



# Preparing Future STEM Faculty at the University of Missouri-Columbia:

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MU's Historic Columns on Francis Quadrangle and the major administrative building, Jesse Hall

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## Abstract

The University of Missouri-Columbia has a number of opportunities for developing future faculty in the area of teaching, including the Graduate Teaching Minor, the Preparing Future Faculty Program, and the Wakonse Conference on College Teaching. Most of these activities are university-wide and involve all graduate school disciplines. Other opportunities, including an informal Conversations about College Science Teaching, and a course entitled "College Science Teaching," were designed specifically for graduate students in the sciences. In addition to these opportunities, many STEM departments offer training to graduate teaching assistants.



Wakonse Conference on College Teaching

## Conversations about College Science Teaching

**Goals:**  
• To provide a forum for faculty and graduate students in the sciences to discuss issues of teaching and learn new instructional strategies

**Activities:**  
• Biweekly luncheon conversation series led by science and education faculty on campus. Includes pizza, presentation, and discussion. Jointly sponsored by the MU Southwestern Bell Science Education Center and the division of Biological Sciences

### Notes:

• Winter 2003 Conversations:

- February 13, 2003 – Changing your Teaching  
• Presented by Mark Volkmann, Science Education

- March 13, 2003 – Guiding Principles for Effective Lectures  
• Presented by Sandra Abell, Science Education, and Dave Emrich (Kemper Awardee), Biochemistry

- April 10, 2003 – Student Engagement in Learning  
• Presented by John Adams (Kemper Awardee), Chemistry

- April 24, 2003 – Creating the Active Learning Lecture  
• Presented by Mark Ryan (Kemper Awardee), Fisheries and Wildlife

- May 8, 2003 – Getting Engaged – Teaching and Learning in the Large Lecture  
• Presented by James Spain (Kemper Awardee), Animal Science

• Fall 2003 Conversations:

- September 18, 2003 – The Benefits of Using WebCT in College Science Teaching  
• Presented by Allison Wiedemeier, Biological Sciences, and Sheri Freyermuth, Biochemistry

- October 2, 2003 – One Model of Converting Cookbook Labs to Inquiry  
• Presented by Jan Weaver, Honors College

- October 16, 2003 – College Students' Science Ideas: Common Misconceptions  
• Presented by Sandra Abell, Science Education

- October 30, 2003 – Getting at What Students Think: Constructing a Good Question  
• Presented by Jan Weaver, Honors College

- November 20, 2003 – Using Action Research to Diagnose Student Ideas About Molecular Genetics  
• Presented by Bethany Stone, Biological Sciences, and Pat Friedrichsen, Biology Education

## Graduate Courses on Teaching at MU

**Goals:**  
• To provide graduate students with useful resources to better their teaching skills

### Sample Courses:

- College Teaching
- College Teaching of Agriculture
- Graduate Teaching Scholars Seminar
- The Community College
- Instructional Strategies for Higher and Continuing Education
- Preparing to be a Graduate Teaching Assistant
- Professional Ethics in Higher Education
- Seminar in Higher and Continuing Education: The Professoriate - Faculty Roles and Work in Academic Environments
- Teaching and Learning Across Cultures
- Teaching with Instructional Technology

### Notes:

- Classes are offered in both semesters and provide specialized honing of teaching skills in a particular area
- Classes fulfill requirements to earn a graduate minor in teaching

## Conclusions

Professional teaching development opportunities for students, new faculty, and current faculty exist in large numbers at the University of Missouri-Columbia. Preparatory coursework offered thru the Graduate Teaching Minor and discipline-specific courses aid students in their quest to become college teachers. Specialized programs such as the Preparing Future Faculty and Program for Excellence in Teaching offer additional preparation to future college teachers. Wakonse conferences, Conversations on College Teaching, and seminars continue advancement of education for all levels of college teachers. The availability of STEM training options across the University of Missouri-Columbia encourages knowledgeable and dedicated college teachers.

## Goals:

- To increase MU graduate student readiness to assume faculty roles within a wide range of academic and professional contexts
- To help graduate students better understand the diversity of expectations and functional realities that exist at different higher education institutions
- To facilitate the placement of graduates by developing wider institutional and personal linkages and mentoring relationships
- To further enhance the graduate student experience at MU by making graduate study even more responsive to and reflective of student, disciplinary and professional needs

## Activities:

- Preparing Future Faculty (PFF) Seminar
  - Seminar Participation
  - Individual Contracts
  - Academic Portfolio
  - Multi-campus Experience
- Certificate
- PFF Brown-Bag Seminar Series

## Notes:

- 2003-2004 Fellows are 15 graduate students, including 2 in Biological Sciences, 2 in Mathematics, and 1 in Engineering

## Graduate Minor in Teaching



## Goals:

- To encourage career preparation as faculty in higher education
- To provide a foundation upon which to build college teaching skills
- To provide inexperienced as well as experienced teachers the benefit of instructional expertise and mentoring of faculty within his/her own discipline
- To give the opportunity to experiment with new teaching techniques or program ideas in an environment where they can consult with others

## Activities:

- Degree Requirements:
  - 12 credit hours beyond major program
  - 6 hours of core coursework, including Seminar in Higher Education and College Science Teaching
  - 3-6 hours Teaching Practicum
  - 3 hours electives
- Available to all doctoral students at the University of Missouri-Columbia
- Applications submitted to and approved by chair of Teaching Minor Committee
- To apply, students must complete an application form, include letters from advisors and departmental chair, and include statement of teaching philosophy and career goals

## Notes:

- Core courses include:
  - EL 408 - Seminar in Higher and Continuing Education: The Professoriate -- Faculty Roles and Work in Academic Environments
  - EL 448 - College Teaching
  - OR
  - EL 408 - Graduate Teaching Scholars Seminar or equivalent
  - OR
  - T427/B10427 - College Science Teaching
- The Teaching Practicum is not an independent teaching experience, rather it is one provides feedback and supervision by a faculty member who oversees a "guided teaching/learning experience."
- Practica are designed to give the student actual teaching experience and developmental feedback. Students should be involved in course planning and implementation as well as assessment.
- Based on their observations, supervisors/observers should provide written and verbal feedback to the practicum student on
  - Mastery of course content
  - Communication skills
  - Enthusiasm
  - Clarity of instruction
  - Organization
  - Selection of course/lesson content
  - Appropriateness of objectives
  - Appropriateness of materials
  - Application of methodology
  - Commitment to teaching and concern for student learning
  - Student achievement based on assessment performance
- Practicum students should write a reflective analysis of the observations
- A Capstone Practice Portfolio completes the experience

## Goals:

- To identify faculty and future faculty on campus known for good teaching or those wanting to improve their teaching
- To form a more supportive campus climate for those concerned with teaching
- To create a collaborative exchange of talent, ideas, and resources within and among participating institutions
- To increase concern for the general issues of the academy
- To renew interest, support, and understanding for what it means to be a college teacher
- To help better teaching

## Activities:

- Week-long Wakonse Conferences
  - May 2002 Wakonse Conference on College Teaching
  - August 2003 High School & College Collaborative Conference on Teaching

## Notes:

- "Wakonse" is a word from the Lakota Indian language and means "to teach, to inspire." The Wakonse conferences bring together people who find inspiring and influencing others is what they do for a living
- Wakonse encourages choosing a diverse team - different as to disciplines, ages, stages of careers, ethnicity, gender, etc
- Talents and concerns of the Wakonse participants drive conference activities
- Wakonse makes everyone a participant, presenter, master teacher, reactant, writer, consultant, discussion leader, musician, photographer, entertainer, role model
- In the end, Wakonse makes teaching the focus of the program. Explore it, model it, practice it, critique it, promote it, refine it, love it!

## College Science Teaching Bio Sci 427/Educ T427 University of Missouri-Columbia

## Goals:

- This course is designed for graduate students and advanced undergraduates in the sciences, and graduate students in science education, who are interested in improving their science teaching and/or are interested in pursuing careers in college science teaching. The central core question is "How do college students best learn science and thus how do we best teach them?"

## Expected Outcomes:

- Have a deeper understanding of what it means to learn science
- Know how to set goals for student learning
- Understand the essential features of inquiry-based science instruction
- Develop a repertoire of interactive teaching strategies for addressing science learning goals in different contexts: lectures, discussions, laboratories

## Activities:

- Interview Project
  - Three interviewing two adult learners about their understanding of concepts basic to your field, you will begin to understand some of the challenges that could face you as a college science instructor
- Mini-internship:
  - Matched with a professor on campus who is recognized for his/her science teaching, you will observe instruction and interview the professor. A brief summary and analysis is required
- Curriculum Development Project:
  - Using what you learned in your interview and synthesizing course readings and class sessions, you will craft part of a college science course includes learning goals, teaching strategies, and assessments. You will present your product at a poster session at the end of the course
- Teaching Philosophy Statement:
  - As you begin the job search process, you will likely be asked to include a teaching statement in your application. This assignment will ask you to prepare such a statement

## Texts:

- Committee on Undergraduate Science Education. (1997). *Science Teaching Reconsidered: A Handbook*. Washington, DC: National Academy Press. (Also available online at <http://www.nao.edu/csa/catalog/2327.html>)
- National Science Teachers Association (NSTA). (2001). *Practicing science: The investigative approach in college science teaching*. Arlington, VA: NSTA Press.
- National Science Teachers Association (NSTA). (2002). *Innovative techniques for large-group instruction*. Arlington, VA: NSTA Press.
- Beyond Bio 101: The transformation of undergraduate biology education. Available: <http://www.him.com/beyondbio101/>
- How People Learn: Brain, Mind, Experience, and School. Available: <http://books.nap.edu/books/0309070369/html/index.html>
- Inquiry and the National Science Education Standards. Available: <http://books.nap.edu/books/0309064767/html/index.html>



Wakonse conferences, held at Camp Minwanca on the shores of Lake Michigan, provides students with an opportunity to meet and talk about teaching.



Students participate in an entertaining discussion during the May 2003 Wakonse conference