our district the opportunity to provide a fun, collaborative learning activity to a group of students that enjoy science. The students looked forward to our after school sessions.
- The participants are excited about the FLL program. In the weeks since the competition, we have continued to build on teamwork and are inviting local engineers in to talk about new concepts such as gear reduction and tracks drive systems. They are all interested in science and enjoy working through problems. Another activity they enjoyed was a prioritization process activity where we weighted FLL missions based upon probability of completion and point value. It was a great learning moment!
- Students increased enthusiasm and interest in programming and this year's topic of seniors increased. Students are creating a storybook using iDraw programs based on their senior and the tool they developed to help him. Students basic understanding of programming seems to be growing as seen through observing them create their own movements with the robots.
- The students are more aware career opportunities in engineering.
- We strived to get more girls involved in First Lego League and were extremely successful. We also were looking to encourage participants to move up to the First Challenge and we have 3 participants moving on to First Challenge next year.
- The girls had a fantastic time working together as a team and solving problems. Our mentor taught them to "try it" and not be afraid of failure.
- I was so pleased to see after teaching and practicing the core values with these young students, the level of cooperation soared. The kids truly became one unit as they consistently helped each other and became better friends.
- The students who participated fully in FIRST LEGO League are leaders now in robotics at our school. Even older students who see what we have in my classroom come around and are impressed with the work we can do! I love it. At least one student wants to pursue a programming career in the future.
- One of my groups was able to complete the robot bowling challenge. This was a group of 8th grade girls who did not expect to be able to accomplish this. I loved the interaction between grade levels and each group gained an appreciation for the talents of others.
- The students have become more engaged in learning and interested. As a teacher I have been award of resources I that I was not aware of before and have passed that information on to other teachers.
- The students, especially the girls, are much more interested in science and technology. Some of the students with reading disabilities are more interested in reading about LEGOs and science topics.
- The students who were on the team learned so much. An additional benefit has been the interest sparked among students not on the team, just because they saw the robots, table, etc. in my room.
- The program helped us to get some much-needed equipment for our Lego League. It provided us with an extensive amount of extra Lego pieces, which spurred the kids' creativity and motivated them to stretch their minds in new places while trying to resolve the problems they were working on with their robots.
- Participants' interest in STEM was both "sparked" and nourished. Team members have planned to meet monthly during the "off-season" and meet more often during the season. Members gained first-hand experience in creating tests and collecting data to guide planning and decisions.
- Positive student self-efficacy increased because students had to learn to solve problems with limited guidelines. They learned a lot about trial and error. Many times in the classroom, they have very specific requirements to follow so many have a fear of failing when they are in a more open ended learning situation. They learned how technology, math, science, and reading applies to engineering. They also learned that speaking, drawing and writing are important when they want to develop and express their ideas. They implemented the engineering design process to their work. It was also great for building leadership skills, social skills, and time management skills. It has been motivating for some to work harder on their schoolwork. FLL gave them a chance to see how learning about stem relates to their future.
- This program was an opportunity for students to learn more about computer programming and engineering that is not directly found in the current middle school curriculum. The students were provided an opportunity to build, test, rebuild, test, rebuild, collaborate with peers with the goal of having fun and creating a robot to complete tasks - not your everyday classroom experience. The Scale-Up program also engaged students that often do not have the opportunity to belong to a team. The program at Ridge View Middle School captured the attention of students not involved in athletics or music programs. This program provided ALL students an opportunity to be part of a team.

- More involved with computer programing and sharing it with their peers
- Our school worked some with St. Cecilias in Ames on this project. Getting to work with them helped us to better understand what we need to do and helped us to collaborate with another team.
- This program gave students confidence that were unsure of their actions before they started the program.
- Students who are rather rambunctious in the classroom stayed focus. Students who typically have difficulty getting along with others, worked collaboratively with their peers.
- My students are more aware of opportunities out there in the area of STEM. They have also strengthened their group work skills.
- A boy who does very poorly academically was pulled out his shell, as he excelled at robot building and programming.
- One of our students struggles greatly with social skills. He is very high achieving in school, but it has been a struggle for him to try to talk to his teammates about team goals and whose turn it is to program and build the robot. He has been better at explaining to his teammates in a logical argument about how they could possibly take turns and rotate roles.
- The student got to learn not only STEM skills, but also life skills such as communication and how to get along with team building skills, which are important skills through out life.
- While preparing for the FLL competition, I invited in a software engineer and a mechanical engineer to speak to the students. The students were amazed by the work that these people do each day, and they had great questions. I could tell their interest in STEM careers was definitely raised.
- Students were able to see that professionals in the real world use the knowledge gained in middle and high school and use those basic skills to refine and hone in on skills specific to their profession.
- Several group members are looking forward to next year.
- I love to see kids get excited over something besides sports. My parents love to see the excitement on their faces when a mission is completed!
- Student excitement with robot. Learning to work together. Attended every meeting.
- Students realized the many opportunities they have for them in the job market. Student learned how fun and exciting STEM activities can be.
- Students were very interested and engaged in this process. They were excited about the opportunity and grew as a team in preparing for this event. They learned valuable teamwork skills and collaborated to reach their goal of being ready for our Regional event. All students indicated they wanted to do this again next year. I have one student who designed an independent study for this trimester to complete the missions we didn't master before the Regional. He is very excited about a career in engineering.
- The largest impact was the FLL project to work with senior citizens. Our students visited a nursing home several times and interacted with the residents, which was very beneficial. The students will remember their conversations with their new friends for a long time.
- Students showed more interest in computers and technology.
- Kids were able to become mini mathematicians and engineers. It was neat to see the kids truly become a team and work together towards a common goal.
- Recruiting youth participants from a very small rural community and building partnerships and interacting with several private and community colleges. Giving youth an opportunity to see themselves attending college and being successful in a STEM career.
- Our students were made aware of more careers in the sciences and engineering by being involved in FLL. They interviewed a neurologist and toured his lab. They attended a workshop event at ISU in the fall and at Dordt College in Feb 2013 and learned more about a variety of science opportunities and careers. At the FLL State tournament, they went with our ISU student guide to a lab demonstration of material engineering, which they had never heard of before and that got their attention and interest.
- Increased confidence in ability to problem solve, especially around building and programming.
- The girls learned practical skills in robot design and programming; they researched a real-world problem/issue and brainstormed how they might help solve it; they learned valuable teamwork skills.
- One girl who typically gets classified as an "artsy" student got really excited and focused on programming her robot. She stayed late, came in for extra sessions, and was extremely dedicated to programming her robot. Her parents now are rethinking how they can continue to support and energize her newfound interest in engineering and computer-related topics!

- The program gave the students an opportunity to experience learning outside of a school setting and specifically connected them to adults working in the STEM fields. The STEM fields feel more accessible and real to the students.
- From a participant: I achieved something I never dreamed I could do. / From a participant: I now understand I need to be a good teammate in order to be successful.
- All members were exposed to robot programming and using math to program routines to solve robot game challenges for First Lego League.
- When taking the students to MedEquip to discuss solutions to their community problem based challenge of using innovation and technology to increase the mobilization of an aging population, students were able to interact with senior living specialists and professionals who shared about the most common issues facing their clients. Youth were challenged to look around the store and then come up with and improvement or an innovative design that they would then share with the MedEquip staff. Students scoured the store examining the various devices and explored their functionality. Fifteen minutes later, students were asked to return to share their designs they had created with their partner. Students spoke for 5 minutes each and entertained questions from peers and professionals. The MedEquip staff was very impressed with the innovative designs and concepts that the youth created and encouraged them to refine them as the day of FIRST LEGO LEAGUE competition drew near. To see youth empowered by the investment of caring adults made a significant impact upon the success of this team in their STEM learning and excitement in their project based learning!
- Amazement at what you can do with Legos and electronics encouraged the imagination to try new things. / A new side to creativity that they had never thought of. Teamwork has improved.
- The program helped the team develop critical thinking skills. While in the FLL competition, they had to think on their feet to deal with unexpected issues during their table runs.
- The team studied senior citizens and how they can overcome obstacles to stay independent. The team also became very confident in what they learned and were effective in presenting their findings to judges. The team learned to approach problem solving in more than one way.
- They are working with the Engineering Process, learning how it compares and contrasts with the Scientific Method. I believe this is new territory for all of them. They are also honing skills of problem solving in a team situation.
- I coached a Jr. FLL team of 6 members and a FLL team of 8 members. All 14 are planning to return next year, while there are at least 15 new students wanting to join.
- The participants learned and implemented positive math and computer programming skills; they learned about how to solve problems in our community; and they learned to work together to solve problems.
- One child expressed love of math. However discovered they did indeed enjoy science and engineering too. Two children expressed a definite interest in continuing FLL, which was previously a program they were unaware of. /
- FLL is a great program for challenging youth. It is a program that requires significant commitment, in addition to being fun for all.
- Youth became problem solvers to create project for Jr. FLL / Youth interested in science
- Interest in engineering careers and possibilities so students are looking into areas for colleges / they want others to participate to create more groups in school who can do this
- Students became very engaged with the challenge of FLL and had to use their problem-solving skills to meet the challenge. It gave them real-world experiences, which helped them connect the challenge and the technology to things that people do in their everyday work. It also gave them an increased awareness of what future studies STEM can do for them further on in school and in an eventual career.
- This has been a great outlet for additional learning for youth who are not as engaged in activities outside of school.
- I feel that one student has become more aware of the fact that they do have talents in STEM areas and two that they are able to work at these areas and when they do they do get better than they previously thought they were.
- The FIRST Tech Challenge is an important program for our students because it informs and promotes the use of technology, math, and teamwork. One of the greatest benefits for our students is the ability to work together on a common goal...creating a well functioning robot to compete with other schools.
- Improved student attendance, improved student academic success

- Concrete examples escape me. However, when I think back over the last few months, I see a team that showed great patience while waiting for the program to pick up speed, then showed great confidence and creativity in quickly building a robot that could function competitively in our final qualifier. When the robot achieved its goal of placing a ring, the entire team cheered. One ring and a dozen smiles. I hadn't seen the team get excited before, so that was novel and inspiring.
- For 2 of my students it helped solidify their interest in engineering. For 2 other students, their confidence in use of technology and programming grew. For the girls in the program, they also increased their confidence in problem solving, building and using had tools (saw, wrench, power drill)
- One of our students had problems with attendance. When they participated in FTC activities during school advisory times, they showed increased attendance and completion of their classes.
- I had one female join because her friends joined. She is now fired up about next year and is wanted summer training to be ready for next year. I had one boy who started the year unable to flex from his ideas and designs. He was always sure that his was the best. By the end of the year he was more open to other people ideas and has become more of a team player.
- My students are leaving this program with very valuable skills in STEM. FTC has helped develop my student's math and science understanding. It has also helped to influence their future career choices. Many of my students will be back next year if their schedule allows them time.
- All of our female students are talking about careers in engineering. We have built many strong relationships with our local industry.
- The participants were able to enhance their teamwork, time management, and stress management. They also were able to get excited about something other than sports and fine arts.
- Students were discussing more now that they're interested in wanting to do engineering in college after working with the robot.
- Students want to know how to manipulate material and produce custom products. Another example is the student in charge of marketing that has come out of here shell and is more comfortable in speak to other and in public and asked if she could go take to business and at the pep-assembly
- We have a few students interested now in Engineering (pursuing as a freshman next year in college) and computer system maintenance.
- Discussed being a critical consumer. The importance of teamwork and the ability to compromise was a lot of fun to watch.
- One student was driven to go to state. She was going to have the team win the inspire award. She worked extremely hard at satisfying what was required for the inspire award and knew that she had to have all team members included to be awarded with the inspire award. Although the team did not win the inspire award or make it to state, I believe that student became a better person through the process.
- Students have become truly energized to participate in a STEM centered career or major in college after seeing how rewarding design, building, and programming a robot can be. We also have to expand our amount/size of teams this year due to increased interest and demand for the program.
- The students working on this project really worked hard and took pride in what they were doing. There were many instances students worked on the robot during their free periods, before and after school. Also the nights before the two competitions, there were students working on the robot until 11 or 12 o'clock at night. They were willing to stay because they took so much pride in what they were doing. They never would have done so for "normal" classroom work.
- It provided an opportunity for students to have hands on experience in designing a complex object, which I believe stretched their understanding of the field of engineering and computers. It also exposed them to computer programming for which there was no other resource previously. It has given them an experience that they can look back on as they make decisions in the future about majors and classes at college.
- Students were able to have a great sense of success in STEM areas.
- I have seen growth in several of my students' self esteem and confidence. I received feedback from staff in the school district validating this as well. I have one student who experienced significant growth in his comfort level speaking and performing in front of groups.
- My three seniors have applied and been accepted at Iowa State University in Engineering
- One young man wrote his college entrance essay on how he found a career passion in robotics. Another young man found computer programming to be too detail oriented and has changed his career path. He is still interested in STEM career areas but not programming.

- I have students who have said they will be sad to graduate from high school because they will miss "Robotics Club." They are saying they will come back to be mentors. Overall, the FTC community with the gracious professionalism practiced by all teams was really cool for the students to see. My student learned how to network out and problem solve. They had great respect for the process at the end looking at their final product and being able to say, "We did this from nothing." The students whose parents are involved now have told me how their son would skip school to avoid giving speeches. Their son has blossomed out with his ability to communicate at the judge's panel, and he has presented out social events and school functions along with his teammates concerning our "Robotics Club." All of my students have seen what true problem-solving (problem solving in math, physics, mechanics, computer science), communication, and social networking can do through participating in FTC.
- One of my students is homeless and enrolled in the alternative high school. The qualifiers were the highlight of his high school career. He had never won any awards before, and this is was the first time.
- Both boys and girls active in the club continue to participate and show eager interest in prototyping their robot. We will be starting a recruiting plan next week to bring in and mentor seventh grade students.
- My students have a much greater understanding of the differences in the engineering disciplines; e.g., electrical vs. mechanical. For many students, this is the first time that they have had to work through an engineering development cycle, and they have a new appreciation for the role of testing in product development.
- Our students were challenged by the tasks and were very engaged in the project.
- 3 of the 7 team members have high school internships and 2 of them now have part time jobs. One team member learned to use power tools / all team members have learned to speak in public presentations and have gained better skills in sharing their ideas with others
- One student in particular has taken a lead role and is developing his leadership skills.
- The students are learning a lot about the value of teamwork and keeping on task. Many of them saw the gracious professionalism of other teams, which gave them a positive outlook on the whole experience. Many of them learned a lot about things they didn't know before—wiring, programming and basic mechanical principles were among a few of the STEM ideas they learned.
- We have had a greater interest in students signing up to talk POE next year.
- I have one student who has changed his intended major to engineering following the season. He had originally planned on a two-year school and is now applying to Iowa State University (Go State!) to major in mechanical engineering. I also have a student with severe behavioral disabilities. He is very bright in science. What he gained in terms of friendship from others and learning how to behave in public situations is really above my being able to explain. He grew so much this year as a person in dealing with others, and the fact that FTC is robotics based is the only reason he was interested. This program impacts students in many more ways than just STEM. And when I say that, I mean in significant ways. Teaching him about gracious professionalism was definitely a challenge and not something I was qualified to do, but I really feel that was our greatest success this year.
- The news and excitement about the robotics club has spread in our district. I have had several students interested in joining the program for next year!
- The process of designing and building our robot helps students learn to be persistent and not give up when your first try is a failure. Frustration is difficult to avoid but little success can be used to bolster your progress.
- The students learned about funding endeavors and the practical technical aspect of technology. The students problem solved and learned project management skills.
- Several students expressed interest in pursuing a college major in science and engineering and to pursue careers in those fields. The program gave our students positive outlets to express their creativity and taught them the importance of teamwork, having a positive attitude, and communication. It also gave them a lifetime learning example of gracious professionalism that they will take with them wherever they end up in life.
- Students made new friendships. Students learned to work in a team and meet deadlines for a goal. Our team one the motivate award at two contests.
- The need to work in collaboration. 2. Networking skills.
- I had some students really take a hold of this hands-on activity. The students found different areas the excelled in. Some preferred the building other preferred the programming.
- Social skills when we met with other kids interested in the same topics.

- The team members all regularly experienced frustration. Positive attitudes and responses to frustration (including perseverance) were modeled and encouraged and all team members increased their competency towards responding to frustrations.
- It helped with their problem solving, communication, and cooperative learning skills.
- It gave one of my students a time in the light. Other students were in awe of the robot that he helped build and what it could do. His confidence soared.
- They are very interested in robotics as well as using math and science outside of just their books.
- Students loved the program. One student is changing his direction of study to engineering and others are considering it.
- Increase in critical thinking. They learned to ask each other more "HOW?" questions as they designed and constructed their robot.
- It has given students a project to sink their teeth into and apply all of the things they have learned over the years. It has given them experience in a team setting and forced them to collaborate to solve an ill-defined problem.
- The students seemed more excited about the things that they could do in the STEM fields. The students learned that the teacher does not always have the answer. Often the students have to problem solve and research to find the answers.
- The kids seem really interested in working on a robot for next year. I had many first year students and they seem more involved with science classes now.
- Learning how to work through the product development lifecycle (design, prototype, build, test, iterate, etc.). The team has learned how to fabricate their own parts for the robot using tools they have not used before (band saw, pop rivets, cutting metal, etc.). Breaking down a very complex problem into manageable chunks to achieve a goal.
- Our students are very proud of their accomplishments this year. Our team presented their project to the Society of Manufacturing Engineers at John Deere after the competition. We have one student who is now interested in writing grants to fund this program for next year. All of our students plan to return for participation next year.
- Created an actual interest in several students in becoming engineers. In their words, "Being able to do a real hands on project that we build ourselves has been fun. In class we just do homework, this is a lot more interesting."
- One student learned how to use a programming language and started to move beyond computer games in his interest in using computers. One student learned about setting priorities and making choices about what things he had to do first.
- Our student doing the programming showed great interest in learning and using the pro-typing board to add additional sensors to the robot. Also much time and effort was put into deciding gear train ratios.
- Participants expressed an increased interest in Engineering careers.
- Strong gain in programming skills and leadership.
- The students really bought in and grabbed ownership of the robot. They work and commitment they showed was really inspiring.
- After participating one student decided to seek out information on, and attend, a summer engineering camp. He is also pushing the school to offer an "Electricity 2" class so he can further his knowledge.
- They got excited at the competition.
- Our students have had the opportunity to learn more deeply about the software available to them and explore interests in technology.
- Mainly just excitement right now. We have only had 3 meetings.
- The senior on our team has plans to continue in the computer technology area next year. The members of our game team have all expressed interest in working over the summer to learn more about the program to be prepared for next year.
- Detailed knowledge of IT Careers, and how to implement the roles of a project group into the classroom. ie. Project Manager, User Experience, Quality Control, etc. 2) Connected the content to real world projects and IT careers in the area of study.
- The participants have really grown to love working with technology this year. They are always very excited to get started with working in their areas of interest within HyperStream. Not only have they

enjoyed their time working with technology, but they have also had a chance to collaborate with a student at the local community college who is studying game design and has been able to help mentor the students!

- How to get along and work together efficiently. How to manipulate the computer program independently.
- The students have been very interested in building new industrial robots. They were surprised at how easy it is to design unique and productive machines. They constructed autonomous motion/pressure activated conveyers, forklifts, transport vehicles, and excavators.
- One of my female students is currently designing an html website for her family business. /One of my students is creating Youtube videos to share the customization with Lego Robotic Mindstorms and Lego Supercars.
- Participants feel more comfortable talking about and inquiring about technology related interests that they have. For example, several students who were interested in art have found ways to incorporate their talents into photo editing software to create new art mediums.
- I believe it has truly sparked a fire in a few of the students to investigate more sophisticated software and perhaps robotics as well. My 7th grade students want to get "fighting" robots and compete and the 8th grade students want a "beefier" and more realistic program to develop games.
- One member in the Story/Boone County HyperStream 4-H Club said she shared with a teacher what she was doing with Alice game design. As a result the teacher downloaded the program and they began using in the class. Members are creating power points or other multimedia items to use as 4-H fair exhibits this summer.
- Had some students who have not excelled in school do some great work. Two people who did not like computers at the start really got into the web design aspect of the class.
- Students' motivation in science. Teacher awareness to STEM.
- Importance of the science of wind energy. How wind can help our world.
- One of the biggest impacts has been student perceptions about STEM and its importance. Students have shared that prior to this program, STEM was no something they really thought about but now they realize STEM has "changed their thinking processes and lives". Based on student interest, we are partnering with Iowa Lakes Community College. They created a field experience day to allow our students to explore and see first hand the career opportunities available in wind technology. Many of the students are actually now considering this as a career choice. In fact 2 students are going to the field trip prepared to apply to the program. This program has even impacted community ideas about STEM. I hear frequently about the ideas/experience my students share which leads to questions about my program and offers of support.
- In my HS class, three students expressed interest in the wind energy industry and career opportunities; all students were engaged and enjoyed learning about something that is in our backyard. 2. In our 5th-6th grade class, students (across all ages and ability groups) performed very well on the post test, indicating a better understanding of how the scientific method is used in wind turbine designs.
- Understanding of expectations that are being set for our curriculum and finding support through STEM opportunities. Realizing the necessity of collaborating with local business partnerships and our school. Value beyond school.
- Used prior knowledge with air planes and used it with the wind turbines. They tried many different designs before they picked the one that worked the best. Working together as a group/teamwork.
- Exposure to engineering and design.
- Students can speak and think more scientifically. They speak to the parts of the scientific method. Students have shown enthusiasm and improved work ethic to complete a quality project. The students practice problem solving and need to work as a group.
- Gave students and engineering opportunity that provided a rich context for discussing energy/power concepts and seeing the parameters and scale of new/old energy supplies and demands.
- The students had more awareness about wind energy in general.
- Our students were exposed to STEM topics related to wind turbines such as designing and building turbine blades. They also worked to report their data and work using technology.
- Students will enroll in classes because of the hands-on approach. Students are more aware of opportunities in electrical career fields.
- It required students to use higher order thinking skills while they worked together in collaborative groups.
- The physical science vocabulary became real to the students. When they had their blades angled wrong, they experienced Newton's Third Law. Some of the freshmen especially are excited about the possibility of

careers in wind technology. Some of them have relatives in the industry and had been considering it. I believe this really helped cement their interest.

- These programs help me to motivate students that do not feel confident in science or did not like science. Encourages problem solving, and working out a solution, which always helps to increase understanding.
- Definite increase in interest of Wind Energy among my 6th Graders. Also increase in knowledge of wind turbine design and build.
- Many students stated that they would consider a career in the wind industry in the future and learned more about wind energy on their own time to help create wind turbines that would produce the most power.
- One individual stated the work was engaging and made him more interested in an engineering field. The students were excited to come after school to work with the materials.
- Several girls have designed and built effective blades for the wind turbine. The girls really worked hard at their design and construction.
- The material really connected with a few students that hadn't connected with other materials previously. In addition, I have several girls that are very engaged with the material and taking charge as opposed to their normal hang back and watch mentality.
- Several students are now interested in taking more science/math courses in high school. Students commented on how much they learned about various ways that an individual can be involved in health science careers.
- Some said they were going to college. Comments about the number of STEM careers.
- Students have become more aware of health career options out there for them. After going on the field trip to the University of Iowa, many students have an increased interest in pursuing a health career.
- The students who went to the State Science and Technology Fair were motivated to improve and expand on their projects for the following year. Most of the students felt proud of the work they accomplished and were excited to showcase their work at our district science fair. They liked members of the community asking them questions and taking their pictures for the newspaper. Students who generally don't praised for their academic work were able to share their knowledge with others and feel proud.
- They had the experience of presenting their research to judges other then their teacher
- The student that participated in the Science Fair gained knowledge on how "real" science is completed. The student learned how to make a timeline and complete his project in the time allotted.
- Peeked a curiosity and interest in future science endeavors.
- My students went from not thinking they could do research to excited to try a project next year. My students gained a better awareness of statistics.
- Several students have talked to me about job-shadowing some of the professionals that helped out. Students became adept at using a hand lens, surveying stick, biltmore stick, and water testing equipment.
- Youth and adult participants in the 132nd Fighter Wing Air National Guard particularly indicated "more" interest in someday having a job using STEM. One elementary age youth particularly was soaking in everything from the airmen, carrying on individual conversations with pilots and expressing a great deal of interest. Some of the pilots shared that their interest started at an early age. Maybe this experience will eventually lead to a pilot related career for this youth. Several of the youth who participated in PEERS program took part in more than one opportunity and a few also participated in HyperStream. Doing multiple programs gave us the opportunity to crossmarket. On a pre/post survey for the BECON Biomass/Wind Turbine workshop and for the 132nd Fighter Wing field trip the greatest positive changes were on indicated on 1) Meeting real scientists and engineers; 2) Learning about many different things scientists, engineers, and technologists do in their jobs; 3) Visiting places where adults use STEM.
- Students are now using the Engineering Design Process language in the school as a basis to problem solving. We will use this process as a school-wide common language to help support solving problems in all subject areas.
- The STEM Science Clubs have increased their attendance throughout the year. Increased attendance at monthly STEM Family Science Nights averaged 40-60 families. More students wanted to join Lego League so another team was formed. STEM Summer Camp Classes expanded this year.
- Students have an increased awareness of the importance of science, technology, engineering and math to their education and future careers.
- Critical thinking increased and the discussions were amazing. Some of the other teachers commented on the kids' conversations about how much fun they were having.

- I had a large percentage of females in my STEM program (57%). I had a large, consistent number of participants in my program January-March with over 95% attendance! Besides numbers, many of my students were early for the after-school activities and many stayed late afterwards: a sure sign they had fun and were excited!
- Students created, modified, and improved their water filters three times. The first time was a great learning experience, and they were anxious to make changes to improve their results. The second attempt went even better. However, the third time they re-designed their water filters, all groups experienced cleaner water. At the end of the class, I congratulated them on being engineers, and they all let out a loud "whoopee!!" One student said, "I'm so proud of myself!!" A student has shared with me she now wants to become an engineer when she grows up. This program has had a very positive impact on student interest and confidence in engineering and science lessons.
- I think the awareness of what engineering and technology is was important at all levels. I liked that specific engineering careers were addressed and all the options of employment within that one type of engineering. I also think students had great hands on experiences of collaborating with peers to solve problems in creative ways.
- One impact that all the students walked away with was the Engineering Design Process. Many students related it to the scientific method and understood the necessity for quick decisions but a greater need for well-thought and thorough examinations of problems. Two students involved also increased their understanding of engineering and expressed a greater interest in considering the field of engineering for a career.
- I believe my students have really enjoyed the science and really learned about engineering.
- The last day the students were anxious to want to know when the next camp would be held. They are thirsty for STEM and hands on learning. Because we met with them multiple days they had time to go home and think about wind or wind energy—they often came back with some stories about wind 'action' they observed.
- Many of my students have told me that they now are interested in becoming engineers or scientists. Parents have told me that their children now talk about an interest in science and engineering.
- One student will be a freshman in college this Fall, and decided he would like to go into the field of engineering. He was very helpful and made sure that others got interested in the projects we were completing.
- Greater interest in science/technology/engineering.
- My 5th grade students had no knowledge on engineering or what engineers did. I feel it opened up a whole new field for them.
- The kids wanted to keep going after the program was over. They had more interest in electricity.
- The impact was very positive. My students enjoyed collaborating with their peers and group mates in designing and creating their sound representation. I think the greatest impact from the program was them learning about the engineering design process. They now understand all the thought put behind creating something.
- Students learned that planning was an important step. Students' curiosity and problem solving increased as they explored the activity.
- Several students wanting to develop better solar ovens at home. Students become more aware of the every increasing need to conserve energy.
- Better understanding of pollination. Better understanding of the engineering process.
- Students were able to become engineers. Something that many have never considered they could do. Also, I saw many students interest sparked into being more imaginative and creative.
- The students in my fifth grade classroom are very excited about the resources in our room and they liked the introduction. They ask a lot of questions about the materials and I can't wait to see them dive fully into a kit! The engineering component is one I know I need to stress, that will impact our science program.
- Students were very interested and engaged. They used critical thinking.
- I feel the STEM kits will offer a better variety of experiences for our kids when they're used with the FOSS kits we are using now. It takes it a level higher to bring in the engineering topics.
- I witnessed more engagement from students who struggle with staying focused. I also feel that productivity in the group/team setting increased.
- Students are more eager to build and design and to recognize the design of structures around them. Students commented on how well built some old buildings were after building their own walls. Students have a

much better understanding of what it means to be an engineer and that technology is not just computers, iPads, smartphones and video game systems.

- The students had almost no knowledge about the engineering field prior to participating in the EiE units, so they gained awareness about engineering and related careers. The units allowed the students to engage in inquiry and work to solve problems, which motivated them to learn. The students talked about the units in their free time and regularly asked when we were completing another EiE unit!
- The participants frequently discussed other opportunities to become involved with the engineering process at other locations. The participants showed a great deal of excitement with the problem solving element of the engineering process and did not want the program to end.
- I think it has opened their eyes to more of an understanding of what engineers do and it has peaked their interested in that field. Students enjoyed creating the windmills and sailboats, learning that math and science concepts are the base of a lot of decisions made by engineers to create products that meet our needs.
- The program completely changed the students' opinion on STEM concepts and opportunities in the real world. They were much more engaged and interested in the learning and processes involved with STEM.
- Students are much more aware of what types of things an engineer works with and how (s)he might go about doing it. Many misconceptions were cleared up.
- The students really liked the hands-on activities. One student completed an electricity project from home and brought it to school to share.
- The students are more aware of pollution. They recognized how hard it is to remove oil from water.
- I feel students understand that technology isn't just something computer or mechanically oriented. Hopefully, they'll be able to think "outside the box" and be better problem solvers. My intention was for them to look at the ordinary, question it, and make it extraordinary!
- The students who used the "Designing a Knee Brace" kit were surprised that learning about the human body isn't always "gross." The students who used the "Designing a Maglev Train" were enlightened by using the Engineering Design Process to create their own Maglev system.
- Two students spontaneously brought devices utilizing the simple machines from home to show, one was constructed from Legos, the other was constructed of wood pieces and string. Parents anecdotally reported their children talked to them about what they were learning and demonstrated an increased interest in "building things"
- Student ability to work in a cooperative and collaboration groups. There was a huge increase in student awareness and interest in science and engineering.
- There were several students who said that they loved science after participating in some of the hands on experiments.
- At the very least, this program allowed the participants do explore hands-on learning within the realm of science. They do not get a lot of science, especially not engineering, in their daily classrooms. So, we were able to expose them to new types of science—outside of animals, plants, and volcanoes—and allowed them to explore using their hands. They built things they were learning about. So it went from reading a book, to doing an activity, to, finally, building the structures that they were learning about. In the end, there were a few participants who really enjoyed the exploration of engineering, which was really the goal. To expose them to new ideas, being in kindergarten and first grade, they aren't exactly thinking about careers yet. However, if we continue to expose them to new ideas, something is bound to influence them in a new direction.
- There was one lesson related to engineering and technology. Students had to really think about how the object they received was technology and what its purpose was/what problem it solved. The 4th graders that I worked with didn't think that the materials at first were technology, but soon realized they were based on how it fit a need to solve a problem.
- Students were very engaged while testing their solar ovens, excitedly calling out incremental temperature changes, recording data, and comparing progress to others. In addition, while conducting unit wrap-up activities, it became clear that students had gained a new understanding of technology, realizing it can be anything designed to solve a problem (and not just something that you turn on or plug in).
- Some of the kids commented that they now love science and really enjoyed the experiments.
- Students have a different perspective on looking at all the "technologies" around us and paying attention to the role of engineers in our daily lives.

Did the outcomes you observed meet your expectation? No (why not?)

- Although this was a new opportunity and experience for everyone involved and was a starting point, it would have been helpful for the ambassadors to have knowledge and/or training in the programs. The members would have learned more.
- I had hoped to get more consistent involvement from more students. Instead I had a lot of part time participants and a core group of consistent participants.
- I never expected the amazing acceptance and understanding of my students to support and care for each other. They went above and beyond my expectations.
- I'd say it was a better reaction to the curriculum than I expected.
- Most of the binder was too lengthy in content. I would have enjoyed a program that was less wordy and had more hands on activities.
- Time element. We needed more time to complete the creative part to match the concrete. Students were excited to learn about design and the function of magnets/train etc. To increase the productivity of lessons learned and put them to use with a company.
- We are a new team, so expectations were low but met.
- We were onto a great start, and due to the push for an ambassador in our area, we switched plans and lost a lot of female members who had been taking leadership roles.
- Would have liked more support and training in the gaming area.
- Would have liked to see additional growth in planning and organizational skills of participants than I saw.

Please describe anything unexpected that happened during implementation or any unexpected results (positive or negative).

- A negative is that we just did not have adequate time to implement each project to the full scale that is offered with the materials provided. However, a positive is that the students very much wanted to continue working with the projects even when we were wrapping up a unit and were excited when we began a new project with the AWIM materials.
- A student asked me if I was a "scientist" because I often referred to the habits of good scientists while we experimented. I responded, "Yes! And so are you!"
- Again, too many participants. Good problem to have but difficult to manage.
- All of the team members are coming back next year. I was expecting to lose at least a couple of the students.
- All students found a niche. Whether it was building the robot, making the presentation or being the leader of the group. Everyone became comfortable in a role on the team.
- All VERY positive! The KidWind unit was featured in our local newspaper, our regional newspaper and our local TV station. Furthermore, students enjoyed the challenge of trying to create the most "powerful" i.e. electricity generating wind turbine.
- As a new coach there is so much to absorb. It was stressful just trying to read all the information. It was definitely worth all of the stress—seeing students cheer the progress of others was amazing.
- As mentioned earlier, the ramp did not stay flat. It was very difficult to get accurate results with this flaw.
- As part of an action research project, I looked at how the use of an engineering design challenge helped students learn to collaborate and communicate with others. My data analysis showed that students who were successful with the challenges were the ones who learned to work collaboratively with their group members.
- At one of the early scrimmages we were afraid that we couldn't get our robot to run, but another group helped us find the problem.
- At one point during our building stages, I didn't know if we would even have a moving robot on the field. I was almost shocked at how everything came together in the end. It was awesome to see what the kids came up with in the end. I was extremely impressed.

- Because our playing field is located in an area that is also used by high school students, they expressed interest in the program.
- Did not realize the amount of time for the coordination of the students to work on the tasks at hand.
- Difficulty in reimbursement from CR School District.
- Even though, at first, I was weary as to how Engineering is Elementary would be received by our participants, I was surprised at how well they did. Some of them were really excited about the ability to build new structures: bridges, windmills, and the like. For not being exposed to these types of skills in their classroom, it went unexpectedly well!
- First Lego League engaged students that would usually choose to not participate—the topic of Legos and robots grabbed their attention and gave them an opportunity to be excited about their learning in school. As a classroom teacher I observed an increase in academic achievement and classroom participation from the students that participated in the First Lego League. The students are excited to continue building this program at Ridge View Middle School.
- Fuel cells were not working the same all the time. Tests were delayed or could not be finished in a timely manner.
- Growth and collaboration between departments. Math and science. The number of opportunities that are available for 21st Century Goals. Outreach of the local colleges is available and their willingness to partner to help schools. Good working relationship with people, Kari Webb at ILCC and her introduction of Joe Rand, KIDWIND. / Students are ready participants in real life experiences. Students are amazed and amazing to watch as they discuss, collaborate, and inspire each other as their design is modified to be BETTER, successful.
- How much fun the students had. It was a blast!
- How quickly they are grasping the programming part.
- I am pleased with the level of student interest at this time.
- I didn't have anything that was unexpected. The curriculum is well planned out. I was a little disappointed in the fourth and fifth grade groups in not being as engaged as they should have been. However, I do not think that is due to the curriculum. I think it was because they did not like the student teams I put them in.
- I expected a little more gender balance among the students who signed up for this program (we have 55 boys and only 5 girls).
- I had hoped for increased student interests and this did occur. What was unexpected was the great amount of interest shown by some students who before had never been interested in completing much of anything. They became driven to accomplish more than they had at other schools.
- I had no idea they would love it as much as they did.
- I had really hoped that this would happen, but the smiles on the students' faces at the competition and while they were building their robot was priceless. They are already planning for next year and they are working on getting sponsors for next year.
- I had two teams participating and it looked like we were not going to get done. The two groups on their own came up with a plan to combine their information and work done to see if they could complete the project. They worked together as a team to problem solve instead of competing against each other. It was nice to see the problem-solving happening on their own without my input.
- I have been positively surprised by the level of local support.
- I have some pretty awesome photos, if you'd ever like to use them for anything. :)
- I like how the stem is very well laid out and the interest the students have in doing the testing.
- I saw some students turn into leaders that I did not expect to be leaders in their groups. STEM has opened my eyes to problem-based learning.

- I think some students were frustrated when the programming didn't go faster or they had to make a lot of adjustments and a few students surprised me with their determination and motivation. This was challenging!
- I think the kids learned that the first solution typically is just a starting point. The finished product may look completely different as they test and improve their design.
- I think the main thing that was unexpected was the lack of student interest in the program and the difficulty of implementing it after the school year had already begun. Although we did not get as much student interest as we would have liked, I think the students that did come and participated have loved the program and that is a success.
- I think the success students experienced during these lessons was greater than I would have imagined. They LOVED having choices in how they created their filters, and they also enjoyed the challenge of keeping the cost low while improving their designs. They worked well together as teams, and considering this was an after school program, their energy and interest level remained high.
- I truly was not expecting such high interest from my students on all this. Wow! They didn't want to quit.
- I under estimated how hard it is to teach students to do research when they had never encountered it before. I was pleases to see how creative and invested they became knowing they had a real audience for their work.
- I was amazed at the level of excitement and energy students had for what they were doing.
- I was amazed with some of the ideas the students came up with.
- I was discouraged that so many students were not able to complete their project and thus dropped out of science club. I would hope to implement this into their classroom instead of a club setting to promote accountability. Positive- I was excited to see the student who decided to complete his project flourish in understanding how to go about testing a hypothesis and presenting results.
- I was pleasantly surprised that we qualified for state. This really got my team excited. Because they went to state, they are very motivated to get ready for next year.
- I was shocked and it really helped smooth the process that students after the first day of implementation started to become excited about engineering and all of the different types of engineering. Many of the students also took great pride in completing the experiment to the fullest.
- I was surprised and bummed out that students responded that they have less interest in engineering as a result of this unit. I did ask a few students to elaborate for me. They said they were not interested in that particular branch and that they enjoyed learning about it. The way the question was worded made them honestly say they were not more interested in engineering. I was glad I asked them to share more because I thought everyone was engaged in these activities.
- I was surprised at how comfortable the team members were with elderly citizens. When they showed the "puzzle snatcher" to senior citizens at Spurgeon Manor, they became little chatterboxes with the residents. They answered questions and smiled with interest when the seniors told them bits about their lives. That warmed my heart.
- I was surprised at how many of the girls choose to repeat the blade (for the wind turbines) design and improve/change the previous blade; whereas most of the boys chose to try something new (the solar cars) when given the choice. We worked on building and testing wind turbines earlier in the year and then in an effort to compete successfully at the Iowa Energy Games in Ames, IA, we pulled out our previously worked on wind turbines.
- I was surprised how little intuition of seemingly obvious principles that students brought to the engineering challenge.
- I was very surprised about how much I could expand the program to give the students a high level of learning beyond competition. It is so much more than what it looks like on the surface. Students often decide what they should or should not study as a profession based on little information about what that

profession includes. They don't have opportunities like this to see how integrated all of the things they are learning now while be used in the future. FLL provides powerful curriculum.

- I was very surprised that my middle school team could accomplish what they did in the short amount of time and shocked that they performed so well at competition. I was also surprised at the amount of help from an outside team. Also, a representative from National Instruments took his time to come and do a training for our team on his day off.
- I will say the first competition we went into we were unprepared. We order parts too late because we just had a slow start with figuring out where to start and there was a back up on parts. Going into our first qualifier, I was thinking I will be glad just to have something running. My group has risen above those small expectations of just getting something to run. We had hopes of winning at the second qualifier we went into. The huge improvement we did was a very positive result that makes us just want to push harder next year. We already have plans to keep better journals and written documentation of our process. We want to get more involved in the community to let them know what we are doing. What started out as low expectations has developed into very high ones.
- I witnessed one student really take pride in what he had learned and accomplished, as a result I saw his entire outlook on the world improve. Seemed like the first activity he was naturally talented at (not a sport), and his self confidence noticeably improved. I think that is the part of this program I am most proud of.
- I'm not sure yet!
- Implementation went very smoothly.
- In my box I was supposed to have lemon juice, instead I had lemon dish soap. It was for our ph scale, so I borrowed lemon juice from our cooks.
- In the future, now that I understand how the program works I will be getting more business and industry involved. I included information about the program in our school newsletter and webpage.
- In the past, we haven't as often invited parents to participate. For two field trips and one of the workshops we offered this opportunity. It was beneficial for them to participate because they got to learn first hand, do something with their child, and as a result be able to be more supportive of their child in exploring STEM opportunities, maybe even a career. For the BECON biomass tour and wind turbine workshop that we offered for 4th-12th graders, a parent of a second grader saw the promotional article in the newspaper and wondered if his child could participate because he is so interested in science opportunities. They did participate and the child was thrilled and the father very appreciative that they were allowed to participate. The father son partnership was great and the father is looking forward to future opportunities offered through Iowa State University Extension and Outreach 4-H Youth programs in our county and region.
- In the short time we had to implement, depending on the staff member, students were able to discuss the reasons for their learning through the EiE materials. It took the concepts deeper, and students were more excited to stick with one topic than to skim over several others using Foss.
- It took longer than I thought to construct a working version of our designs.
- It was great to see some students' creativity as they worked through the project.
- It was just hard to do with such a nagging timeline. The kids really wanted to compete and could not.
- It went smoothly.
- It's always great to see students explore, learn and create. What's really inspiring is to see students who don't always excel in the classroom, use their abilities to succeed outside the "norm". Watching their faces light up when their ideas "work" is priceless. When my first session of students dissected frogs, I asked them how they could relate what they were doing to technology. One idea included: studying the frogs' legs to see how they worked, then finding ways to make human legs (prosthetic devices) so people who had lost legs could swim (biomedical engineering). This was relevant, because one of your associates lost her leg in a mower accident. This group worked longer on the dissecting than any group I've ever had in 20+ years. It was amazing!
- Just the challenges that come with taking on a new project.

- Late distribution of materials. Had I known it would take until after Christmas I may have utilized my mentors to present other items of interest/programing.
- Library administration did not allow library staff to take the student club to view IT-Adventures and I feel that seeing this competition would have been beneficial to the group.
- Loved watching the student engagement on a wide variety of topics.
- Managing the grant funding was unique due to district policies for clubs. Eventually we ran our program through community ed. I am not sure how our teams will move up to the high school as far as materials and funding; however we will deal with that when it happens.
- My scale-up team won recognition for Core Values. I am so proud of them. They truly have a broader understanding of the amazing abilities of students, parents and senior citizens and how to accept each other and welcome all ages and abilities.
- My students, who when the competition came around in December, seemed unprepared. At first we tried to go as observers only. I was happy when Kari Webb and Scott Stokes talked us into going as participants instead. Then I was so proud when my students received honorable mention in the Team Performance category.
- None.
- Nothing really unexpected as I knew this would be a 'get to know' kind of year with the materials.
- Nothing.
- Once the students were able to get one task programmed in the robot, it gave them the confidence to try different tasks.
- One child was so engrossed in getting the robot to accomplish missions he always wanted to stay after class and continue working—thus sharpening his programming skills and learning to really analyze his design decisions as well. One child asked if we would present this FLL program to the "Extended Learning Program" teacher in their school.
- One of our cars was defective. Had we not had an extra peg car, we would have been hard-pressed to complete the lessons.
- One of our programmers "hates computers" yet found he was very good at programming.
- One surprise was how helpful everyone was at the competition. The day of competition we had some difficulties with our robot, and many other teams were very helpful.
- One thing I was mindful of is the importance of hands-on learning. We didn't have enough time with the 7th or 9th graders. I had such a wealth of activities and materials from the grant, but I did not get to use all of them. We will have KidWind materials for years to come.
- One unexpected result was how possessive my students were of Science/STEM activity dates! I had to work with the Show Choir instructor to share the students (we had met before we both got started to coordinate when she would meet and when I would meet so the students would be able to do both if they wanted to). We had a snow cancellation on a Show Choir practice date so I offered her one of the Science/STEM dates (since Choir had a Spring Concert coming up) and my Club kids came up to me to complain that that wasn't fair! WOW!
- One unexpected result was the "green" attitude promoted within the students when they heard about the damages of oil spills, experienced the difficulty of completely cleaning up the spills, and heard about oil spills in the news.
- Our primary goal was to compete at the national level, and this goal was not realized.
- Our robot actually performed! That was so neat!
- Our team set a goal to start one new FTC team in the district each year for the next 4 years and ended up starting 3 new teams in ONE year in our district because of the Scale-Up Grant!
- Our team was far more successful in their first year than what we anticipated.

- Parents were really excited to bring their student to the activities. After each session they discussed what was taught and learned. One concern I had was the younger students seemed to be able to listen and follow directions better than the older / students. Some pre-requisite skills seemed to be missing.
- Parts arrival was late which delayed the start of building by the participants.
- Positive.
- Positives results that we increased the diversity of participants
- Since our school was new to Lego League everything that we did was a little unexpected. The most unexpected thing was the after school time that the kids needed to put in order for the project to be completed on time.
- Since we would not have been able to afford the extra "special" pieces that we used towards our solution, it was amazing to see not only how effectively the pieces were used, but how they helped the students with a creative solution to their problems.
- Some of my students were getting frustrated when they were not able to come up with solutions on getting their gear trains to do what they needed. However, through perseverance, they did figure it out. This gave them a deep sense of accomplishment. I knew some of them would resist having to think for themselves and they did. I also knew some of them would really get into the engineering aspect of this project and they did.
- Some of the kids got bored while the story was being read. So I had to skim and summarized the text to make it go by a little quicker.
- Sometimes the materials didn't lend themselves to getting the "correct" result. It wasn't a big problem, though, as it allowed us to discuss multiple variables that may have affected the results.
- Student engagement soared!
- Student groups were so motivated and competitive with the wind turbine blade design lab that I chose to extend the time given to design!!
- Students felt pride in calling themselves engineers and confidence in knowing they could design new products/structures if they wanted to.
- Students in other classes seeing the wind turbines and constantly asking when they get to try them.
- Students that said that they would participate backed out and did not help at all. I had about 30 students that said that they were interested so I had two teams. I ended up with about 10 students that actually showed up and helped between the two teams. Another thing that was unexpected is how hard it was to find resources on the FTC site. Another thing that was unexpected was how little time we had to get things done before deadlines. When it came to signing up for FTC and paying for things, we had about a weak to get this done. Schools do not work this fast.
- Students took care in constructing their displays. Many students went above my expectations and almost created a competition amongst themselves to create eye-catching displays. This created some great looking displays but also led to a student stealing a display board and colorful paper!
- Students were far more engaged in the activities than I thought they would be. They really enjoyed building their electrical circuits and seeing if they could make them work.
- Students who discovered mistakes in assembly along the way exhibited good natured reflections. They would step back, regroup with the encouragement of others and correct the mistakes.
- Students who we typically do not think of as scientific thinkers in the classroom far exceeded our expectations and their own. The hands-on programming was beneficial to many students' learning styles. Students were in charge of their own design logs and amazed us with their data they collected and how they presented it (graphing, etc.). Sometimes teachers' expectations put limits on what students can do. When students were done being evaluated, some of them lost interest, while others continued to try to make modifications, even though their evaluations were done.
- The 6 team members participated in a regional qualifier event for First Lego League in December of 2012 and took First Place out of 11 teams and qualified to go to the State championship tournament in January

2013. At the State Tournament, the team took Second Place Champion out of 72 qualified teams from Iowa.

- The amount of parental involvement with our team, both negative and positive. Great to have parents so involved and excited in their children's lives, but hard to coach students when they are being given conflicting instructions. Definitely showed me a skill I need to work on personally.
- The community and administration really rallied around our team. I teach in a great district and knew this going in to this year, but I still am amazed at the support we have received. Without my asking, the school board has already made the FTC Coaching position a paid position for next year. Many businesses have contributed to us financially, and we are in the process of filling requests to bring our robot out to local businesses to show it off. It has just grown much faster than we ever could have imagined.
- The excitement level was great to see. When I said we were going to do a STEM activity, my kids would cheer!
- The girls were BY FAR much more focused and dedicated programmers. The boys had as much opportunity as the girls to program and work on the robot missions, but quickly lost interest/patience/attention to the task! Only the girls successfully programmed any missions for the robot.
- The kids added gears to their projects and seemed to have more general knowledge about wind energy than I expected.
- The main negative was that I probably should have only started with one team to limit the number of students and give them more of my time. With two groups, I thought it would be better to have more kids, but it also made it much more challenging to try and keep the kids organized.
- The more I learn about STEM in Iowa the more opportunities I hear about for young people to learn and choose a career in the field. The most recent is a STEM program in our high school MOC-FV and teaming up with NCC in Sheldon to offer science opportunities for training in the high school. My daughter will be a freshman next year and we will have her check out these opportunities.
- The most fascinating part of the KidWind project is the students discovering how many variables affect the wind power outcome. At first the blade designs seem simple and easy to carry out and once they get into the project they realize how many factors they have to control.
- The program reached students in my classroom that are sometimes not easy to reach and pulled them in!
- The ramp was poorly made and didn't hold up well.
- The ramps did not want to stay attached or lay flat. The pegs in the pinball, because of their angle did not want to stay upright and support the rubber bands
- The STEM programs at Wood and Lemme have been expanded to include STEM programming as part of Summer School at both Wood and Lemme.
- The strong relationship built between our members and Farm Bureau.
- The students’ behavior was wonderful during this program. Students were very engaged in learning.
- The students created unique and successful projects without any difficulties. I did not expect them to be as creative or have as little trouble as they did.
- The students showed a great deal of appreciation for the opportunity the state of Iowa gave them to expand their knowledge through the FTC program. We were able to get many more materials than I expected will the STEM grant.
- The students took a lot of pride in what they were creating. They wanted their product to be the best and achieve the best results. Students asked to come in during their own time to continue improving their windmills. I also loved that they learned together, some of the students have the most trouble showing their knowledge academically through typical assignments flourished during the engineering process.
- The students were all great when going outside and cooperative. Even the kids that were not "outdoorsy" seemed to be enjoying themselves and learning new material.
- The students were highly motivated with the activities. It brought the scientific process to life for young learners.

- The students were way more successful with the "Improve" step of the engineering design process than I expected. Things went very well and the kids had a great time!!
- The team had one member that was reluctant to give up control and failed to learn from the process. This will be a must in future applicants that they accept team before I and understand that you may not always have the best idea.
- The teams tried many different ideas on how to improve their wind turbine. Some of the students that are not that into school, loved the option of working on something that they enjoyed and had success in.
- The thing I noticed most of the students' excitement when it came to science time.
- The time commitment required of the students was more than most students expected.
- The time it took to get all the materials and the computer from the tech department was unexpectedly long. Also, the amount of time it took to program the robot and get it to be consistent was surprisingly long.
- The two teachers I asked to help lead this project were so helpful and excited (Julie Timmins and Nancy Clawson). They have worked with EiE before and were a wonderful asset. I know Extension and Outreach now has some new resources in the school and with STEM.
- The unexpected things were identified in the challenges barriers section. I was pleased that for the most part youth were engaged. The more computers that were available, the more youth were engaged individually (or in pairs).
- The weather limited us to the basic wind turbine design challenges.
- There were 3 students in my teams who really could not design LEGO attachments without having some sort of instruction manual in front of them. It was very difficult for them to feel comfortable just creating on their own. This was a great experience for them to see that other things can be made from a kit besides what the intended function of that kit was.
- This group of students wanted to try a variety of ways to construct their toy model resulting in an interest in each others' work and increased cooperation.
- This is the first year my team did not lose focus after the regional competition. They were very productive and very motivated to show off their work.
- Timeliness of some of the materials was delayed.
- Very impressed with all of it
- Wasn't aware of all components going in. I didn't know we were supposed to establish a "green team" and audit the schools energy use. I hadn't planned on that for this school year so it will need to be built into the curriculum next year. Also need to check alignment with the Iowa Core.
- We did expect to have more participants. Scheduling conflicts prevented many students that were interested from participating. There are 3 female students that intend to come to the next meeting!
- We did not expect students to want to do as much after-school collaboration as occurred
- We did not have all the programming right when we went to our qualifier and EVERYONE there was so helpful. They were all trying to get us up and going so we could compete and we did!!! They were also very willing to share materials and ideas and helpful hints. A great learning experience for my kids in gracious professionalism!!
- We did not qualify for state in Iowa and could not get into a neighboring state tournament either as FTC is just too popular across the nation.
- We had a wonderful support from local individuals to support our team
- We had way fewer participants than expected due to delays. So, the impact of the program was narrower than expected because fewer children were reached.
- We have received very positive feedback from our students about this club.
- We have run into more design problems than I expected and it has been frustrating for some of the groups of students. However, it has been a great opportunity to teach them that it is okay to not achieve success the first time you do something. Redesigning is part of the process, not failure.

- We have two robotics teams but this past year they worked as one team producing two robots. I liked it.
- We invited our state representative, Jason Schultz, to come see STEM in action and he enjoyed seeing the activities in action.
- We started out with a large interest, and ended up with 4 core individuals who were involved. I was hoping for more continued interest, but we were successful with the 4 students who were regularly involved.
- We went into the competition without a working robot. The collaborative environment at the competition allowed us to fix the glitches and have some success in the competition. The results were surprising.
- We were excited that the University of Iowa simulations were varied and well thought out. Many of our students had never been on a college campus. This in itself was a new experience. Getting the opportunity to participate in the simulations was an even greater experience.
- We were spread too thin. My students could hardly meet the available opportunities to teach. Instead we partnered with the classroom teacher to cover our lessons when we could not be there to teach.
- We were very proud of the honor of receiving the robot design award at both the competitions. This makes our students want to plan for next year already.
- Weather and the flu created issues. It may be that all of the students will not have an opportunity to complete the grade level kit this year. Six days of school were missed in during the implementation schedule. It is difficult to recover the time.
- Weather disrupted our planned working sessions with the students. Solar cars, it rained, rained, rained, and was windy and snowed.
- While my students worked on the robot other students were intrigued by it and very interested--wanting to know what they would have to do next year to do that.
- With our younger kids, we did not expect the difficulty they had in recording information. We did lots of the recording as a group.
- Would have never anticipated this young, first-year team (14513) would be selected to go to State. The team also was privileged to present to the Boards of Girl Scouts, United Way, and Boys and Girls Club, as well as Des Moines University Administration. We also participated in STEM Day at the Capitol, getting to meet legislators and stand on the House and Senate floors. We will be at Girl Scout Day at the Capitol on Mar 11, 2013. They were also featured in news clips on TV8 and TV13. All of these were educational experiences most of the team had never dreamed of.

Appendix M: Regional Scale-Up Program_Student Surveys

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?

   4 More interested now than before
   5 Just as interested now as before
   6 Less interested now than before

Scale-Up STEM Interest (POST) – 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 take part, please sit quietly until everyone else is finished.

1. Are you… ______________ Boy ______________Girl
2. How old are you? __________ Years
3. Think about how interested you were in <u>math</u> 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 <u>science</u> 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 <u>using computers</u> 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 <u>designing, creating, and building things</u> 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

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 take part, please sit quietly until everyone else is finished.

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 design and build things more now than you did then, 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

7. Are you more interested now, about the same, or less interested in having a job that uses science, math, and computer skills?

    1 ☺ I am more interested now
    2 😐 About the same now
    3 ☹ I am less interested now

Appendix N: 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	4181	54.4	53.6	52.2	59.0
Female	3505	45.6	46.4	47.8	41.0
Total	7686	100	--	--	--

E2. How old are you? ____ Years
MS/HS 2. How old are you? ____ Years

Response	n	Total %
5	75	1.0
6	312	4.1
7	420	5.5
8	610	8.0
9	775	10.2
10	763	10.0
11	887	11.7
12	1003	13.2
13	698	9.2
14	1105	14.5
15	534	7.0
16	182	2.4
17	147	1.9
18	92	1.2
19	4	0.1
Total	7607	100
No response	121	--

E2. **How old are you? ____ Years**
MS/HS 2. **How old are you? ____ Years**

Subgroup	Sub-group n	Total %	Gender M %	Gender F %
Elem (5-10y)	2955	38.9	53.2	46.8
MS (11-13y)	2588	34.0	52.9	47.1
HS (14-19y)	2063	27.1	59.1	40.9
Total	7606	100	--	--
No response	103	--	--	--

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 Options	n	Total %	M %	F %	Elem %	Middle School %	High School %
More Interested	2968	38.8	39.0	38.6	54.2	31.5	25.6
Just as interested	3804	49.8	49.4	50.2	33.0	58.4	63.4
Less interested	872	11.4	11.5	11.2	12.8	10.0	11.0
Total	7644	100	99.9	100	100	100	100
No Response	85	--	--	--	--	--	--

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 Options	n	Total %	M %	F %	Elem %	Middle School %	High School %
More Interested	4623	60.3	60.8	59.8	69.2	59.7	48.2
Just as interested	2544	33.2	33.1	33.2	23.1	34.5	46.0
Less interested	504	6.6	6.2	7.0	7.7	5.9	5.9
Total	7671	100	100	100	100	100	100
No Response	58	--	--	--	--	--	--

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]?**

			Gender**		Education**		
Response Options	n	Total %	M %	F %	Elem %	Middle School %	High School %
More Interested	4568	59.8	64.1	54.7	71.0	58.5	45.5
Just as interested	2522	33.0	29.8	36.8	23.5	34.0	45.5
Less interested	551	7.2	6.0	8.6	5.6	7.5	9.0
Total	7641	100	100	100	100	100	100
No Response	88	--	--	--	--	--	--

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)?**

			Gender**		Education**		
Response Options	n	Total %	M %	F %	Elem %	Middle School %	High School %
More Interested	5147	67.0	71.9	61.3	74.9	68.1	54.5
Just as interested	2090	27.2	24.1	30.9	19.9	27.2	37.9
Less interested	443	5.8	4.0	7.8	5.2	4.6	7.6
Total	7680	100	100	100	100	100	100
No Response	49	--	--	--	--	--	--

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?**

			Gender**		Education**		
Response Options	n	Total %	M %	F %	Elem %	Middle School %	High School %
More Interested	3808	49.6	52.6	46.2	56.0	45.9	45.0
Just as interested	3059	39.9	38.0	42.1	29.2	46.3	47.4
Less interested	803	10.5	9.4	11.7	14.8	7.8	7.5
Total	7670	100	100	100	100	100	100
No Response	59	--	--	--	--	--	--

Items 3-5 Compiled. Any interest in at least one STEM topic							
			Gender		Education		
Response Options	n	Total %	M %	F %	Elem %	Junior High %	High School %
More Interested	6,866	89.1	90.5	87.5	96.3	89.4	78.2
Just as interested	815	10.6	9.1	12.2	3.5	10.4	20.9
Less interested	28	0.4	0.4	0.3	0.1	0.3	0.8
Total	7,709	100	100	100	100	100	100

*Updated July, 2014.

Appendix O: Iowa STEM Monitoring Project Factsheets

Fact Sheet #IS01
February 2013

Iowa STEM Monitoring Project

Iowa STEM Indicators System

Governor's STEM Advisory Council

ACT Achievement and College Readiness*

Overall, composite ACT scores among Iowa students are higher than the national average. Iowa students also score higher than the national average on subject-area tests in mathematics and science.

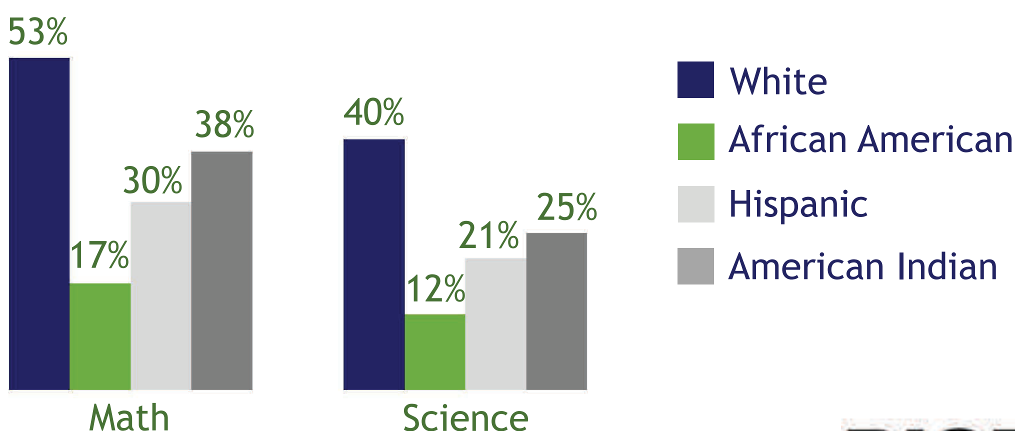
	Iowa		National
Class of 2012 average ACT composite score:	22.1	>	21.1
Average mathematics subject-area score:	21.7	>	21.1
Average science subject-area score:	22.2	>	20.9

ACT *college readiness benchmarks* are the minimum scores needed on subject-area tests to predict a 50% chance of obtaining a grade of B or higher in a corresponding college course. In both mathematics and science, a higher percentage of Iowa students met the college readiness benchmark scores than in the US as a whole.

Percent of 2012 ACT test-takers that met the...

	Iowa		National
Mathematics benchmark:	51%	>	46%
Science benchmark:	38%	>	31%

Even though *overall* scores indicate that Iowa students are doing better than the national average, there are troubling disparities in the percent of underrepresented students that meet college readiness benchmarks on the ACT subject-area tests.



The University of Iowa
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RISE Research Institute for Studies in Education
University of Northern Iowa Center for Social and Behavioral Research

*Source: ACT, Inc.; The Condition of College and Career Readiness 2012; Profile Report—State (Iowa)

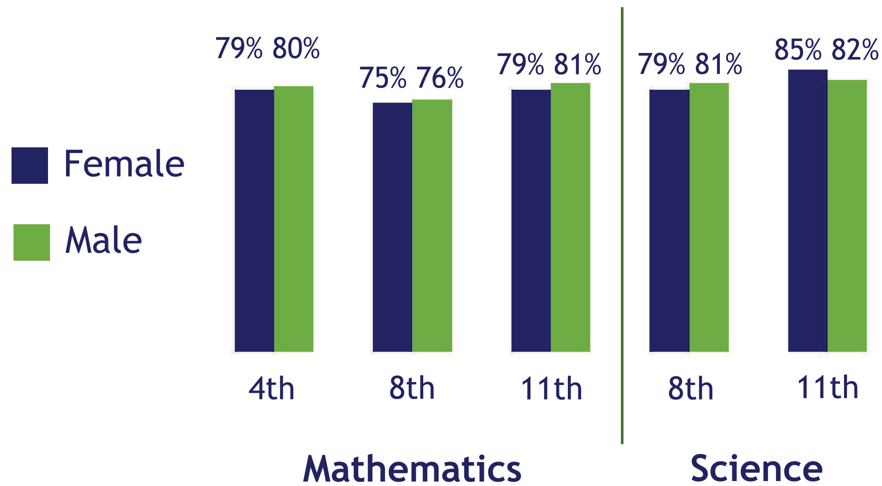
Fact Sheet #IS03
February 2013

Iowa STEM Monitoring Project

Iowa STEM Indicators System

Gender Differences in STEM Achievement*

The 2010-2012 results of the Iowa Assessments showed that a slightly larger percent of male students than female students were proficient in math and science, with one exception. In 11th grade science test, a larger proportion of female students than male students were proficient.



In 2012, male students in Iowa scored higher on the ACT math and science subject-area tests and had higher average composite scores than female students.

ACT *college readiness benchmarks* are the minimum scores needed on subject-area tests to predict a 50% chance of obtaining a grade of B or higher in a corresponding college course. A larger proportion of male students than female students met the math and science benchmarks.

2012 Iowa Average ACT Scores

	Male	Female
Math	22.5	21.1
Science	22.9	21.7
Composite	22.4	21.9

Percent Students Meeting ACT College Readiness Benchmarks

	Male	Female
Math	57%	46%
Science	45%	33%

After high school graduation?

75% of males and **86%** of females plan to pursue post-secondary education

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*Source: ACT, Inc.; Profile Report—State (Iowa); Iowa Department of Education, Annual Condition of Education Report 2012

Fact Sheet #IS02
February 2013

Iowa STEM Monitoring Project

Iowa STEM Indicators System

Governor's STEM Advisory Council

Iowa Student Achievement in Mathematics*

On the 2011 National Assessment of Educational Progress (NAEP) mathematics assessment, Iowa 4th and 8th graders scored higher than the national average. Iowa ranks 20th in the nation in 4th grade NAEP math scores and 25th for 8th grade. Of the 11 states with 12th grade NAEP math results in 2009, Iowa ranked 6th, but still higher than the national average.

Average NAEP scale scores for Public Schools Grades 4, 8, and 12

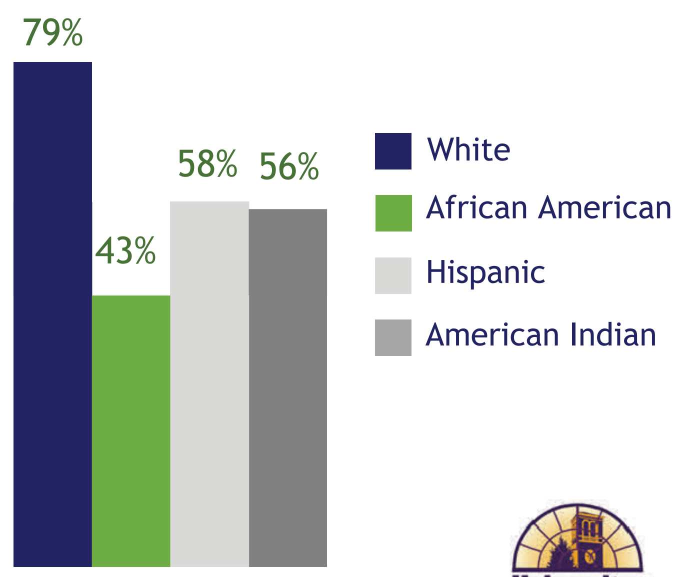
Year	Grade	Iowa	National
2011	4	243	240
2011	8	285	283
2009	12	156	152

Grade 4 and 8 scale range 0 to 500
Grade 12 scale range 0 to 300

In 2010-2012, 76% of Iowa 8th graders were proficient on the Iowa assessments math test but disparities are evident in the percent of underrepresented students that met this benchmark.

2010-2012 Iowa 8th graders Proficient on Iowa Assessments Math Test

Not Eligible for Free/Reduced Price Meals	84% > 60%	Eligible for Free/Reduced Price Meals
No Disability	82% > 29%	Disability
English Primary Language	77% > 39%	English Language Learner
Non-Migrant	77% > 50%	Migrant



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*Source: Iowa Testing Programs, The University of Iowa; Iowa Department of Education, *The Annual Condition of Education Report 2012*
U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, NAEP

Fact Sheet #IS03
February 2013

Iowa STEM Monitoring Project

Iowa STEM Indicators System

Iowa Student Achievement in Science*

On the 2009 and 2011 National Assessment of Educational Progress (NAEP) science assessment, Iowa 4th and 8th graders scored higher than the national average. Iowa ranked 11th in the nation in 4th grade 2009 NAEP science scores. Iowa ranked 17th for 8th grade in 2009 and 2011.

Average NAEP scale scores for Public Schools Grades 4 and 8

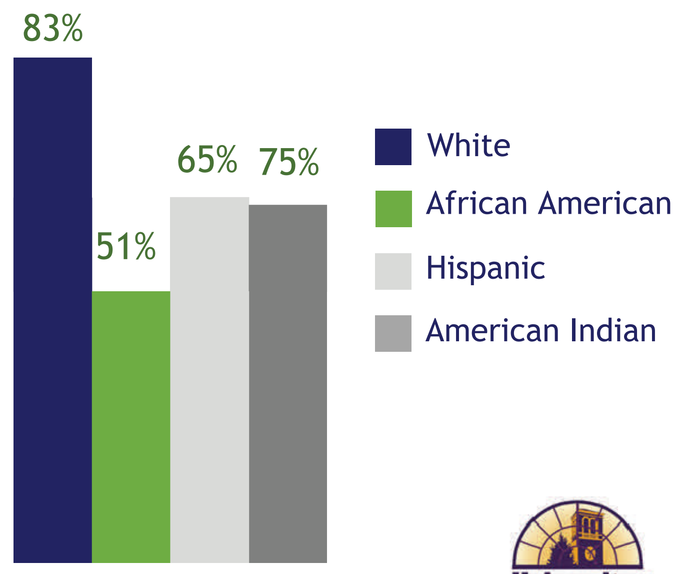
Year	Grade*	Iowa	National
2009**	4	157	149
2009	8	156	149
2011	8	157	151

Grade 4 and 8 scale range 0 to 300
*No data were available for Grade 12
**2011 data were not available for Grade 4

In 2010-2012, 80% of Iowa 8th graders were proficient on the Iowa assessments science test but disparities are evident in the percent of underrepresented students that met this benchmark.

2010-2012 Iowa 8th graders Proficient on Iowa Assessments Science Test

Not Eligible for Free/Reduced Price Meals	87% > 67%	Eligible for Free/Reduced Price Meals
No Disability	85% > 44%	Disability
English Primary Language	81% > 44%	English Language Learner
Non-Migrant	81% > 47%	Migrant



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*Source: Iowa Testing Programs, The University of Iowa; Iowa Department of Education, *The Annual Condition of Education Report 2012*
U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, NAEP

Fact Sheet #PS01
February 2013

Governor's STEM Advisory Council

Iowa STEM Monitoring Project

Statewide Survey of Public Attitudes Toward STEM*

Only 26%

of Iowans have heard of the acronym STEM

Recall is highest among...

Iowans with a 4-year degree or higher **(47%)**
Iowans with children in school **(35%)**

Although STEM "brand awareness" may be low...

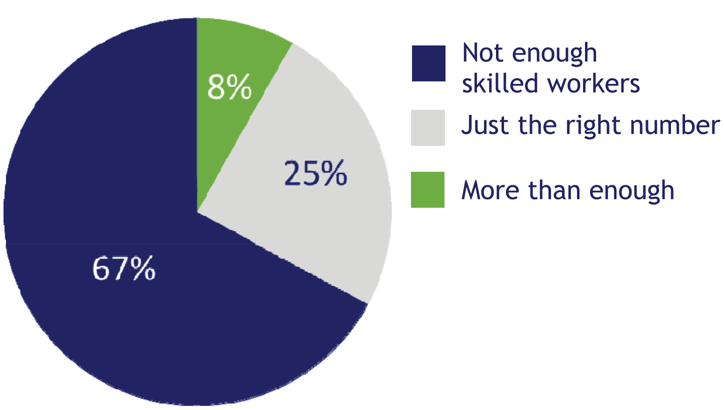
65%

of Iowans have heard *something* about improving math, science, technology, and engineering education in the past month

Most Iowans agree that...

Statement	%
Advancements in science, technology, engineering and math will give more opportunities to the next generation	98%
Increased focus on STEM education in Iowa will improve the state economy	86%
There are more jobs available for people who have good math and science skills	85%
More companies would move/expand to Iowa if the state had a reputation for workers with great science and math skills	76%

2/3 of Iowans say there are not enough skilled workers in the state to fill the available jobs in STEM areas



Most Iowans have some familiarity with STEM issues, but do not recognize the acronym "STEM." Public attitudes toward STEM topics are generally positive, which could indicate that some of the groundwork related to public awareness has been accomplished.

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*Findings reflect weighted values from survey data collected in Iowa from July-September, 2012 (N = 2010)

Fact Sheet #PS01
February 2013

Iowa STEM Monitoring Project

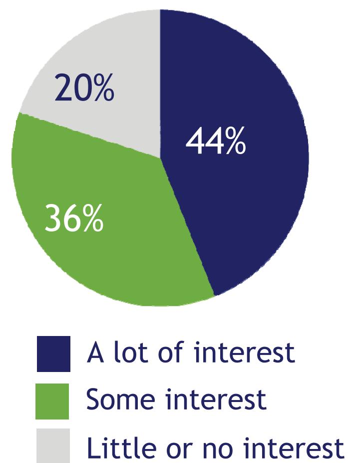
Statewide Survey of Public Attitudes Toward STEM*

Parents of Children Ages 12-19

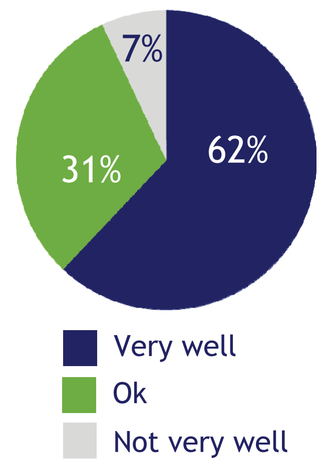
Less than 1/2 of parents of middle and high school students say their child has *a lot of interest* in STEM topics.

Nearly 2/3 say their child is doing *very well* in STEM subjects in school.

How much interest does your child show in STEM topics?

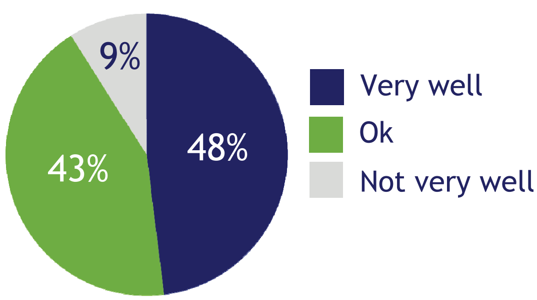


How well is your child doing in STEM subjects?



48%

of parents say their child is being *very well prepared* in STEM subjects by the school he or she attends



BUT...that depends on where they live.

only 37%

of parents living on a farm or in a small town said their child is being *very well prepared*, compared to

62%

of parents in larger cities

After high school graduation and beyond?

83% say their child is likely to attend a 2-year college or a 4-year college/university

59% say their child is likely to pursue a STEM career

*Findings reflect weighted values from survey data collected in Iowa from July-September, 2012 (N = 2010)