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STEM and Branches: Update on the Columbus State University STEM-II Initiative

Cindy Ticknor  
*Columbus State University*

Tim Howard  
*Columbus State University*

Kimberly Shaw  
*Columbus State University*

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**Abstract:**
Two USG STEM Initiative awards to Columbus State University have spawned the growth of several STEM and STEM education programs and nearly $2.6 million in grants. We provide an update on STEM-II initiative projects including a peer leader program for core math and science courses, a faculty mini-grant program to promote scholarship on teaching and learning and awareness of best practices, and a service learning course. The infrastructure that emerged through the first STEM Initiative continued and developed with the STEM-II Initiative paved the way for a $1.4 million UTeach replication grant and a $1.2 million Robert Noyce Teacher Scholarship Program grant. We describe key developments in these two programs designed to recruit and prepare more STEM teachers.

**Faculty SoTL Mini-grants**

1. Development of Undergraduate Curriculum in the Area of Experimental Physical Chemistry, by Rajeev Dahle
   - Outcomes: New techniques available for use in courses; Article published
   - **Project**: Peer Instruction Project
   - **Challenges**: Help session attendance was low, but improved in later semesters; Matching peer leader schedules to students and courses
   - **Data Analysis**: Only used courses that had completed PIL session attendance records, and excluded all cases of academic withdrawal. Includes 1000 cases.
   - **Preliminary Results**: Those who attended PIL sessions earned significantly greater course grades (722 cases reported grades as points; t(722)=2.84, p<0.005). Overall, those who attended PIL sessions performed 5.7% higher on their end of course grades than those who did not, and 3.9% higher than those who attended only one session.
   - **Future Research Questions**: Does a Peer Instruction leader increase the odds of students seeking tutoring help? Can we control for student ability? Self-selection effects? How do PIL pre- and post-experience surveys correlate with help session attendance rates and with student performance?

2. Use of a Writing Consultant in a Science Course, by John Barone
   - **Outcome**: College of Letters and Sciences Faculty Fellow for Outstanding Teaching
   - **Program Benefits**: Development of new pedagogies, promoting faculty interest in SoTL
   - **Program Challenges**: Difficult to get faculty to apply for program

**Peer Instruction Project**

- **Project elements**: PIL attends all lectures, meets 4/semester with instructor; Help sessions available to all students enrolled w/instructor; Two weekly PIL support group meetings and guidance
- **Challenges**: Help session attendance was low, but improved in later semesters; Matching peer leader schedules to students and courses; Confused: Some Peer Instruction Leaders are also tutors
- **Data Analysis**: Only used courses that had completed PIL session attendance records, and excluded all cases of academic withdrawal. Includes 1000 cases.
- **Preliminary Results**: Those who attended PIL sessions earned significantly greater course grades (722 cases reported grades as points; t(722)=2.84, p<0.005). Overall, those who attended PIL sessions performed 5.7% higher on their end of course grades than those who did not, and 3.9% higher than those who attended only one session.
- **In comparison of course letter grades (N=1000), one-tailed t-test found significantly greater** (t(998)=5.68, p<0.001) with those who attended at least one PIL session earning a 2.21 grade point for the course, compared to a 1.75 grade point average among those who never attended a PIL session.
- **75%** of those students that attended a session earned an A, B, or C, compared to only 56% of those students that never attended a PIL session.

**Service Learning Course**

- **Developed course**: Inquiry Approaches to Teaching
  - **Design**: One credit hour
  - **Students observe twice in elementary classrooms**
  - **Student pairs teach three math/science lessons**
  - **Part of the UTeach Columbus program—reimbursed for tuition after course completion**

**Developing a STEM Teacher Recruitment Pipeline**

**UTeach Columbus**
Through a newly designed, streamlined curriculum and the support of highly experienced Master Teachers, university students prepare to teach secondary math and science via a model that has proven highly successful around the U.S. at recruiting teachers who stick with the profession and excel at inquiry-based instructional methods. This program has been made possible through Georgia’s Race to the Top funding, with a grant worth up to $1.4 million. CSU committed to substantial matching contributions in order to demonstrate support, and long-term planning for the sustainability of this program.

**CRAFT-STEM**
The Columbus Region Academy of Future Teachers of STEM is an NSF Robert Noyce Teacher Scholarship program funded with grant number 1136356. Program components include a STEM Honors Summer Camp engaging high school juniors and seniors in STEM research and activities, $4500 summer internships for CSU freshmen and sophomores, and scholarships worth $10,000–13,000. This five-year grant is worth approximately $1.2 million.

**MAYT = Math And Science Teachers Council**
A group of STEM and STEM education faculty, together with staff from CSU STEM outreach centers (Oxbow Meadows, Coca-Cola Space Science Center, Columbus Regional Math Collaborative) working to promote K-12 teacher preparation and improve university student learning. Formed in conjunction with the first STEM Initiative.

**Math & Science Learning Center**
A community resource dedicated to enhancing the learning of math and science through development, best-practices training for college faculty as well as in-service and pre-service K-12 teachers. The center also provides tutoring and tutor training. Established with STEM Initiative funding.