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

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USG STEM Initiative
UNDERSTANDING THE CHALLENGE

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

100 Georgia Public 9th Graders

56 Graduate High School

24 Start a 4-year College

19 Become Sophomores

6 Graduate Within Time

13 Start a 2-year College

6 Become Sophomores

3 Graduate Within Time

91% Loss
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

*Projected need, assuming current graduation levels are maintained, and population change is met.
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
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

By Sector

Research Universities
- 2010: 40,000
- 2011: 40,000
- 2012: 40,000
- 2013: 40,000
- 2014: 40,000

Comprehensive Universities
- 2010: 15,000
- 2011: 15,000
- 2012: 15,000
- 2013: 15,000
- 2014: 15,000

State Universities
- 2010: 20,000
- 2011: 20,000
- 2012: 20,000
- 2013: 20,000
- 2014: 20,000

State Colleges
- 2010: 10,000
- 2011: 10,000
- 2012: 10,000
- 2013: 10,000
- 2014: 10,000

Source: USG Office of Research Policy Analysis
Breakdown of Enrollment by STEM Subject (Largest Enrollment), by Fiscal Year

- Biological and Biomedical Sciences
- Computer and Information Sciences and Support Services
- Engineering
- Engineering Technologies and Engineering-Related Fields
- Physical Sciences
- Mathematics and Statistics
- Health Professions and Related Programs

Source: USG Office of Research Policy Analysis
## STEM Course Success - Science

<table>
<thead>
<tr>
<th>Percentage of Students that Receive A, B, C in STEM Core Courses</th>
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<tbody>
<tr>
<td>Biology</td>
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<tr>
<td>FY 11</td>
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<td>FY 12</td>
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<td>FY 13</td>
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<td>FY 14</td>
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## STEM Course Success - Mathematics

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

Institutional Retention in a STEM Major for Bachelor’s Seekers that declared a STEM Major Freshman Year

- One-Year Later
- Two-Years Later

- Research Universities
- Comprehensive Universities
- State Universities
- State Colleges
- System Total
Retention Rates in STEM

Institutional Movement into a STEM Major for Bachelor's Seekers that declared a Non-STEM Major Freshman Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Research Universities</th>
<th>Comprehensive Universities</th>
<th>State Universities</th>
<th>State Colleges</th>
<th>System Total</th>
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<tbody>
<tr>
<td>2010</td>
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- **One-Year Later**
- **Two-Years Later**
STEM Degree Production

Percentage of Degrees Awarded in STEM, by Fiscal Year

- Research Universities
- Comprehensive Universities
- State Universities
- State Colleges
- System Total

% of Degrees Awarded

- 2010
- 2011
- 2012
- 2013
- 2014
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!

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