

# The University of Georgia STEM Initiative II Projects, Programs and Partnerships

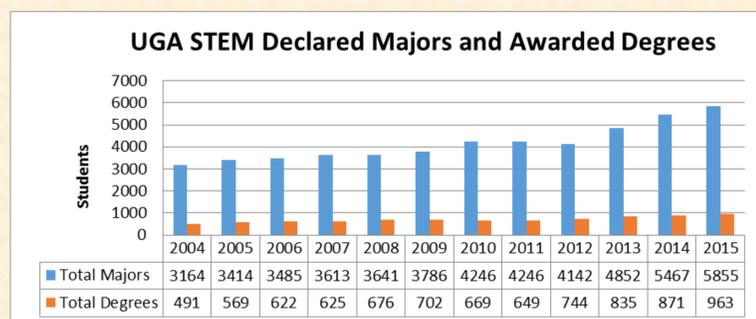
## STEM INITIATIVE GOALS ADDRESSED

Worked with campus partners, local school districts, Georgia institutions and national partners to identify and implement projects to address the USG STEM Initiative Goals:

1. Increase the number of K-12 students who are prepared for and are interested in majoring in STEM disciplines in college;
2. Increase the success and completion rates of college students majoring in STEM disciplines; and
3. Increase the number of qualified K-12 STEM teachers.

## BACKGROUND INFORMATION

Numbers of STEM majors and degrees increased during STEM Initiative II.



However, 10 – 30% of UGA students pursuing a B.S. degree receive grades of D, F, or W in introductory STEM courses.

## ACTIVITIES

- **Supporting three tenure-stream faculty members** whose teaching and scholarship contribute to improved instruction and student learning in STEM disciplines.
- **Offering the STEM mini-grant program** that supports faculty undertaking innovative projects to improve instruction and student learning in undergraduate STEM courses.
- **Supporting Learning Communities** comprising UGA faculty and local K-12 teachers who meet regularly and work together to develop and share professional knowledge.
- **Organizing and hosting the annual UGA STEM Institute on Teaching and Learning** as a forum for sharing best practices in STEM education.
- **Supporting Project FOCUS** (Fostering Our Community's Understanding of Science) that places STEM undergraduate students in local K-8 classrooms to present inquiry-based science lessons.
- **Engaging in partnerships** with the Clarke County School District (CCSD), RESA, UGA colleges, the NSF-sponsored Center for the Integration of Research, Teaching and Learning (CIRTL), and the National STEM Center Initiative of APLU.
- **Developing and delivering MATH 1113 online** as a high quality, accessible and affordable multi-institutional course with an overarching goal of improving student success in a gatekeeper course.

## RESULTS

**58 Mini-Grants** were supported from FY12 to FY16. This work led to numerous publications, presentations at national conferences, and grant submissions. Highlights include:

- A mini-grant, *An Interdisciplinary Initiative to Educate for Empathy as a Core Learning Competency and Professional Qualification for Engineering and STEM Students*, was foundational to selection for an NSF award in 2015 for \$349,000.
- The Presidential Early Career Award for Scientists and Engineers (PECASE) was bestowed on mini-grant recipient Joachim Walther, Associate Professor in Engineering, in 2016.
- A suite of short videos on active learning strategies in large biology courses was developed as part of a mini-grant and are freely available to faculty for professional development.
- An early mini-grant laid the foundation for the creation of the Scientists Engaged in Education Research (SEER) Center, an ongoing STEM pedagogy research group.

**12 Learning Communities (LC)** were supported from FY12 to FY16.

- Five of the 12 have met at least once a month for five years. They include the Mathematics Curriculum Team, The SEER Center LC, Mathematical Pedagogical Problem Solvers (MPPS), AP Statistics LC and AP Calculus LC.
- MPPS, a CCSD / UGA partnership, has developed a Taxonomy of Students' Mathematical Strengths and will soon have a chapter in the 2017 publication *Annual Perspectives in Mathematics Education*.
- The AP Statistics LC spans seven counties and provides a much needed discussion opportunity for teachers who are often the only ones to teach their subject in their schools. This group contributes questions that are used in AP Statistics Mock Exams.

**The 2016 STEM Institute** was the largest ever with approximately 165 attendees representing faculty, graduate students, staff and members of the community. Two nationally recognized plenary speakers energized the gathering, and a very popular graduate student poster session was featured for the first time.



**Project FOCUS**, a partnership with the CCSD, placed over 500 undergraduate students in K-8 classrooms teaching science lessons to nearly 10,500 students from FY12 – FY16.

**MATH 1113 Online (Precalculus Emporium)** was a three-year project that involved over 40 individuals including seven faculty instructors, nine USG institutions, and 651 students. Over all success rates (A, B, C) averaged around 50% with withdrawal rates nearly equaling failure rates for some terms. Numerous recommendations were generated regarding the development and delivery of collaborative and online core courses.

## CHALLENGES

- Annual funding cycle with late spring confirmation of funding availability and amounts presented challenges in planning and organizing for maximum efficiency.
- Inability to carry forward unused funds limited ability to leverage funds toward maximum project benefits.
- Semester and faculty schedules together with budget processes constrained mini-grant flexibility.
- Scaling of individual classroom successes to additional course sections with other faculty varies from department to department.
- Multi-institutional projects inherently have many coordination challenges due to differences in policies, procedures, and dates.
- Increasing awareness within the University and beyond regarding the services and projects offered by the OSE requires multiple strategies.
- DFW rates in STEM gatekeeper courses remain a challenge.

## LESSONS LEARNED

- Mini-grants are a great way to seed research that becomes the foundation for a large federally funded grant.
- Selection of mini-grant recipients prior to funding confirmation allows for a more realistic planning, budgeting, and implementation timeline.
- Learning Communities are most successful when the members have a common goal or a project to work toward and have strong leadership.
- Withdrawal and failure are not really the same thing yet both delay time to graduation.
- More analysis of the causes for withdrawal would be beneficial to understanding student success patterns.
- Students on Academic Probation often receive the last registration time slot increasing the barriers that these students encounter to success.
- Substantial variation exists across institutions and within departments as to what a student needs to know and be able to do within individual courses.
- Departments and in some situations, faculty, have a great deal of latitude in determining what resources can or cannot be used to support learning (e.g., graphing calculators, formula sheets).

## FUTURE PLANS

- Implement a **Peer Learning Assistant (PLA) program in gatekeeper courses** for six disciplines (math, engineering, computer science, biology, physics and chemistry) that will allow for departmental flexibility in design but include creating/aligning institution resources and support structures that are scalable and sustainable. Components of the PLA program include the specific PLA model adopted by the department, PLA training and coordination, evaluation for continuous improvement of program elements, faculty training and support, and overall project management.
- Expand the **University of Georgia and the Clarke County School District partnership** to provide targeted teacher training experiences that will lead to improved student success in math and science courses from grades 6-12. Faculty-delivered training will include enhancing teachers' content knowledge, pedagogical knowledge, and curricular knowledge. Teachers will work in cohorts including student teachers, instructional coaches, graduate students and UGA Professors-in-Residence.