



University System of Georgia (USG) STEM Initiative

Annual Report from Columbus State University for FY2014 (2013-2014)

I. STEM Initiative Program Overview

A. *Program Implementation and Operation* – This section covers the operation of your institution's STEM Initiative Program:

1. Identify and explain the **key programs and projects** (i.e. mini-grant program, FOCUS-derived project, etc.) that comprise the STEM Initiative at your institution. (You will be asked more detailed questions about these later.)

The STEM Initiative II proposal from Columbus State University entails three components: faculty mini-grants, Project FOCUS replication, and supplemental peer instruction. Though not formally a part of the program, the new UTeach Columbus program and a Robert Noyce Teacher Scholarship program complement and extend these efforts.

Faculty mini-grants

Mini-grants in the \$1,000-\$2,500 range are available to faculty on a competitive basis for projects related to the scholarship of teaching and learning STEM.

Project FOCUS replication

CSU has created two new service learning courses, UTCH 1201 Step 1: Inquiry Approaches to Teaching and UTCH 1202 Step 2: Inquiry-Based Lesson Design, which comprise the first two courses in the UTeach Columbus program. Step 1 was first offered in spring 2012. The Step 2 model is similar; in Step 2, the university students work in a middle school setting and design their own lessons.

Supplemental peer instruction

Each peer instruction leader is a CSU student assigned to an introductory math or science course. The peer leader attends all class lectures so she/he is familiar with the instructor's approach and emphasis, meets with the instructor at least four times during the semester to discuss course objectives and plans, meets weekly with fellow peer leaders and the coordinator for debriefing, and holds two hours of help sessions each week.

UTeach Columbus

With up to \$1.4 million in Race to the Top funds and about \$1.7 million in matching funds over a four and a half year period, the UTeach Columbus program addresses both the number of STEM majors and the success of STEM majors from the supply side by recruiting more high school STEM teachers and preparing them to incorporate engaging instruction based on recognized best practices.

Robert Noyce Teacher Scholarship Program

The UTeach Columbus program is supported by a \$1.2 million Robert Noyce Teacher Scholarship Program award from the National Science Foundation. Our program, the Columbus Region Academy of Future Teachers of STEM (CRAFT-STEM), combines a summer camp for high school juniors and seniors, \$4500 summer internships for university freshmen and sophomores, scholarships starting at \$10,000 for juniors and seniors (\$13,400/year in FY2014) to recruit more STEM and STEM education majors, and strong mentoring relationships for interns and scholars in the program.

STEM Honors Camp

The STEM Honors Camp is a 2-week summer camp for 24 rising high school juniors and seniors, supported by CSU faculty and interns paid through the Robert Noyce Teacher Scholarship program grant. Over six hundred Georgia high schools are invited to nominate two students each to a pool of applicants, from which the 24 participants are selected based on the basis of academic achievement, demonstrated interest in a STEM field, potential benefit, and ability to work collaboratively. Participants engage in hands-on activities, small group research projects, and field trips to STEM related industries. Summer interns organize a “College 101” seminar to tell participants everything they might want to know about college life. Goals of the camp include interesting participants in STEM related careers and the interesting the interns in STEM teaching. See the camp website for more information, including a sample camp schedule: http://uteach.columbusstate.edu/stem/stem_camp.php

2. Identify **key personnel** associated with your institution’s STEM Initiative program and briefly describe **each person’s role**. Be certain to include all personnel whose salaries have been paid, either fully or partially, by STEM Initiative funds. Include any faculty or staff receiving course release time or some comparable form of compensation to participate.
 - a. Tim Howard – STEM Initiative coordinator responsible for program administration and reporting, receiving faculty mini-grant proposals, mini-grant selections, identifying courses for peer leader support, selecting peer leaders, supervising peer leader program. Also serves as co-director of STEM Honors Camp.
 - b. Janet Jamieson – administrative support for the CSU STEM Initiative program
 - c. Kenneth Jones – master teacher for Project FOCUS replication (Step 1 and Step 2). Recruits elementary school and middle school principals and teachers for participation in the program. Teaches inquiry based instruction and inquiry based lesson design to university students taking Step 1 and Step 2. Mentors university students in their preparation of lessons. Observes delivery of lessons.

- d. Barbara Sinkule – master teacher for Project FOCUS replication (Step 1 and Step 2). Recruits elementary school and middle school principals and teachers for participation in the program. Teaches inquiry based instruction and inquiry based lesson design to university students taking Step 1 and Step 2. Mentors university students in their preparation of lessons. Observes delivery of lessons. She also has developed training activities for our peer instruction leaders.
 - e. Kim Shaw – co-PI on STEM Initiative, co-director of UTeach Columbus, co-director of STEM Honors Camp. Serves on the supplemental peer instruction steering committee. As a UTeach Columbus co-director she helps oversee Project FOCUS replication through Step 1 and Step 2.
 - f. Deborah Gober – UTeach Columbus co-director. As a UTeach Columbus co-director she helps oversee Project FOCUS replication through Step 1 and Step 2.
 - g. Cindy Ticknor – Part of the steering committee for our Peer Leader program.
 - h. Samuel Abegaz – hired with the first STEM Initiative to alleviate an enrollment bottleneck in Principles of Chemistry
 - i. Zdeslav Hrepic – hired with the first STEM Initiative to support science teacher preparation. Teaches integrated science courses, physics, and Knowing and Learning Math and Science for the UTeach Columbus program.
3. Identify **partnering departments, offices, or centers** participating in the STEM Initiative at your institution. Briefly discuss their relationship with the STEM Initiative and note any relevant contributions.
- a. Math and Science Learning Center –The Math and Science Learning Center is a community resource dedicated to enhancing the learning of math and science through curriculum development and best-practices training for college faculty as well as in-service and pre-service K-12 teachers. The center also provides student tutoring and tutor training. The director of the MSLC functions as the STEM Initiative coordinator.
 - b. MAST Council – The Math and Science Teaching (MAST) Council is an organization dedicated to supporting students enrolled in STEM courses and programs, and promoting programs leading to teaching certification in those fields. The MAST Council consists of professors, advisors, representatives of outreach centers, and professionals that provide oversight to the degree programs and experiences for undergraduates at Columbus State University. The MAST Council is the steering committee for Columbus State University's STEM Initiative. Members of the MAST Council serve as promoters and reviewers of faculty mini-grant projects. Council members also provide guidance for the peer instruction program. Both the UTeach Columbus Program and the Robert Noyce Teacher Scholarship program were initiated within MAST.
 - c. UTeach Columbus – The UTeach Columbus program is a new interdisciplinary program for recruiting and preparing high school STEM teachers.

- B. **Program Successes** – This section covers the key accomplishments of your institution’s STEM Initiative program during FY2014:

1. Explain how your program has made progress toward Goal 1, **improving the readiness of P-12 students** for STEM in college. (You may wish to draw upon service learning programs, among other efforts. You also may wish to describe bridge programs or similar efforts directed at incoming freshmen.)

CSU is addressing P-12 readiness through its teacher preparation programs, including the spring 2012 launch of the UTeach Columbus program, designed to recruit more high school STEM teachers. We also maintain a strong commitment to quality P-8 teacher preparation, which is supported through outstanding academic programs, close collaboration between colleges, and three outreach centers of excellence: Coca Cola Space Science Center (CCSSC), Columbus Regional Mathematics Collaborative (CRMC), and Oxbow Meadows Environmental Learning Center. Collaborations are facilitated through the Math And Science Teaching (MAST) Council, which has representatives from Biology, Chemistry, Computer Science, Earth and Space Science, Mathematics, Teacher Education and our outreach centers.

College readiness is also facilitated through a host of activities designed to stimulate interest in STEM fields among P-12 students. The Math & Science Learning Center hosts a regional Science Olympiad for middle school students and a regional science and engineering fair for middle school and high school students. The Space Science Center and Oxbow Meadows Environmental Learning Center offer phenomenal opportunities for informal science education for children in many grade levels. The Math Collaborative provides faculty development for P-12 math teachers and hosts summer math camps for children of all school ages.

Particular noteworthy accomplishments in the 2013-2014 fiscal year include the following:

Implemented new UTeach courses: Scheduled the first-ever offerings of all remaining UTeach courses. These include the following:

<u>Course</u>	<u>Fall 2013 Enrollment</u>	<u>Spring 2014 Enrollment</u>
<u>UTCH 4205 Project Based Instruction</u>	<u>2</u>	<u>2</u>
<u>UTCH 4485 Student Teaching</u>	<u>N/A</u>	<u>2</u>
<u>UTCH 4795 Student Teaching Seminar</u>	<u>N/A</u>	<u>2</u>
<u>SPED 4115 Teaching Math/Science to Exceptional Learners</u>	<u>N/A</u>	<u>2</u>

Increased interest in STEM among high school students. In June 2014 CSU ran its third STEM Honors Camp, a component of the Robert Noyce Teacher Scholarship Program. The camp builds on the Academy of Future Teachers, which was part of the first STEM Initiative.

Over 600 Georgia high schools were invited to nominate students for camp participation. The team selected 24 of the nominated students to attend the camp. 23 attended, representing 23 different schools. Forty three percent of camp participants represented ethnic minorities – 7 black of African American, 2 Asian, and 1 Hispanic or Latino. Participants were asked to rate their experiences at the end of the camp through a survey; twenty-three participants responded. Highlights of their responses include the following:

- 19/23 (83%) indicated moderate (4) or large (15) gains in their enthusiasm for STEM

- 19/23 indicated moderate (6) or large (13) gains in their desire to pursue a STEM degree in college
 - 16/23 (70%) reported that participating in the camp had changed their view of what it means to do math/science
2. Explain how your program has made progress toward Goal 2, **improving student success and completion rates**, by discussing how your program, a) **increased STEM majors**, b) **supported student retention and progression in STEM**, and c) **increased STEM degree completion**.
- a. **Increasing STEM majors.** The overall number of STEM majors enrolled in FY2014 reached 1501, an increase by 9.2% from FY2013 enrollments (1374) and up 22.7% since FY2010 (1223). The largest increases were in Biology (29 students, or 6%), Pre-engineering associates degree program (15 students, or 14%), and Computer Science / Information Technology (89 students, or 21%); enrollments in the Earth and Space Science program declined by 7 students (7%). Enrollments in Chemistry and Mathematics were virtually equal to the previous year's enrollments.
- b. **Supporting student retention and progression in STEM.** CSU supports student retention in introductory math/science courses through free tutoring services provided in the CSU Math & Science Learning Center (MSLC) and a supplemental peer instruction program.
- i. **Math & Science Learning Center.** Established as a part of the first STEM Initiative, the MSLC provides free tutoring in introductory math and science courses and offers a common location for students to meet in study groups. The effects of tutorial services have been documented and published (Ticknor, Cindy S., Kimberly A. Shaw, and Timothy Howard. "Assessing the Impact of Tutorial Services." *Journal of College Reading and Learning* 45.1 (2014): 52-66). In 2010-2011 the MSLC logged 2813 tutoring visits by an estimated 719 students. Incontrovertible evidence that MSLC services boost student success has been elusive, due to probable selection effects in our assessment data. Overall, MSLC visitors outperform non-visitors in terms of overall productive grade rates; this distinction is statistically significant at the $p < 0.05$ level, even when we account for differences in "ability level" as measured by standardized test scores. However, when we look only at courses tutored, we generally find that recipients of tutorial services had lower productive grade rates than the overall population in the tutored course. Tutored students tend to receive more D's and fewer A's and B's than the overall population in the tutored course. When we restrict our attention to black male students who sought tutoring, we find that they received B's and F's at lower rates than the overall black male population in those courses, but received C's and D's at higher rates. 76% of black male students who received tutoring for a course received a passing grade, while only 71% of the overall black male population in those courses received a passing grade in the same courses.
- Since FY2011, the MSLC has logged an average of 3034 tutoring visits per fiscal year, and has averaged approximately 752 unique students tutored per fiscal year.
- ii. **Peer Instruction Leader Project.** In-FY2014, adjustments were made to broaden the impact of the Peer Instruction Leader program by opening up help sessions to students enrolled in any sections of the served course, regardless of the instructor. (In FY2012 we used a matched-pair design to help gauge the

impact of the peer leaders, whereas in FY2013 we felt that it was important to provide the opportunity for help to more students). This year we offered the services of peer leaders to approximately 2,149 students enrolled in BIOL 1215, CHEM 1211, CHEM 1212, GEOL 1110, MATH 1111, and PHYS 2212. A preliminary analysis of the FY2012 data published in *Perspectives in Learning*¹ indicate a statistically significant difference in the course score for students who attended at least one session with a peer leader.

- c. **Increasing STEM degree completion.** The numbers of STEM bachelor's degrees awarded is up by 20% since FY2013 (which was 20% higher than 2012) and up by 34% since FY2011. Over this 3-year period, degree production has increased most notably in Computer and Information Science (by 27 degrees, or 113%) and Earth and Space Science (which graduated 8 students in FY2014 after graduating its first class of 11 in FY2013).

3. Explain how your program has made progress toward Goal 3, **improving the pre-service P-12 STEM teacher preparation and production.**

In FY2014, a total of ten students graduated from bachelor's degree programs in secondary education concentrations (2 biology, 2 chemistry, 2 earth and space science, and 4 mathematics). These numbers are aggregated with STEM degrees awarded since they are concentrations, and not stand-alone degrees. Students graduating with STEM majors in secondary education programs increased by 100% (up by 5) since FY2013 and by 233% since FY2011 (up from 3 degrees awarded). We anticipate continued increases in these numbers for several more years as students continue working their way through the UTeach Columbus pipeline. Our first 2 UTeach graduates received their degrees in spring 2014 – a year before we had planned on graduating the first group.

Overall, though, STEM education related degree production declined by 19 (38%) from FY2013 to FY2014 (from 50 to 31), following several significant jumps in graduate programs the previous year. The changes were as follows:

Increases			
	FY2013	FY2014	Change
Sci. & Secondary Ed. Bach. Progs.	3	6	+3
Math & Secondary Ed. Bach. Progs.	2	4	+2
Masters, Secondary Science Ed.	1	3	+2

Decreases			
	FY2013	FY2014	Change
Education Specialist, STEM related concentrations	10	3	-7
Master of Arts in Teaching, Mathematics	13	6	-7
Bachelor of Education, Middle Grades w/STEM conc.	10	4	-6
Master of Arts in Tchg, Science Education	7	3	-4
Master of Education, Middle Grades, w/STEM conc.	6	3	-3
Master of Education, Secondary Mathematics Education	3	1	-2

¹ Shaw, K. A., Ticknor, C., & Howard, T. (2013). The Effect of Peer Leader Instruction on Introductory University Science and Mathematics Course Performance: Preliminary Results. *Perspectives in Learning*, 20.

4. Discuss **other key successes** of your institution's STEM Initiative program.

STEM Honors Camp. The third STEM Honors Camp was held in June 2014, with 23 high school students attending. At the closing day of the camp, a survey was administered for the participants to assess their learning gains. All twenty three participants completed the survey. Key ratings include the following:

- i. 19 indicated moderate or large gains in their enthusiasm for STEM as a result of participation in the camp
- ii. 19 indicated moderate or large gains in their desire to take more classes in STEM
- iii. 19 indicated moderate or large gains in their desire to pursue a degree in STEM

Since the inception of STEM Honors Camp in 2012, three former camp participants enrolled at Columbus State University as full-time students majoring in STEM fields. One of them received a 2014 summer internship through our Robert Noyce Teacher Scholarship Program, through which she worked as a member of the 2014 STEM Honors Camp staff.

- C. *Program Challenges* – This section covers challenges that continue to face your institution's STEM Initiative program:

1. What challenges has your program encountered in **increasing the number of STEM majors**?

Challenges identified through conversations with STEM department heads and faculty members include the following:

- a. **Low mathematics placements:** About 78% of STEM majors who were first generation college students, females, or underrepresented minorities placed at or below College Algebra – at least one course before the minimum course accepted for credit in Area A
- b. Quality and availability of chemistry laboratory equipment
- c. Lack of diversity among enrolled students in some programs, particularly computer science and engineering (mostly males enrolled).

2. What challenges has your program encountered in **increasing STEM degree production**?

- a. **Low student retention rates.** Our Office of Institutional Research and Effectiveness analyzed student retention rates for a cohort of first time full time freshmen that began in fall 2012; the offices findings are summarized in the following table. While student retention rates are a concern, university wide, the indicated subgroups of STEM majors fare even worse.

	1-yr retention (2012-2013)		2-yr retention (2012-2014)	
	In STEM	At CSU	In STEM	At CSU
CSU FTFT Freshmen, overall	N/A	66%	N/A	54%
STEM majors who are also 1 st generation coll. Students	54%	60%	53%	60%
Female STEM majors	64%	69%	57%	61%
STEM majors from underrepresented groups ²	57%	61%	52%	55%

² Using National Science Foundation definition, which includes women, persons with disabilities, and three racial/ethnic groups—blacks, Hispanics, and American Indians.

- b. **Fixed mindsets.** In the terminology of Stanford University psychologist Carol Dweck, many of our students come to us with fixed mindsets and are not accustomed to being challenged, academically, which can cause them to doubt their suitability for a degree in a STEM discipline.
- c. **Student financial challenges.** Many students who attend CSU struggle to finance their education. Approximately 85% of fall 2012 CSU undergraduates were Georgia residents, many of whom rely on the HOPE Scholarship. An examination of CSU STEM students from 2010-2012 found very low HOPE eligibility rates among selected subgroups after one year of study, as indicated in the following table.

Subgroup of STEM Majors	HOPE eligible at end of first year
First generation college students	21%
Female students	27%
Students from UR groups	17%

3. Are there any **program-specific** (i.e. mini-grants, service learning opportunities) challenges that your program has encountered?
 - a. Peer Leader Program challenges
 - i. Recruiting peer leaders to support physics
 - ii. Development of a suitable training program for peer leaders
 - iii. Convincing faculty to use peer leaders to promote active, collaborative learning experiences
 - iv. Low attendance at peer-led supplemental help sessions
 - v. Availability of adequate funding to maintain suitable peer leader to student ratios in Principles of Biology and Principles of Chemistry
 - vi. Faculty buy-in in Chemistry
 - b. Faculty mini-grants
 - i. Lack of faculty time to engage in mini-grant projects
 - ii. Faculty interest/support for mini-grants
4. Are there any **other challenges** that your program has encountered that you have not described (i.e. departmental buy-in, personnel issues)

N/A

- D. Did you implement the STEM Initiative program at your institution **as described in your project proposal** for FY2014? Please describe any notable changes from the proposal that you made (additional project components, project deletions).

All of the components were implemented as proposed, though not on the scale originally envisioned due to budgetary constraints and lower-than-anticipated participation rates. Project additions include the establishment of the UTeach Columbus program and a Robert Noyce Teacher Scholarship program, and the creation of the STEM Honors Camp. The UTeach program entails a significant commitment of institutional resources to recruit and prepare more high school STEM teachers. The Noyce program entails a summer STEM Honors Camp for high

school students, summer internships for university freshmen and sophomores, and sizeable scholarships for juniors and seniors in STEM education programs to help with the recruitment of more high school STEM teachers.

II. Data Sheet Addendum

- A. If you reported **engineering majors** in FY2014 (Row 12), please identify relevant subfields (mechanical engineering, electrical engineering, engineering technology, etc.) and specify the number of majors in each.

Associate of Science in Engineering Studies (125 of them)

- B. If you reported majors in the field **“Other”** (Row 13), please identify those degree programs and specify the number of majors in each.

N/A

- C. If you reported **engineering degrees awarded** (Row 73), please identify the specific degrees (i.e. BS in mechanical engineering, BS in electrical engineering, etc.) and specify the number of awardees for each.

N/A

- D. If you reported **degrees in the category “Other”** (Row 74), please identify the specific degrees and specify the number of awardees for each.

N/A

- E. If you have any **additional notes** to offer relevant for the data sheet, please enter those here.

N/A

III. Programmatic Components

A. *Faculty Mini-grants*

1. Please provide a list of the mini-grants provided by your institution as part of its STEM Initiative for FY2014. You may use the following table or some alternate format, but please be sure to provide all of the information requested:

Project Title	Faculty Investigators	Award Amount	Brief Description (4-5 sentences)	Key Research/Pedagogical Outcomes
Glycolysis By Metacognition & Scientific Reflection	Monica Frazier	\$1,982	To improve learning in science, I propose to use a combination of metacognition and reflection alongside cutting edge lab activities to teach glycolysis in my BIOL 5515 Advanced Cell and Molecular Techniques course. Using these techniques, I expect students to see and improvement in their learning and understanding of the glycolytic pathway and the cutting edge technique of immunocytochemistry (ICC).	Five students completed the research and presented their findings at a poster session at Columbus State University's Tower Day on 4/15/2014.

2. State the **funding rate** for mini-grants at your institution (i.e. number of grants funded vs. total number of proposals received)? Discuss how proposals were **judged and awarded**.

Funding was available for projects with budgets in the \$1,000-2,500 range. Since we only received one proposal, the STEM Initiative Coordinator reviewed it to insure compatibility with program goals and then approved funding.

3. For any of the mini-grants listed, do you **have evaluation data or other evidence suggesting the efficacy of the projects**? Also, please discuss the broader impacts for these projects (i.e. changes to instructional approaches, changes to departmental policies, etc.).

We do not yet have the final outcomes of this project. We normally ask faculty investigators to present their findings at a seminar on the scholarship of STEM teaching and learning. This has not yet occurred.

B. Service Learning Opportunities (i.e. FOCUS-derived projects)

1. Briefly describe the **operation of your institution's service learning opportunity** or FOCUS-derived project for FY2014, including the following:

- a. Name of project(s) or other branding

Through UTeach Columbus we have two service learning courses, UTCH 1201 Step 1: Inquiry Approaches to Teaching and UTCH 1202 Step 2: Inquiry Based Lesson Design. Students enrolled in the Step 1 course are assigned (usually in pairs) to an elementary school class, where they observe at least two class meetings and lead three lessons. Step 2 functions in a similar manner, but placements are in middle schools.

Step 1 introduces the 5E (Engage, Explore, Explain, Elaborate, and Evaluate) lesson plan design. Students get an introduction to the theory and practice necessary to design and deliver excellent instruction in grades 3-12.

Step 2 builds on the knowledge and skills developed in Step 1, with an emphasis on the middle school environment and curricula.

- b. Key Partners for your Project (i.e. Departments/Schools at your institution, participating P-12 schools/school districts, area businesses, etc.)

College of Education and Health Professions
College of Letters and Sciences
Columbus Regional Mathematics Collaborative
CSU Coca Cola Space Science Center
CSU Math & Science Learning Center
CSU Math And Science Teaching (MAST) Council
CSU Student Advising and Field Experiences Office
Muscogee County School District
Oxbow Meadows Environmental Learning Center
UTeach Columbus

Companies that provided funding and/or programming for STEM Honors Camp:

- AFLAC
- AT&T
- Cott Beverages
- Don Jones Construction Company
- Geotechnical & Environmental Associates
- Golden's Foundry
- Path-Tec
- PES Structural Engineers
- Pratt & Whitney
- Society of American Military Engineers

- c. Data regarding participants (students taking part in project, number/classes of P-12 students engaged through project, number of teachers taking part, etc.)

- a. 54 university students took UTCH 1201 Step 1, through which approximately 81 lessons were taught in area elementary schools
- b. 34 university students took UTCH 1202, through which approximately 51 lessons were taught in area middle schools

d. Primary activities and their operation

University students learn the basics of inquiry based instruction and lesson design from master teachers. They work under the guidance of a master teacher to understand and practice three elementary school math/science lessons (UTCH 1201) or middle school lessons (UTCH 1202). They observe their assigned elementary/middle school classes on two separate occasions, and work in pairs to implement three prepared lessons in the school.

e. Any outcomes data demonstrating the project's efficacy or effectiveness.

The UTeach Columbus program is ahead of its targets for program enrollments and graduations. In fall 2013 the UTeach Institute program census identified 116 students enrolled, exceeding the target enrollment number of 80 by 45%.

C. Institution-Specific Projects

1. **Identify your institution-specific project(s)** outlined in your proposal for FY2014 (i.e. 4-Year Undergraduate Research Experience, Academy for Future Teachers, MESA, summer bridge programs, peer learning communities, STEM tutoring/learning centers, etc.). Discuss any specific branding.

Specific projects at CSU that were in the proposal include faculty mini-grants to support projects on the scholarship of teaching and learning STEM subjects, supplemental peer instruction, and a Project FOCUS replication. Our Project FOCUS replication was incorporated into the UTeach Columbus program's service learning courses, UTCH 1201 Step 1: Inquiry Approaches to Teaching and UTCH 1201 Step 2: Inquiry Based Lesson Design.

2. Provide data regarding the **level of participation** in each of these projects (i.e. number of faculty participants, number of student participants). Discuss their **scope** (i.e. oriented toward incoming freshmen, upperclassmen, STEM majors, education majors, all students, etc.)

Faculty mini-grants. One mini-grant was awarded in FY2014, directly involving 1 faculty member and 5 students.

Supplemental peer instruction. In FY2014, 15 unique faculty members and 17 different student assistants participated in the peer instruction leader project. Collectively, they served 2,110 students enrolled in introductory and learning support math and science courses.

Project FOCUS replication. 2 full-time master teachers and 1 part time assistant supervised 88 CSU students (freshman through senior class standings). The CSU students taught math and science lessons for hundreds of elementary and middle school students.

3. Discuss the **activities and operation** of your institution-specific project(s), including any efforts to connect multiple projects for synergistic impacts.

Tim Howard, Director of the Math and Science Learning Center (MSLC), coordinates STEM Initiative activities. The MAST Council, chaired by the MSLC director, is the hub around which all of the CSU STEM Initiative activities operate. The council serves as a steering committee and

as a vehicle for involving faculty from across the institution. This council created the nexus in which proposals for UTeach Columbus and the Robert Noyce Teacher Scholarship program were developed.

The first component of the CSU STEM Initiative is faculty mini-grants. Dr. Howard worked with MAST Council members to develop a call for proposals and a rubric for evaluating proposals. A sub-committee of the council was available to review proposals and advise Dr. Howard regarding the strengths and weaknesses of the proposed projects, and whether or not to fund them. However, since only one proposal was submitted (presenting no competition for available funds), Dr. Howard reviewed and approved the project without committee advisement.

A second component of the CSU STEM Initiative is a supplemental peer instruction program. Peer leaders are assigned to specific learning support and introductory STEM course sections. Courses are selected for support on the basis of high enrollments and/or high DFW rates. Peer leaders attend class lectures, meet regularly with the course instructor for planning and coordination, meet with fellow peer leaders and Dr. Howard for debriefing and training, and hold 2-3 hours of supplementary learning sessions each week for voluntary student attendance. Participating instructors have the prerogative to incentivize student attendance at the learning sessions through extra credit and/or the provision of additional study materials.

A third component of the CSU STEM Initiative is our Project FOCUS replication, implemented through the new UTeach Columbus program in UTCH 1201 Step 1 and UTCH 1202 Step 2. These are taught by master teachers with extensive K-12 teaching experience. Students in UTCH 1201/1202 meet with the master teacher, who introduces them to key aspects of engaging, effective instruction. Students in the class visit an assigned elementary/middle school a couple of times to get to know the teacher and kids. The university students practice and discuss pre-designed math and science lessons, and work in teams to present those lessons in their elementary/middle school class. CSU students who successfully complete the course get their tuition rebated.

Additional, Synergistic Effects.

- a. **Robert Noyce Teacher Scholarship Program.** Our Robert Noyce Teacher Scholarship program incorporates summer internships for CSU freshmen and sophomores whom we hope to interest in STEM teaching. Dr. Howard's involvement with both the Noyce program and the STEM Initiative has enabled some summer interns to become involved as peer leaders. MAST Council members have been active in pursuing several other STEM related grants.
- b. **Project Fusion.** In January 2014 several members of the MAST Council (Cindy Ticknor, Kimberly Shaw, and Tim Howard) submitted a proposal to the National Science Foundation's Improving Undergraduate STEM Education program for a project called Project Fusion. The project aimed to fuse several programs to improve student retention in STEM programs, including a summer bridge program, elements of Peer Led Team Learning and the Emerging Scholars Program, and existing recruitment and support programs (Robert Noyce Teacher Scholarship program and Peer Leader program).

Although the project did not receive funding, we did get a good deal of useful feedback and we are planning to submit a modified proposal in January 2015.

4. Provide any available **outcomes data demonstrating the efficacy or effectiveness of the project(s)**.

In a preliminary analysis of Peer Leader Program data (also cited in our FY2013 report), we have found some correlation between session attendance and end-of course points, as summarized in the following table³.

Mean Percent of End of Course Points Versus Session Attendance				
	Fall 2011	Spring 2012	Fall 2012	Overall
Never	70.1%	70.3%	70.2%	70.2%
Once	70.4%	68.3%	75.5%	72.0%
More than once	73.1%	77.9%	76.9%	75.9%

IV. Future Efforts

- A. Please discuss **dissemination efforts** for best practices or research findings identified through participation in the USG STEM Initiative.

Findings identified through this initiative have been disseminated through several outlets:

- a. *Related to STEM Initiative I*: Ticknor, Cindy S., Kimberly A. Shaw, and Timothy Howard. "Assessing the Impact of Tutorial Services." *Journal of College Reading and Learning* 45.1 (2014): 52-66.
- b. "Outgrowths of USG Stem Initiatives: Service Learning Courses And A Stem Honors Camp". Tim Howard, Kimberly Shaw, and Cindy Ticknor. Poster presentation at the 2014 Georgia Scholarship of STEM Teaching and Learning Conference, March 7.
- c. "STEM and Branches: Update on the Columbus State University STEM-II Initiative". Cindy Ticknor, Tim Howard, and Kimberly Shaw. Poster presentation at the 2013 Georgia Scholarship of STEM Teaching and Learning Conference, March 8.
- d. "The Effect of Peer Leader Instruction on Introductory University Science and Mathematics Course Performance: Preliminary Results". Kimberly Shaw, Cindy Ticknor, and Tim Howard. Refereed article published in *Perspectives in Learning*, 20. Spring 2013. See http://perspectives.columbusstate.edu/current_edition.php.

³ Shaw, K. A., Ticknor, C., & Howard, T. (2013). The Effect of Peer Leader Instruction on Introductory University Science and Mathematics Course Performance: Preliminary Results. *Perspectives in Learning*, 20.

We anticipate additional article submissions on our findings in the Peer Leader Program in national journals and presenting at the 2015 Georgia Scholarship of STEM Teaching and Learning Conference.

- B. Please identify any **external grants** (e.g. NSF, Department of Education, private/foundation) for which you have applied based on support received for the STEM Initiative. Indicate whether any applications have been successful.

Grants already awarded include:

- \$1.4 million Race to the Top Georgia grant to establish UTeach Columbus
- \$1.2 million National Science Foundation grant to establish a Robert Noyce Teacher Scholarship Program
- \$100,000 grant from AT&T awarded in August 2013 for the UTeach program and STEM Honors Camp (covers summer 2014 and summer 2015 camps)
- \$10,000 from Pratt and Whitney for the 2012 and 2013 STEM Honors Camps
- \$3,000 from the Society of American Military Engineers for the 2012 STEM Honors Camp
- \$2,000 from Don Jones Construction Company for the 2013 and 2014 STEM Honors Camps
- \$1,000 grant from Texas Instruments for the 2012 STEM Honors Camp
- \$1,000 from Cott Beverages for the 2012 and 2013 STEM Honors Camps
- \$1000 from Geotechnical and Environmental Consultants for the 2013 and 2014 STEM Honors Camp
- \$900 from Path-Tec for the 2013 and 2014 STEM Honors Camps

Grant applications not funded:

- \$1.1 million proposal to the National Science Foundation's Improving Undergraduate STEM Education Program submitted January 2014