

STEM Initiatives at OU

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Building and Diversifying Pathways to STEM Education

- Inspire, excite, and educate K12 students on STEM professions
- Graduate K12 teachers with strong fundamentals in STEM fields
- Offer professional development workshops for math and science teachers
- STEM is not only for the gifted students, it is for everyone

Examples of Current K12 Outreach at OU

- Summer Camps by Precollegiate Programs
 - STEM to Store Academy
- Other Outreach Efforts
 - Hosting K12 Schools (National Weather Center)
 - Outreach from Engineering Practice Facility
 - Students Chat with Competition Teams
 - Engage in Educational Projects led by Engineering Students
- Concurrent Enrollment

OU Outreach Precollegiate



Summer Academic Camp Opportunities

- Architecture Summer Academy
- Aviation Summer Academy
- Chemistry Summer Academy
- CSI: Forensic Science
- Engineering Summer Academy
- ExxonMobil Bernard Harris Summer Science Camp
- Horizons Unlimited
- Meteorology Summer Academy
- Mini College
- Oklahoma Mesonet Weather Camp



Department of Chemistry and Biochemistry

"STEM to Store Academy" Summer 2013



- The Academy is a one-week residential program for exceptional students entering their junior and senior years of high school in Oklahoma.
- Program funded by a \$20,000 grant from the Oklahoma State Regents for Higher Education, renewable for 3 years.
- Diverse applicant pool of 130 qualified students from across the State, 16 counties, 66 zip codes
- 30 were selected, no more than 2 from each H.S.
- Administrative assistance from College of Continuing Education and Pre-Collegiate Programs

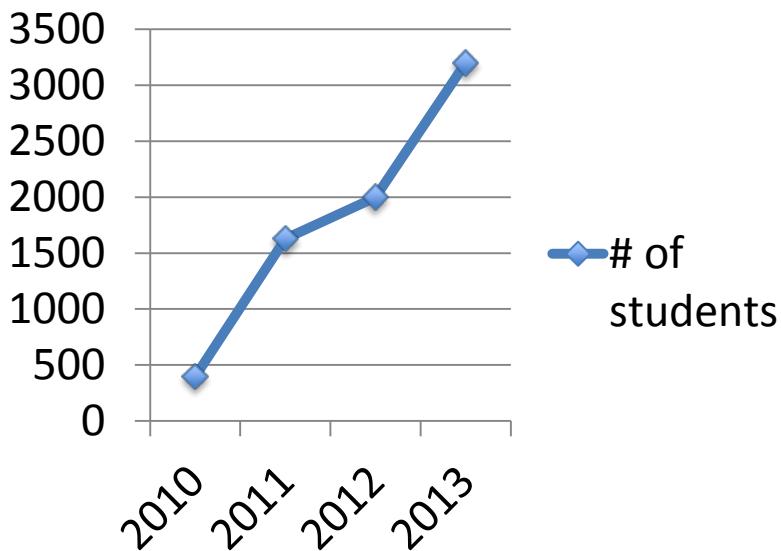
Contact Prof. Charles Rice (rice@ou.edu) 325-5831
for more information

- Academy students study the chemistry and history of natural products and herbal medicines, specifically *Echinacea*.
- Exposure to Chemistry, Botany, Mathematics, Medicine, History, Sociology and Native American Studies.
- Students use traditional scientific methods and social science methodology to maximize impact across disciplines.
- 7 OU Faculty Members from OU Chemistry and Biochemistry lectured and mentored.



Engineering K-12 Outreach from REPF

- Hands-on activities for groups of K-12 students to excite them about the engineering professions.
 - School group visits from schools in Oklahoma, Missouri, Kansas, and Texas
 - High School Open House
 - Summer Camps
- Our K-12 visits have increased rapidly in the past 4 years
- In 2013, our school group visits consisted of:
 - 70 visits from 47 different schools
 - 3,200 K-12 students



Engineering Students Leading Outreach

- Diverse group of students (SEED Scholars) who are selected to lead the hands-on engineering activities.
 - Trained by CoE staff
 - Lead activities that teach the engineering design process
 - Problem, Brainstorm, Design, Build, Test, Rebuild and Retest when needed.
 - Gain public speaking experience, working with children, giving back to the community.
 - Role models to younger students.



Current and Future CE Initiatives

Increased communication with high school students about Concurrent Enrollment opportunities at OU

New Website: ou.edu/ce

- There is now an assigned representative in each area that is involved in the CE process at OU (RS, UCOLL, Admissions and Parking) to provide individualized support to help students transition from high school to college course
- Simplified application process
- Discounted cost for seniors
 - approx. \$80 per credit hour for high school seniors (cost table online)

Featured Courses on www.ou.edu/ce

- 5-15 OU courses will be featured each semester on ou.edu/ce based on:
 - Curriculum (including unique course like Intro to Computer Programming)
 - Schedule (does the class time work with high school students' schedules?)
 - Professor engagement with students
- Janux courses give students who don't live nearby options to take CE at OU and still interact with other students/professor
- HS University Centers – Enid HS, NN and NH plans

Bridging the Gap to Help Students Succeed at OU

- Developmental Math
- Summer Bridge Program for Engineering Students

Developmental Mathematics (DMAT) Program

- Redesigned in 2011
- Active Learning with MyMathLab
- Success Rates exceed 70%
- Students must take a DMAT course every semester until completing the two-semester sequence.
- University College Gateway-DMAT classes
- Consortium with Redlands CC



AT&T Summer Bridge Program is a four-week long, residential camp for incoming freshmen students who have been accepted to OU and are planning to major in engineering. This annual program is intended to encourage diversity within the College of Engineering, helping students connect with engineering students, faculty and staff, acclimate to the college and prepare academically for engineering and math coursework.

First Cohort in 2007

6-year grad. rate in engineering: 56%
6-year grad. rate for engineering: 37%
(approx)

2012 Cohort: One-year retention rate:
75% - eng., 82% OU



 Diversity and Inclusion Program
College of Engineering

 at&t
Summer Bridge Program



Transform STEM Education at OU

- Improve the first two years of STEM education
 - Make first-year STEM courses more engaging
 - Encourage communication across STEM disciplines
- Promote adoption of evidence-based teaching practices
 - Active learning, flipped classroom techniques
- Incentivize and reward faculty adopting innovative and effective instructional strategies
- Engage high-performing students with research

The **K20 Center's** Virtual Learning Experiences (VLE) development team, in collaboration with OU faculty, is creating game-based learning experiences to be used in undergraduate courses at The University of Oklahoma.

CALCULUS

The purpose of this program is to support the teaching of undergraduate calculus to college freshmen and sophomores.

For the pilot version of the VLE we chose to focus on the topic of Optimization. This topic was chosen because it incorporates a range of calculus concepts, has practical application, and is a difficult concept for students to master.

Figure 2-Calculus game, perspective view

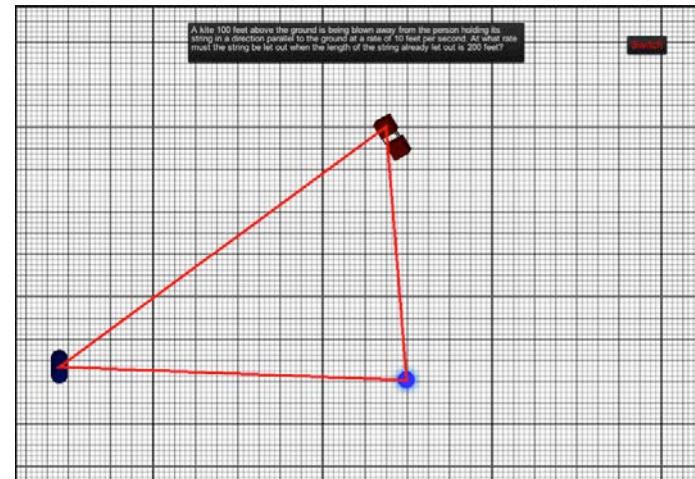
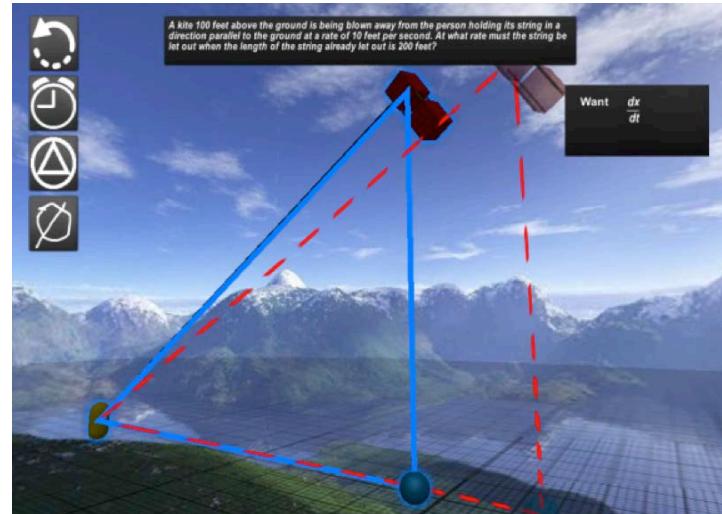


Figure 3-Calculus game, orthographic view

BIOL 1114/1121 redesign

- BIOL 1114 Introductory Biology and BIOL 1121 Introductory Biology Lab are separate courses serving approx. 1400 students each year
- General education natural science (and lab)
- Prerequisite for health and exercise science and science education majors. Also needed for pre-allied health students (e.g., nursing, physical therapy) and can be substituted for a course in the biology major intro. sequence.

- Course Innovation Program grant to integrate these courses (BIOL 1115) and introduce active learning and inquiry
- Replacing “canned” labs with “authentic” learning labs (real data & presentations)
- Active learning approaches
- Hybrid exercises

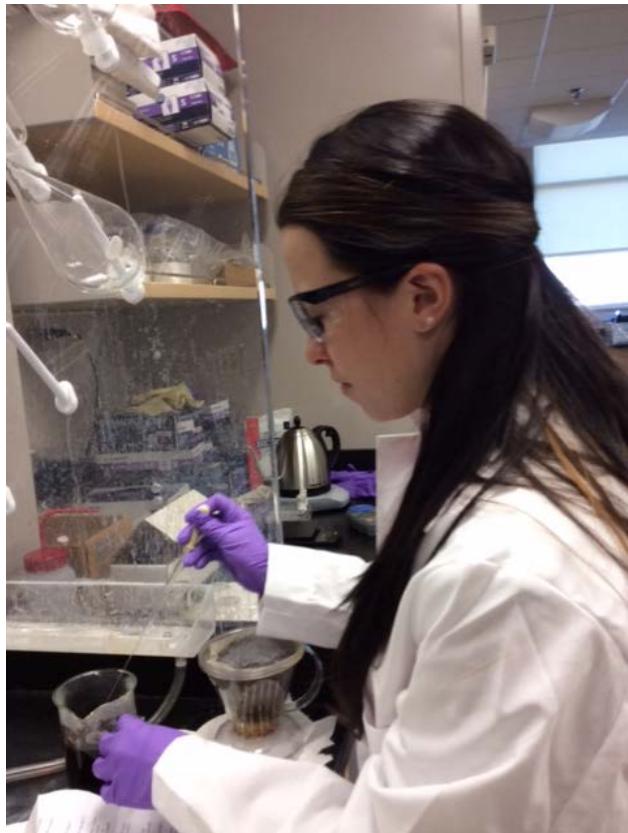


Biology Cornerstone

- Pilot project: biology majors doing scientific inquiry in a 2000-level course
- Each section based on research in a faculty member's area of expertise
- Shared instructional goals across all sections – emphasis on competencies (e.g., hypothesis generation, experimental design, troubleshooting, written and oral presentation)
- Assess success in meeting instructional objectives, with comparison to existing courses
- Fall 2014:
 - Sexual selection in guppies (Ingo Schlupp)
 - Evolution of mitochondria energy systems (Rich Broughton)
- Spring (or summer) 2015:
 - Forensic entomology (Heather Ketchum)
 - Genetics of zebra fish development (David McCauley)
 - Biology of land snails (Liz Bergey)



ChemBiochem Honors Research Program



□ Early Engagement in UG Research

- First Year Research Experience (FYRE) with Honors College (32 students in 2014 with 13 faculty) (Anthony Burgett)
- Undergraduate Research with presentations at Science Café Norman Public Library (Susan Schroeder)

Other colleges created similar programs such as Honors Engineering Research Experience (H.E.R.E) – not just for first year but for all engineering students