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

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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-grants program to promote scholarship on teaching and learning and awareness of best practices models, and a service learning course. The infrastructure that emerged through the first STEM Initiative and continued to develop 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 Dabke
   Outcomes: New techniques available for use in courses;
   .Article published
2. **Use of a Writing Consultant in a Science Course**, by John Barone
   Outcome: College of Letters and Sciences Faculty Fellow for Outstanding Teaching
3. **Evaluation of Two Peer-Assisted Learning Strategies in BIOL 2221** , by Kathleen Hughes
   Status*: Second year* of funding
4. **Methodology and/or Technology: Making a Difference in Improving Students' Problem Solving Skills**, by Zdeslav Hrepic
   Z.Hrepic, K.Lodder, and K.Shaw, "Pedagogy and/or Technology: Making difference in improving students' problem solving skills", peer reviewed, 2012 Physics Education Research Conference Proceedings, AIP Conference Proceedings #1513, Ed. Engelhardt, Churukian, and Rebello, p.182-5.

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 avail. 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
.Confound: some Peer Instruction Leaders are also tutors

Data Analysis – only used courses that had complete PIL session attendance records, and excluded all cases of academic withdrawl. Includes 1000 cases.
Fall 2011 — Principles of Biology, Principles of Physics, Introductory Statistics
Spring 2012 — Principles of Biology, Principles of Chemistry II, College Algebra
Fall 2012 — Principles of Biology, Principles of Chemistry I, Geology 1110 (Natural Disasters)

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.

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?

Service Learning Course

Employed two Master Teachers
Responsible for mentoring students, ensuring quality of lessons

Developed course: Inquiry Approaches to Teaching
Open to students in all majors
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

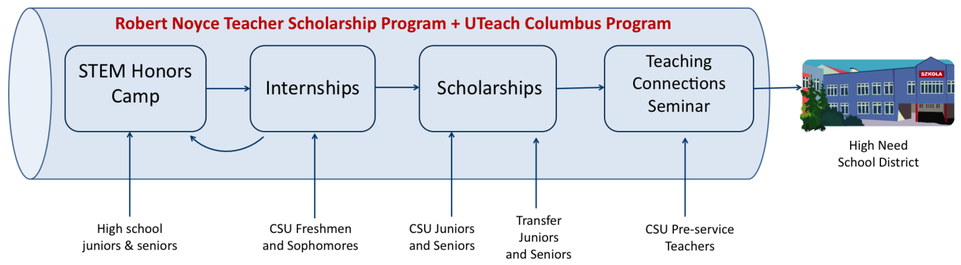
Second Course: Inquiry-Based Lesson Design
One credit hour
Students observe twice in middle school classrooms
Student pairs teach three math/science lessons
Part of the UTeach Columbus program – reimbursed for tuition after course completion.

	Inquiry Approaches to Teaching	Inquiry Based Lesson Design
Spring 2012	32	N/A
Fall 2012	32	10
Spring 2013	35	16

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.



MAST = 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.

See our presentation on Friday