Iowa STEM Monitoring Project

2014-2015 Summary Report

Presented at the

Governor's STEM Advisory Council Meeting XIII

September 15, 2015

Marshalltown, IA

Iowa State University RISE Research Institute for Studies in Education

The University of Iowa College of Education Center for Evaluation and Assessment

The University of Iowa ITP Iowa Testing Programs

University of Northern Iowa Center for Social and Behavioral Research

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 STEM Indicators System (ISIS)

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

18 indicators in 4 areas:

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

Data sources:

- Department of Education
- Iowa colleges and universities
- Census Bureau
- Iowa Workforce Development
- Iowa Testing Programs
- National Assessment of Educational Progress
- ACT

Statewide Survey of Public Attitudes Toward STEM

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

Additional questions target perceptions of parents of K-12 children

Data collected from 2,000+ Iowans; results adjusted to reflect opinions of statewide population

Used as an indicator of STEM attitudes and awareness among the general population

Statewide Student Interest Inventory

Annual assessment of interest and achievement in STEM among Iowa's K-12 students on the Iowa Assessments

8 questions gauge interest across individual STEM topics and careers

Assessment of achievement scores and national percentile rank in math and science

Student interest and achievement compared across demographic and geographic lines

Scale-Up/ Regional

Program level perspective on STEM Scale-Up programs

Scale-Up programs implemented in schools and organizations across Iowa's 6 STEM regions

Teacher survey about Scale-Up implementation

Student survey about interest in STEM after participating in a Scale-Up program

Comparison of Scale-Up student participants versus all students statewide on math and science scores on the Iowa Assessments

SURVEY OF PUBLIC ATTITUDES TOWARD STEM

Statewide Survey of Public Attitudes Toward STEM 2012(Y1) and 2014 (Y3)
Increased Awareness & Support for STEM

2012 2014

Increased awareness

From 2012 to 2014, awareness of STEM has significantly increased

26% → 41%

In addition, more Iowans said they "*strongly agree*" that…

Increased support for STEM's economic contributions

Increased focus on STEM education in Iowa will improve the state economy

15% → 22%

More should be done to increase the number of women working in STEM jobs

12% → 28%

Increased support for broadening participation

More should be done to increase the number of Hispanics and African Americans working in STEM jobs

7% → 14%

Advancements in science, technology, engineering, and math will give more opportunities to the next generation

28% → 40%

Data source: 2012 and 2014 Statewide Survey of Adult Iowans Toward STEM, Iowa STEM Monitoring Project, July 2014
*All differences reported here statistically significant at $p<0.001$.

IOWA STEM INDICATORS

Iowa STEM Indicators: STEM Achievement

Indicator	Math Achievement		Science Achievement	
Iowa Testing Programs (since 2011-2013)	Increase % proficient in 4th (+1%) 8th (+1%) and 11th (+1%) grade students	4th/ 8th 11th	Increase % proficient in 8th grade (+4%); decrease % proficient in 11th (-3%) grade	8th 11th
National Assessment of Educational Progress (since 2011)	Increase % proficient in 4th (+5%) 8th (+2%) Grade students	4th/ 8th	Not reported	
ACT (since 2011)	Decrease from 52% to 48% of students meeting benchmarks		Increase from 40% to 47% of students meeting benchmarks	

Iowa STEM Indicators: STEM Preparation

Indicator	Trend	Change
Teacher Licensure	From 2011/12 to 2013/2014, increase in number of high school teachers with *initial* teacher licensure, decrease *standard* teacher licensure, and increase in *master-educator* licensure in in STEM-subject areas.	Initial 15% Standard -13% Master educator 8%
Teacher Retention	In 2013/14, there were 59 new teachers hired to teach advanced high school STEM-related courses. While this was the smallest cohort of new teachers since 2010-2011, their one-year retention rate was similar to previous cohorts of new teachers (~76%). In 2010/11, there were 73 new teachers hired to teach advanced high school STEM subject courses. Four years later, approximately 40% of those teachers were still teaching advanced high school STEM-subject courses.	1-Yr Retention 76% 4-Yr Retention 40%
HS Student Enrollment in STEM	From 2011/12 to 2014/15, increase in student enrollment in science, decreased enrollment in technology, and increased enrollment engineering and math	Science 1% Technology -7% Engineering 23% Math 7%

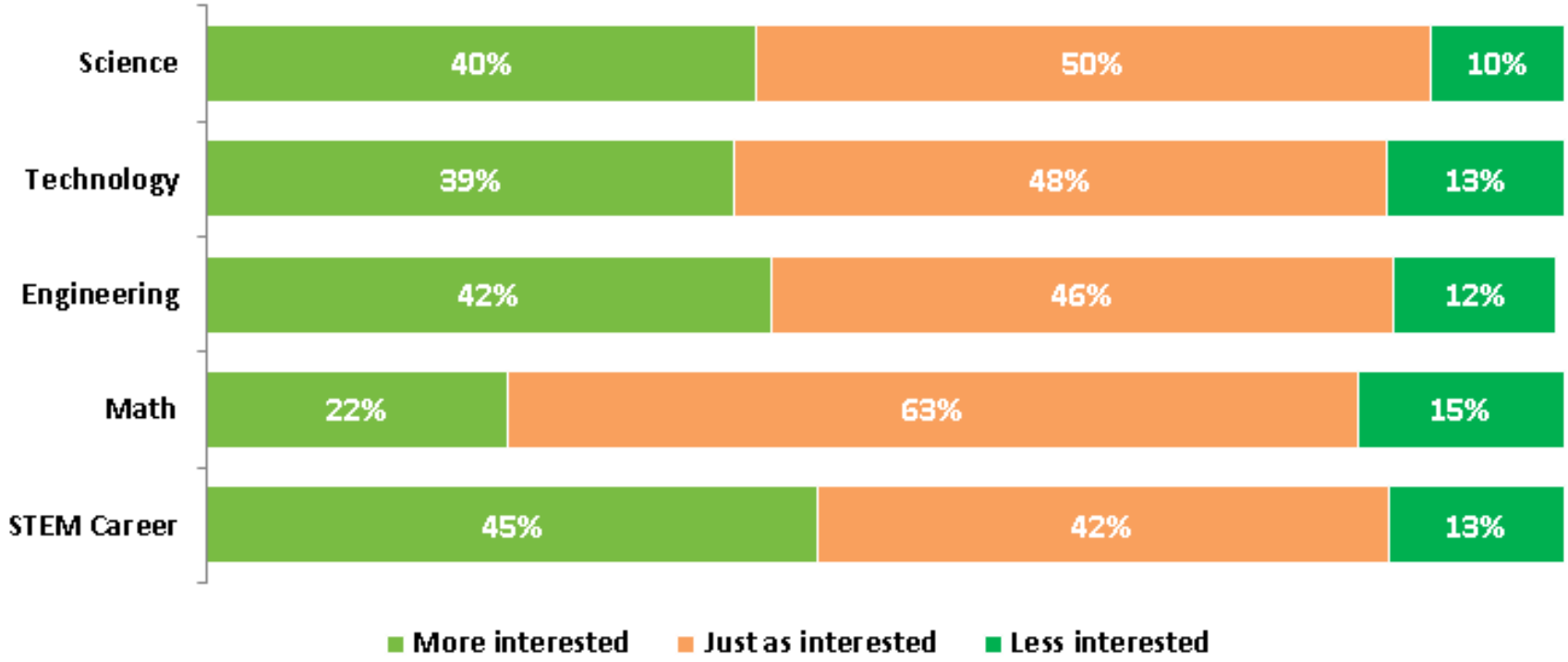
Iowa STEM Indicators: College Completions

Indicator	Trend	Change
Community College	Since 2010/11, the total number of awards granted by community colleges in STEM-related fields increased by 1%	1%
4-year Public	Since 2010/11, the total number of awards granted by Iowa's 4-year public universities in STEM-related fields increased by 12%	12%
4-year Private, not-for-profit	Since 2010/11, the total number of awards granted by Iowa's 4-year private, not-for-profit colleges in STEM-related fields increased by 11%	11%
4-year Private, for-profit	Since 2010/11, the total number of awards granted by Iowa's 4-year private, for-profit colleges in STEM-related fields increased by 5%	5%

REGIONAL SCALE-UP PROGRAM MONITORING

Regional Scale-Up Programs Student Survey

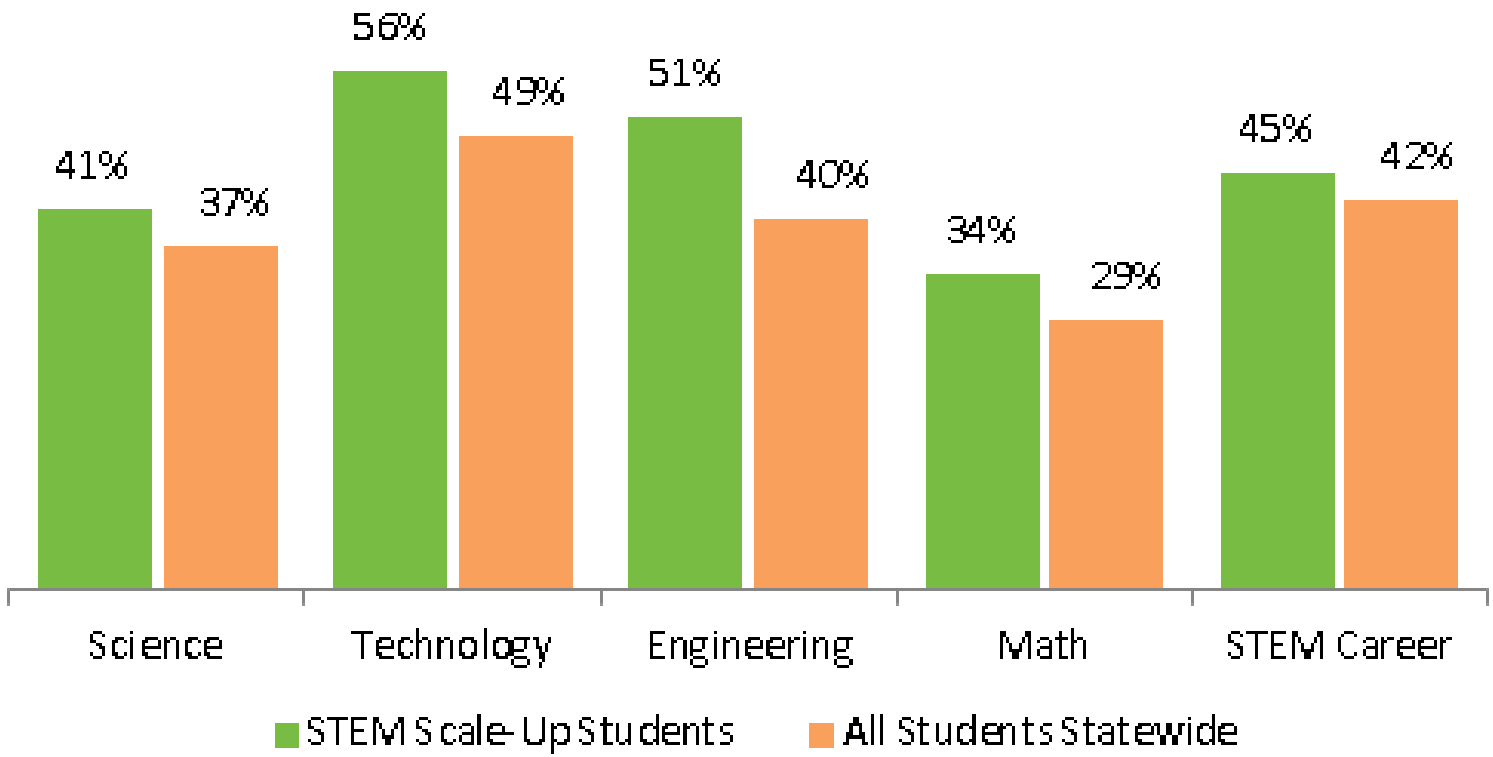
The majority of students reported increased interest in STEM topics and careers following participation in a Scale-Up Program.



Data source: 2014/15 Student Survey data compiled by CSBR (UNI)
Iowa STEM Monitoring Project, July 2015

Regional Scale-Up Programs Student Participation

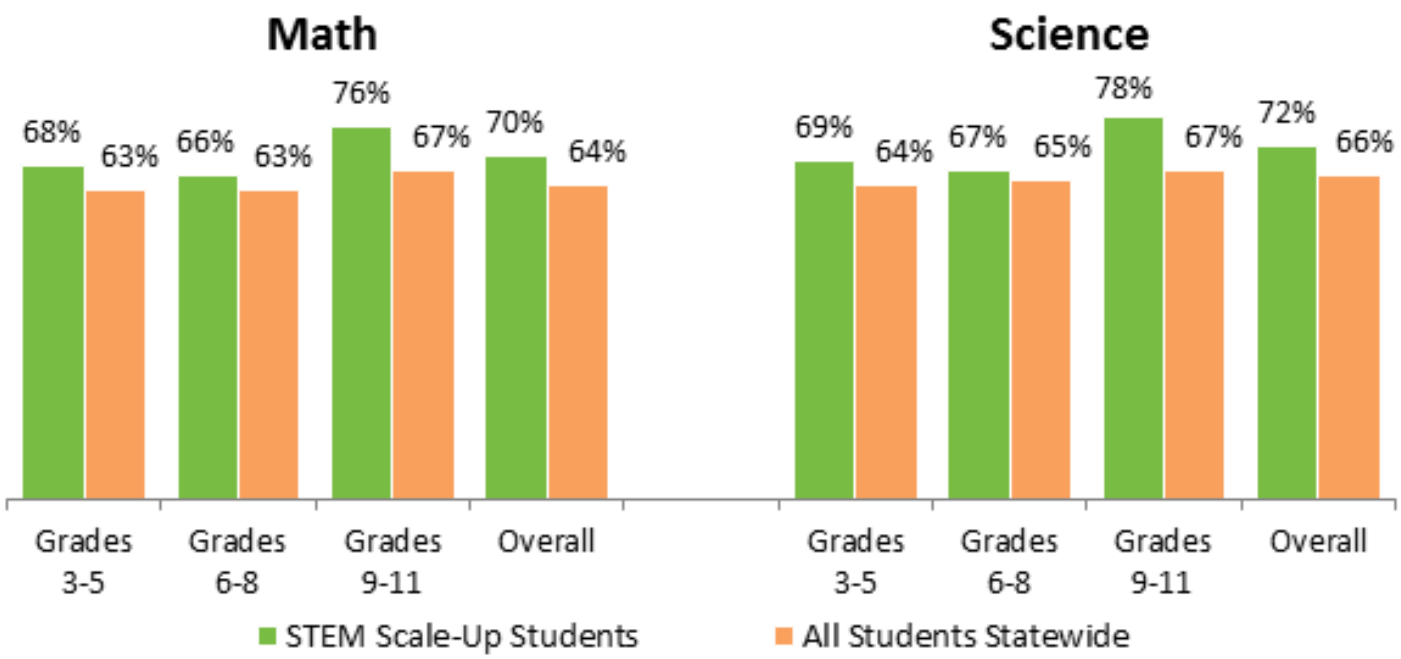
A higher percentage of students who participate in STEM Scale-Up programs said I like it a lot (Grades 3-5) or were very interested (Grades 6-12) in STEM subjects and in pursuing a STEM career compared to all students statewide



Data source: 2014-2015 Student Participant data compiled by Iowa Testing Programs (UI)
Iowa STEM Monitoring Project, July 2015

Regional Scale-Up Programs Student Participation

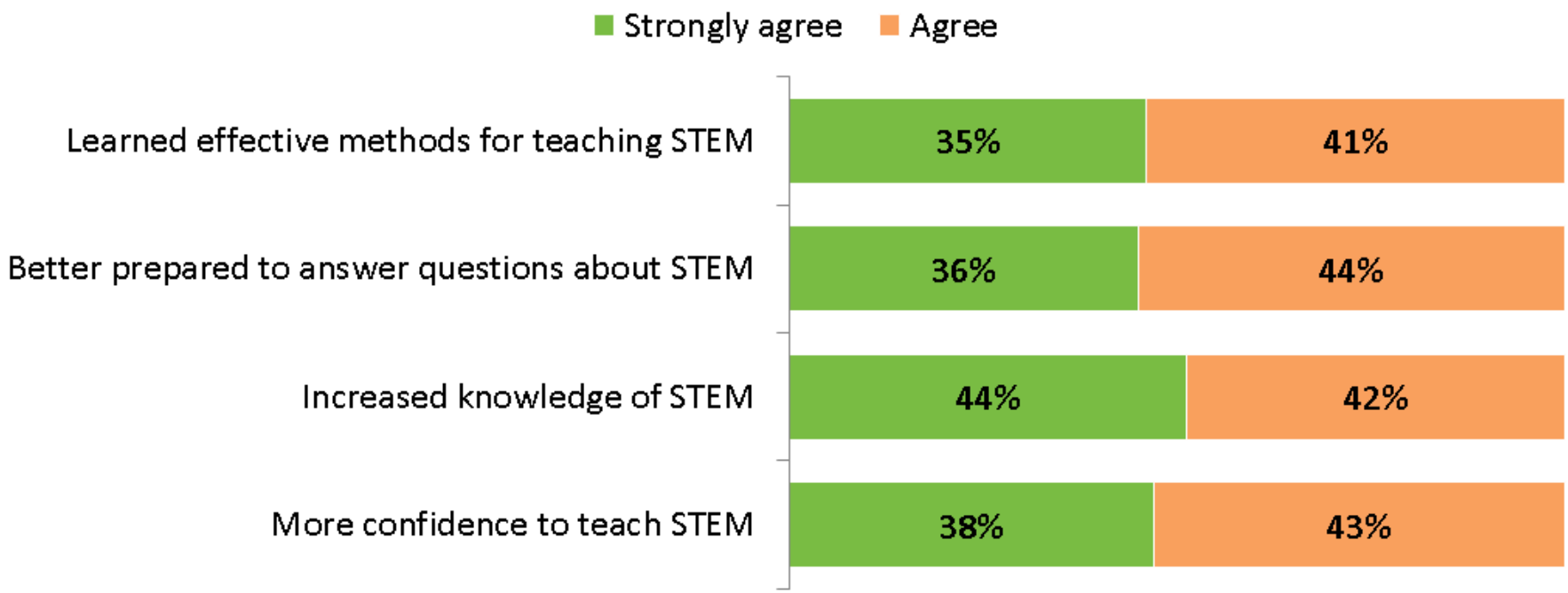
In 2014-2015, students across all grade groups who participated in STEM Scale-Up programs had higher average National Percentile Rank of math and science scores on the Iowa Assessments compared to all students statewide.



Data source: 2014-2015 Student Participant data compiled by Iowa Testing Programs (UI)
Iowa STEM Monitoring Project, July 2015

Regional Scale-Up Programs Educator Survey

Teachers & leaders who implemented a Scale-Up Program reported increased knowledge, skills, and confidence to teach STEM.



Question item: We are interested to know if you, as a teacher/leader of a Scale-Up program, have gained skills or confidence as a result of your participation. Please indicate if you strongly agree, agree, somewhat agree, somewhat disagree, disagree, or strongly disagree with the following statements.
Data source: 2014/15 Teacher/Leader Survey data compiled by RISE (ISU)
Iowa STEM Monitoring Project, July 2015

Regional Scale-Up Programs Educator Survey

Educators worked with an estimated 1,162 existing business partnerships and established 376 new school-business partnerships during 2014-2015.

- *"A local business is family owned and several students have parents who work for this business. We invited them to work on this project with us. Instead of the business sending us one engineer, they sent us five. We split up the class into smaller sections, so that they could have more time to ask questions. It was great!"*
- *"We held an open house and invited representatives from a wide range of businesses. What resulted was multiple offers for financial support, invitations to visit robotics in use in several of the businesses in attendance, and an increased interest in the accomplishments of the work being done by our students."*
- *"[Our partner] gave us funds that will keep our entire programming functional for the next year."*
- *"Because of previous experience with our Scale-Up program at the Extension Office, we were able to get help condensing the material and actually presenting it to the students."*

Data source: 2014/15 Teacher/Leader Survey data compiled by RISE (ISU)
Iowa STEM Monitoring Project, July 2015

Iowa STEM Education Evaluation (I-SEE)

(NSF DRL-1238211)

Iowa STEM Professional Network Analysis

(Preliminary results)

- The next two slides show professional between-ness (nodes between two important brokers) across different years of the Iowa STEM initiative.
- The lines represent the connections between individuals.
- The larger the node, the higher their betweenness score – meaning they are connected to others who are very connected.
- The nodes are color coded by profession (see map key).

Map Key:

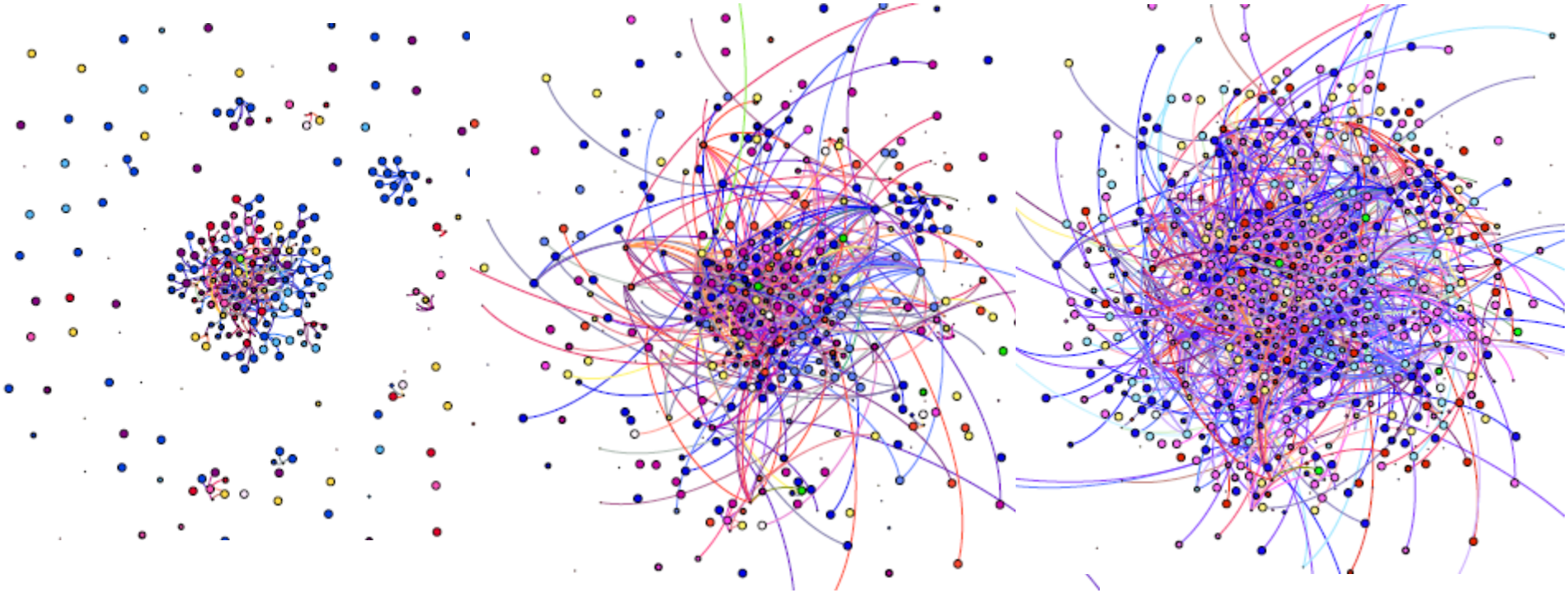
Professions –

- Purple – K-12
- Light Blue – 2-yr higher education
- Dark Blue – 4-year higher education
- Red – Business
- Gold – Government
- Pink – Non-profit
- Green – Community member

This research is funded by the National Science Foundation, Math and Science Partnership, Research Evaluation and Technical Assistance Program (Award No. DRL-1238211).

Iowa's STEM Professional Network Analysis

By looking at the color and density of the nodes (dots) and the growth of connections (lines), the planning years are dominated by higher education professionals, with fewer representatives from PK-12 and business throughout the network. By 2014-2015, the map shows many more professionals in a tight, cohesive network characterized by business professionals having connections closer to the core, and PK-12 and higher education with strong cross-network connections.



Planning Years 2007-2011 | **Year 1 2011-2012** | **Year 4 2014-2015**

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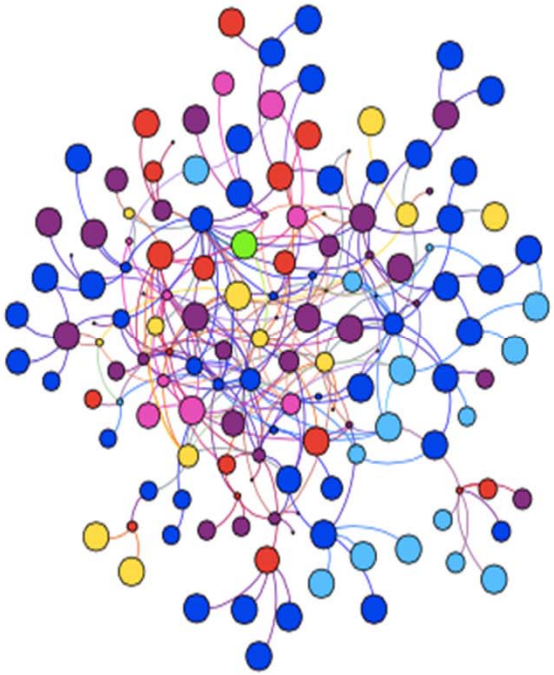
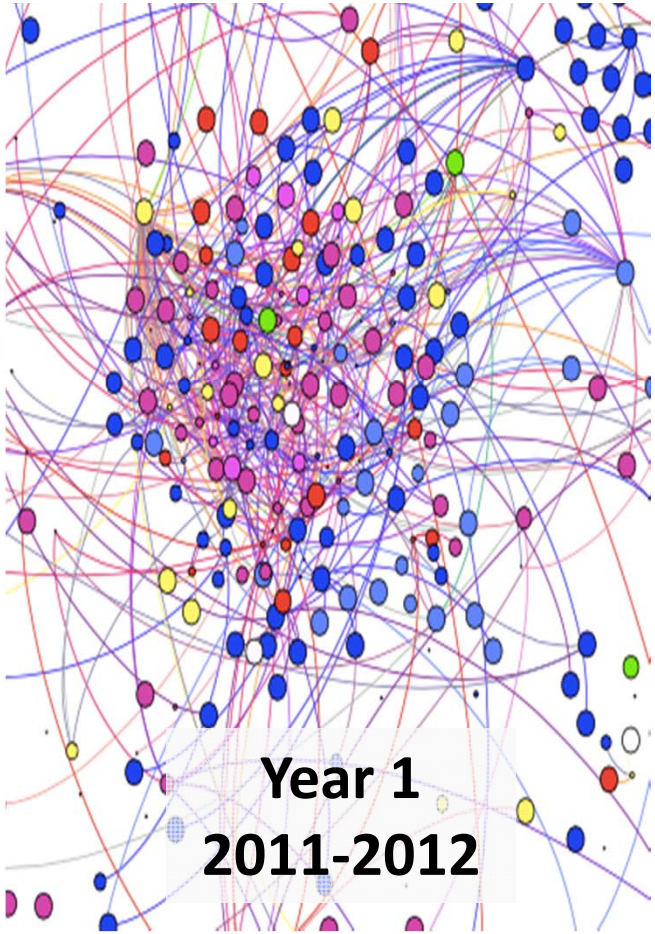
Iowa's STEM Professional Network: A closer look at the core

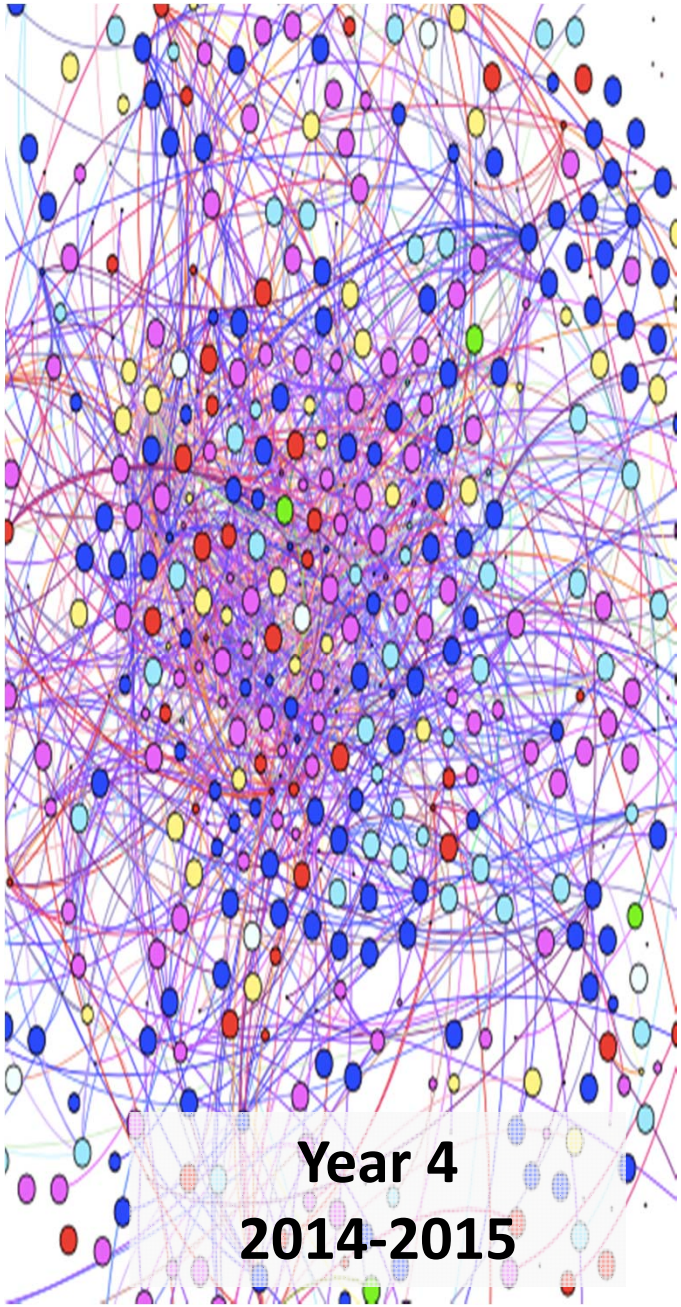
The core is represented by nodes of various colors and sizes, meaning Iowa's STEM professionals are diverse, their connections are tight, and their between-ness varies. All good things.



Planning Years 2007-2011



Year 1 2011-2012



Year 4 2014-2015

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