“LOOKING BACK”: PROGRESS IN STEM IN GEORGIA TO DATE

Nathan W. Moon
Associate Director for Research, CACP
Georgia Institute of Technology

(Former) Evaluator and Researcher
USG STEM Initiative

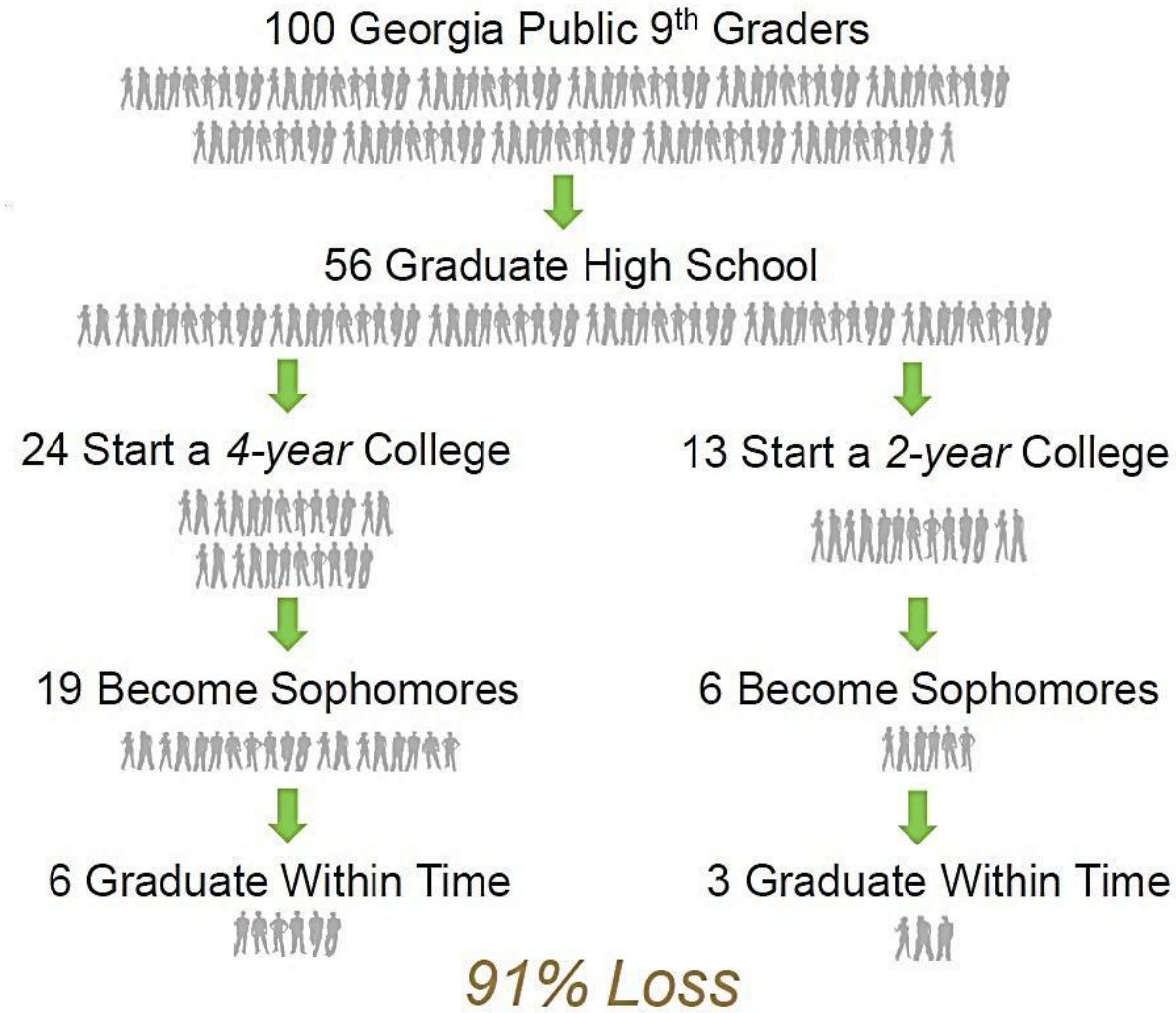
Georgia Institute of Technology

CACP
Center for Advanced Communications Policy

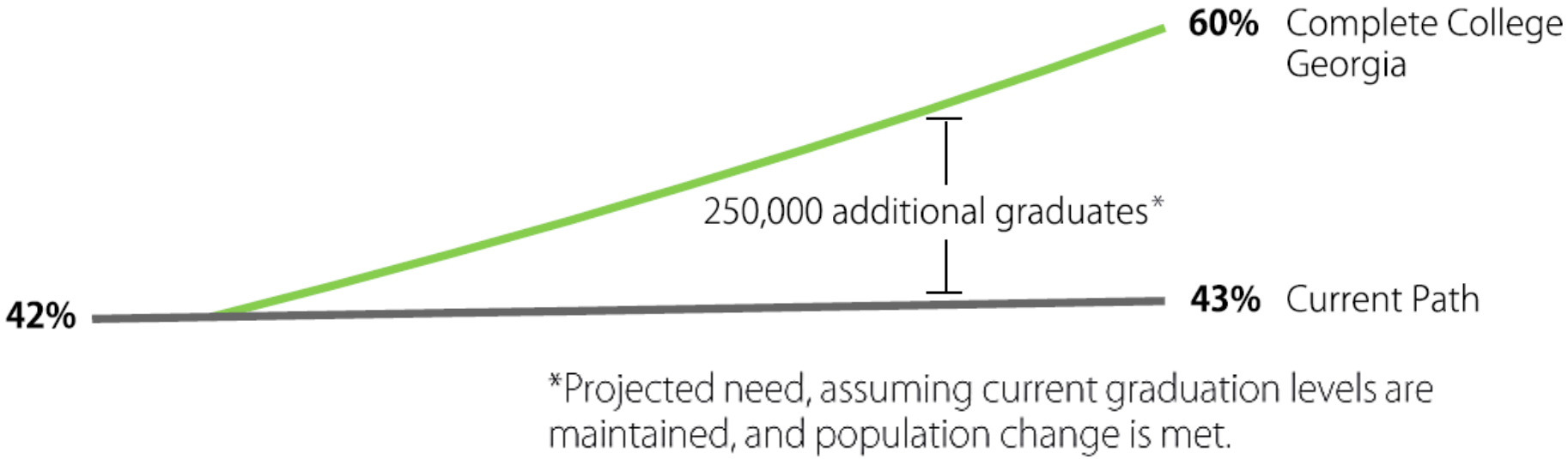
UNDERSTANDING THE CHALLENGE

The need to increase student access and success within STEM in Georgia’s colleges and universities.

Challenge of Attainment in Georgia



Complete College Georgia



Key Focuses for Improving Postsecondary Attainment

- **College Readiness**
- **Improve Access and Completion for Underserved Students**
- **Shortening Time to Degree**
- **Restructuring Instructional Delivery**
- **Transforming Remediation**
- **STEM Pathways Program**

EFFORTS TO IMPROVE STEM IN USG

Overview of major STEM efforts within the University System of Georgia

STEM Efforts within USG

- 2003-2010: **Georgia Partnership for Reform in Science and Mathematics (PRISM)**
- 2007-2011: **USG STEM I Initiative**
- 2011-2016: **USG STEM II Initiative**
- 2016-present: **USG STEM Education Improvement Plans (STEM EIPs)**

Georgia PRISM: Overview

- $34.6 million grant from the National Science Foundation (NSF) for seven-year effort (2003-2010)
- PRISM Phase II project to develop evidence base (2008-2011)
- Network of seven (7) USG colleges and universities and 15 public school districts within four (4) geographical regions in Georgia

PRISM
Partnership for Reform in Science & Mathematics

Georgia PRISM: Objectives and Goals

Key Objectives:

- Test strategies to increase student learning and achievement at secondary and postsecondary levels
- Codify best practices identified from these efforts
- Influence statewide change in STEM education policy and practice
- Inform national stakeholders about successes to be replicated or adapted

Other Goals:

- Provide all P-12 students with highly qualified and ethnically diverse science and mathematics teachers
- Ensure all P-12 students access to and readiness for challenging courses and curricula
- Increase the engagement of STEM higher education faculty in solving the needs of public schools

Georgia PRISM: Indicators and Milestones

- Professional learning support provided to over **10,000 teachers of science and mathematics**
- Establishment of over **300 P-16 Learning Communities**, with **participation by over 500 faculty**
- **Georgia's science and mathematics curriculum redesigned** and implemented to ensure that all students take four years of mathematics and four years of science, graduating "college and career ready"
- **100% of PRISM districts improved graduation rates**, increasing from 60.4% (2004) to 75.4% (2010) for a total of 15% vs. state improvement of 4.7%
- **Decrease in students requiring learning support** in college

USG STEM Initiative: Overview

- USG STEM I Initiative (2007-2011)
  - Efforts to institutionalize Georgia PRISM
  - Part of Chancellor's "Science + Math = Success Initiative"
  - 11 USG institutions

- USG STEM II Initiative (2011-2016)
  - Building upon promising practices learned from STEM I
  - Addition of newcomer institutions as innovative testbeds
  - 7 USG institutions

- USG STEM EIPs (2016 to present)
  - Addressing institution-identified needs and objectives
  - Building upon promising practices from STEM I and STEM II
  - 14 USG institutions

STEM Initiative: Objectives

Objective #1: P-12 Readiness

- To increase the number of K-12 students who prepare for and are interested in majoring in science, technology, engineering, and mathematics (STEM) in college.

Objective #2: STEM Success

- To increase the success rates and number of students in college who pursue the STEM disciplines.

Objective #3: STEM Educator Preparation

- To increase the number of teachers who are prepared in science and mathematics—which will lead to an increase in the number of K-12 students who are prepared to enter the STEM fields.

STEM Initiative: Activities

- Faculty Mini-Grant Programs
- Service Learning Programs (K-12 Outreach)
- Institution-Specific Programs
  - Supplemental instruction (SI) programs
  - Peer mentoring
  - Learning communities
  - Undergraduate research experiences
  - Courses on STEM careers
  - Deployment of instructional technology
  - Enhancements to STEM teacher preparation

STEM Initiative I: Milestones

- **Increase in STEM** majors among participating institutions **from 12,972 in FY 2007 to 16,559** in FY 2010 -- an increase of 3,587 majors, or **27.7% vs. 15.3% in USG**

- **Increase in STEM degrees among participating institutions by 11.3 percent** from 2007 to 2011

- **Improvements in passing rates for STEM core courses** at participating institutions, ranging from 2.4 percent (mathematics) to 6.6 percent (physics)

STEM Initiative II: Milestones (Majors)

Actual, Reported Percent Change (Overall Initiative)

- *AY2011-2012 to AY 2012-2013* 9.97%
- *AY2012-2013 to AY 2013-2014* 26.44%
- *AY2013-2014 to AY 2014-2015* -8.86%
- ***OVERALL CHANGE*** ***26.72%***

Adjusted Percent Change (Proportion of Majors)

- ***OVERALL CHANGE*** ***-2.20% to 5.05%***

STEM Initiative II: Milestones (Degrees)

Actual, Reported Percent Change (By Institution)

- *AY2011-2012 to AY 2012-2013* -2.08% to 64.86%
- *AY2012-2013 to AY 2013-2014* 4.31% to 60.49%
- *AY2013-2014 to AY 2014-2015* -8.23% to 43.40%
- ***OVERALL CHANGE*** ***14.84% to 167.57%***

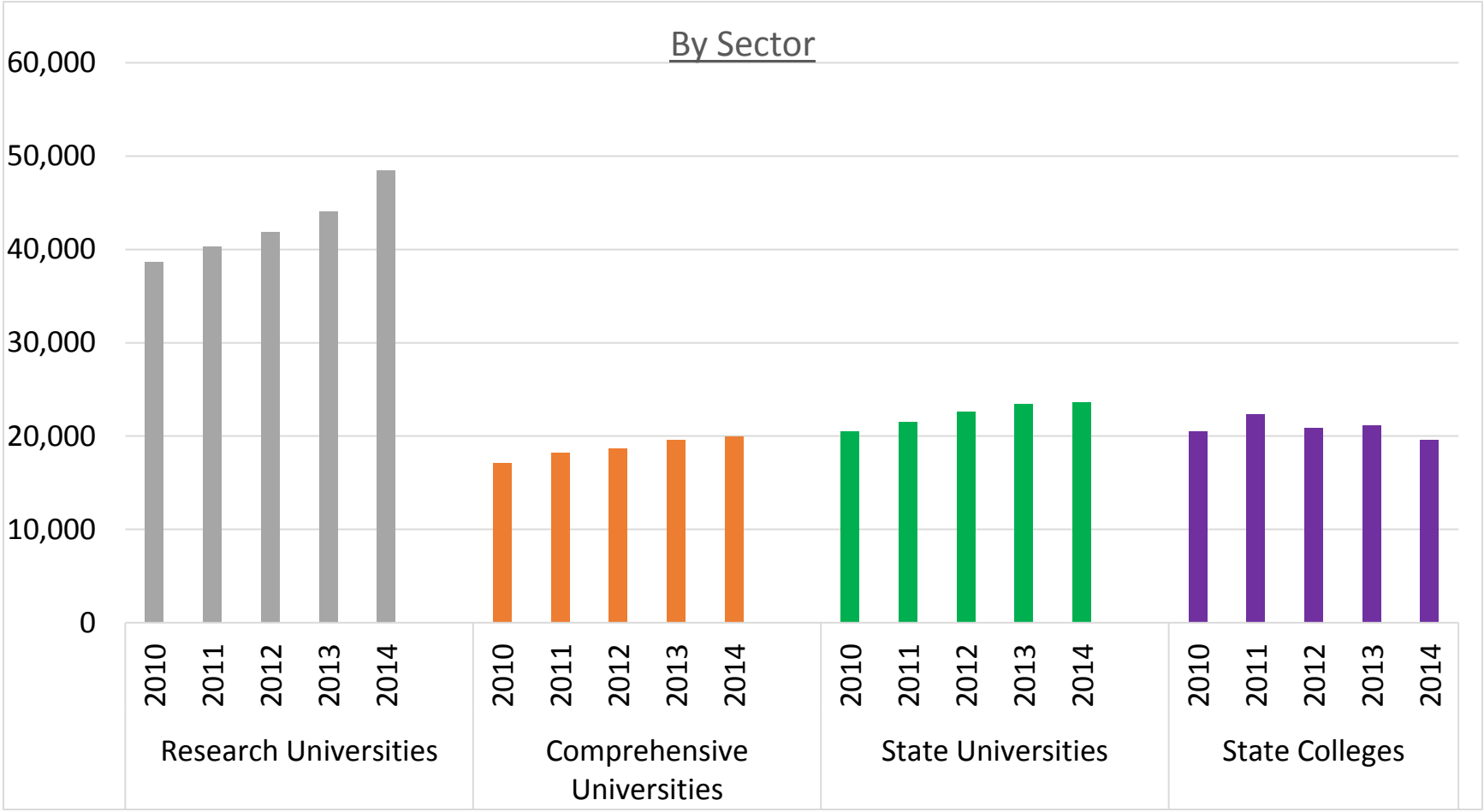
Adjusted Change (Percent Change in STEM Degrees)

- ***OVERALL CHANGE*** ***10.07% to 86.52%***

STEM ATTAINMENT WITHIN USG

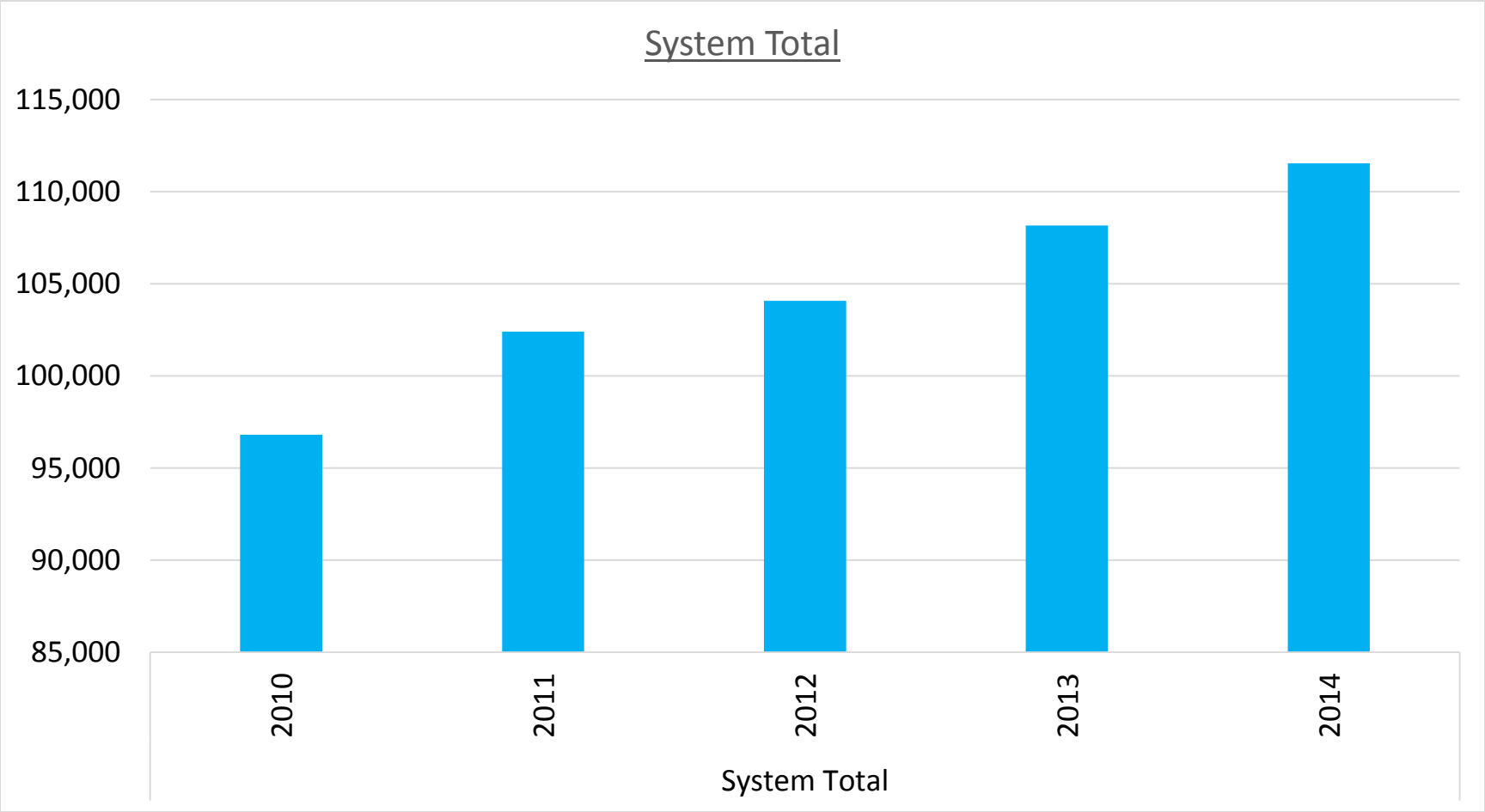
A closer look at enrollment, retention, and graduation over the past five years.

Enrollment in USG STEM Programs

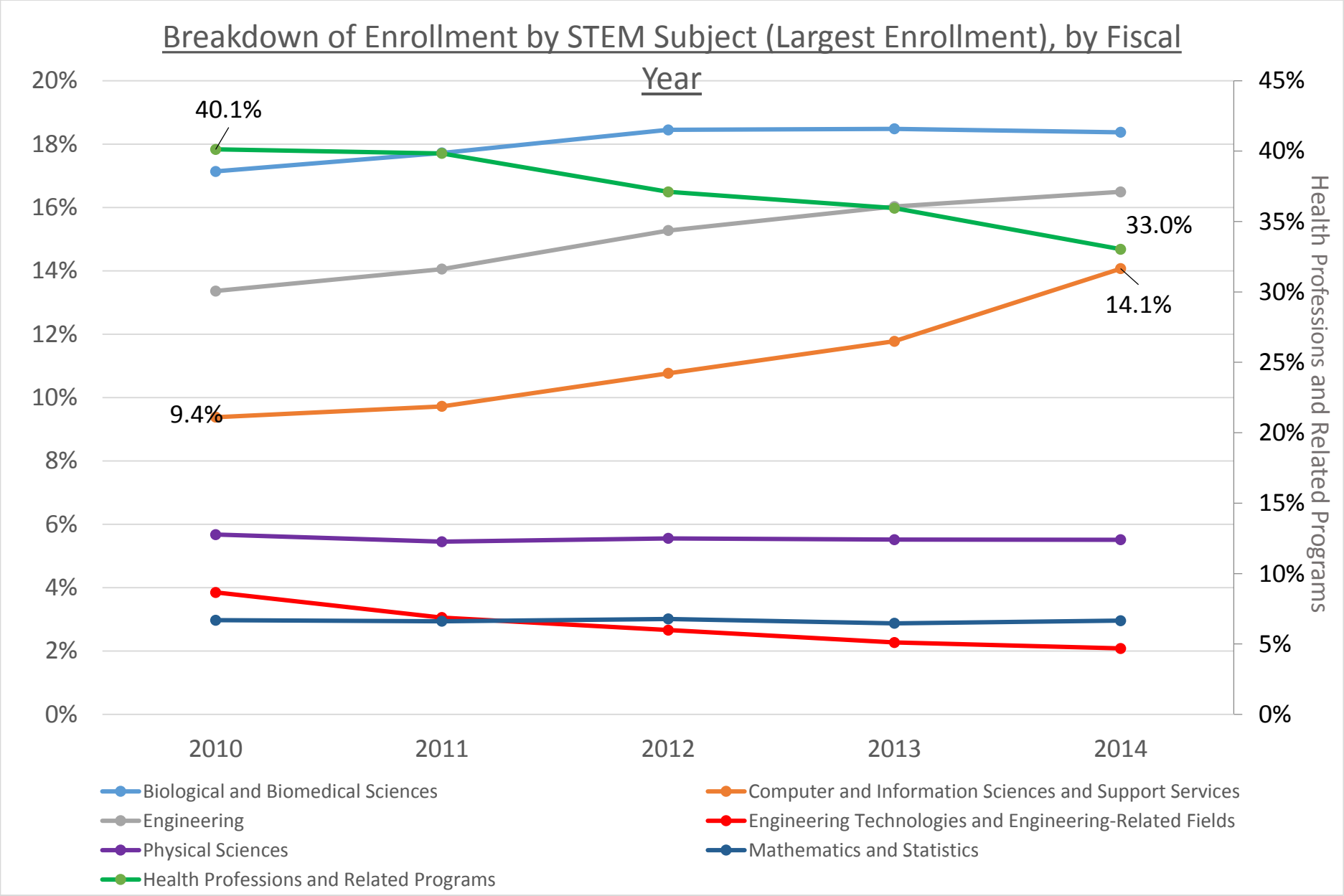


Source: USG Office of Research Policy Analysis

Enrollment in USG STEM Programs



Source: USG Office of Research Policy Analysis



Source: USG Office of Research Policy Analysis

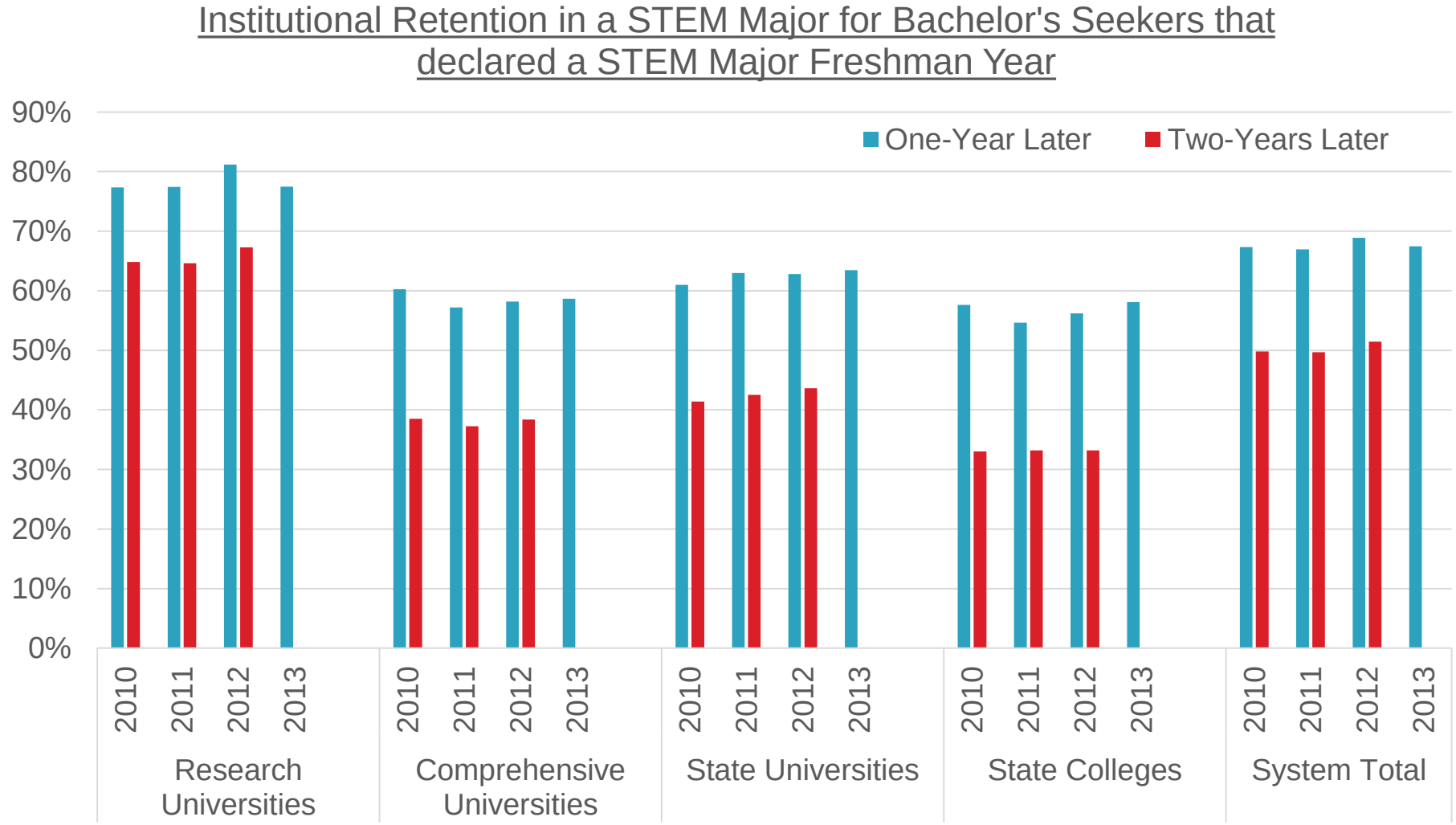
STEM Course Success - Science

Percentage of Students that Receive A, B, C in STEM Core Courses							
	Biology		Chemistry		Physics		
	1111	1112	1151	1152	1111	1112	
FY 11	68.4%	83.7%	69.7%	74.6%	73.1%	86.9%	
FY 12	67.4%	81.6%	69.4%	73.3%	71.6%	87.3%	
FY 13	71.7%	82.5%	68.3%	75.2%	75.0%	87.9%	
FY 14	70.3%	83.6%	68.6%	78.1%	74.6%	86.9%	

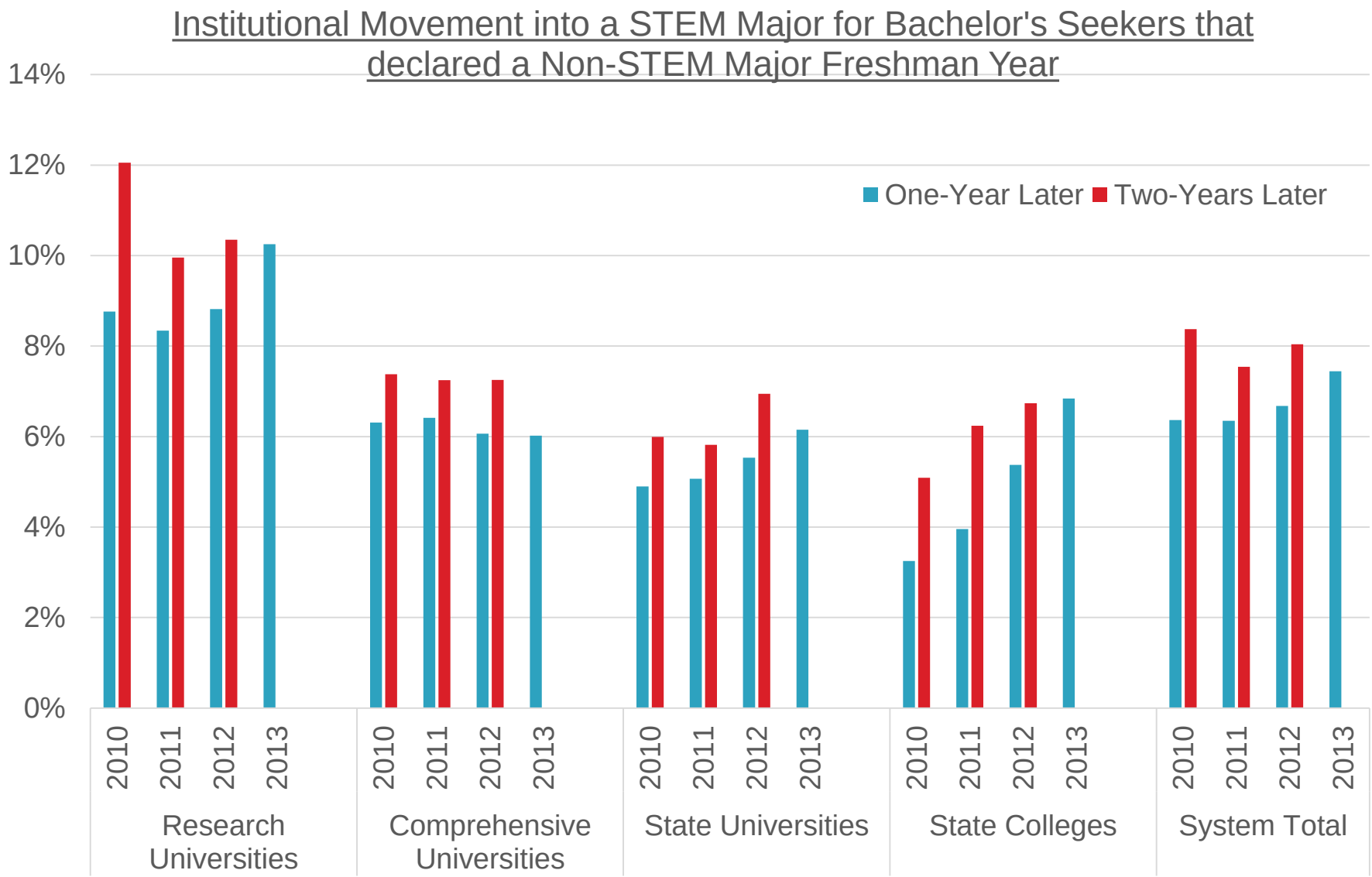
STEM Course Success - Mathematics

Percentage of Students that Receive A, B, C in STEM Core Courses				
	College Algebra (1111)	Pre-Calculus (1113)	Calculus I	Calculus II
FY 11	56.8%	61.1%	63.8%	65.8%
FY 12	58.1%	63.5%	64.2%	67.5%
FY 13	59.7%	64.3%	64.8%	68.9%
FY 14	62.2%	63.5%	65.2%	68.8%

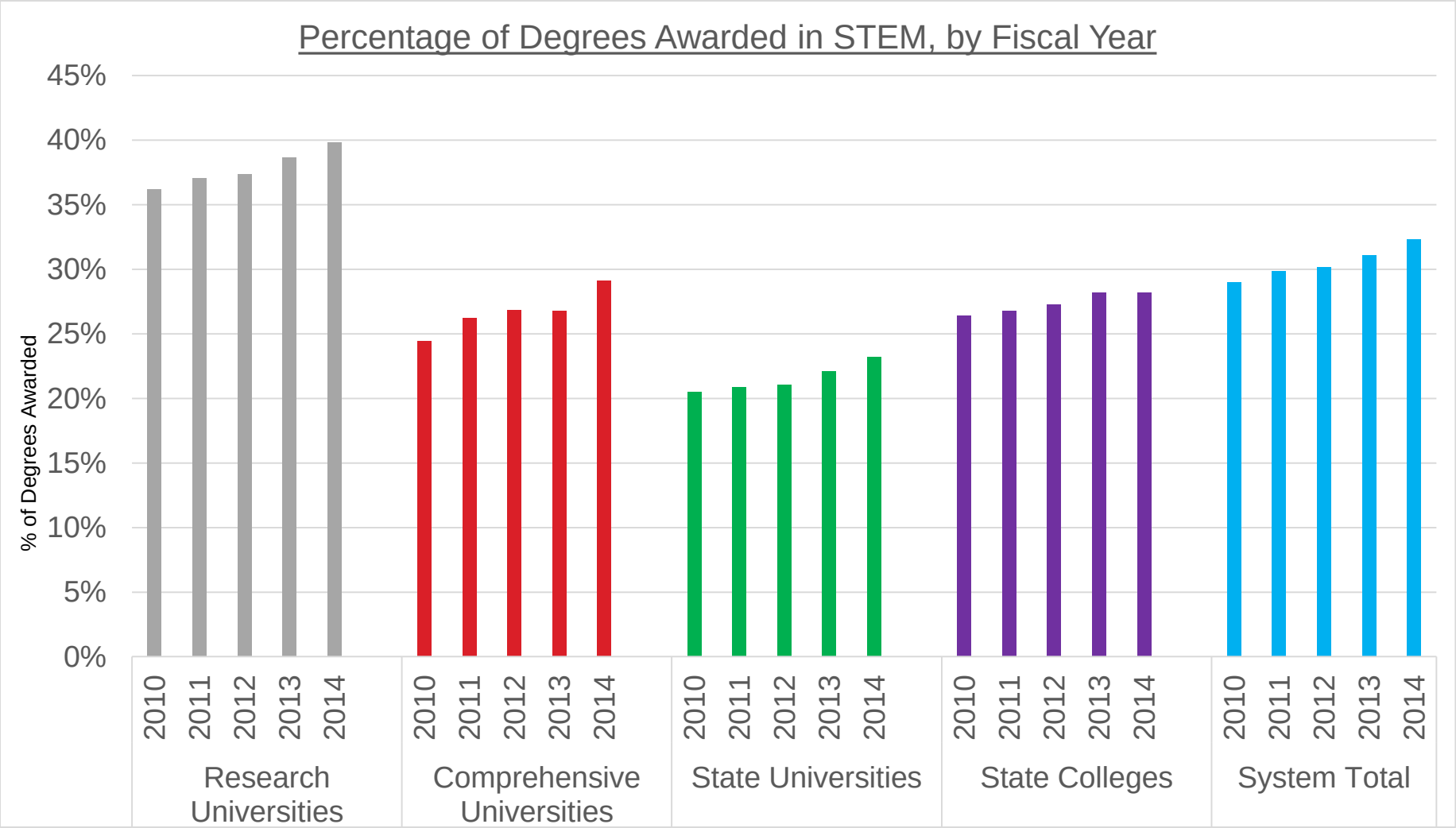
Retention Rates in STEM



Retention Rates in STEM



STEM Degree Production



Discussion

- Increasing enrollment in STEM across USG overall, but varying trends based on type of institution
- Despite overall improvements in gateway mathematics courses, progress is still needed
- Challenges in two-year retention rates in STEM suggests need for longer-term approaches
- However, students may still switch to STEM
- Overall, progress in the right direction—issue one of strength of that direction

NEW DIRECTIONS

Some considerations on the future of the STEM Initiative.

Principles in Support STEM EIPs

- Equitability and Opportunity – Need for Greater Participation by USG Institutions
- Specificity – Respect for Institutional Missions and Needs, Focus on Formative Evaluations for Improvement
- Attainment – Furthering the Aims of Complete College Georgia (CCG) through STEM *For All Learners*
- Knowledge Translation – More Effective Means of Disseminating Promising Practices, Focus on Adapting Rather than Replication

New Research on STEM Workforce Readiness

- USG Research Project for FY2017
- Investigate relationship between STEM education and workforce development in Georgia:
  - How do USG institutions respond to needs and determine effectiveness of efforts to improve STEM education and STEM workforce development?
- Methods:
  - Surveys of USG institutions and STEM workforce stakeholders (associations, employers, economic developers)
  - Interviews of USG institution leaders (deans, department chairs), STEM workforce stakeholders (employers), and policymakers
- Planned report and recommendations by May 2017

Thank You!

We acknowledge the support of the University System of Georgia's (USG) Office of Educational Access and Success (OEAS), including the leadership of Sheila Jones (STEM Initiative Coordinator) and Rob Anderson (Vice Chancellor for Educational Access and Success). We also acknowledge the support of the Office of Research & Policy Analysis (RPA), including Angela Bell (Associate Vice Chancellor of Research & Policy Analysis) and Rachana Bhatt (Senior Research Associate).

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the evaluator and do not necessarily reflect the views of the USG or the Board of Regents.