University Collaboration to Prepare Excellent STEM Teachers

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Wilson Center Conference, Washington, DC

May 6, 2008

Teachers for a New Era at Michigan State University

- All-university initiative, organized around four core subjects in K-12 schools
- Teams bring together faculty from Education and Arts & Sciences
- TNE Principles
  - Use of evidence
  - Joint work of Education and A&S
  - Strengthening field experience, extending to first years on the job

Improving the Quality of STEM Teacher Preparation

- Improving STEM learning requires increasing teacher quality, as well as quantity
- Start with agreement on what teachers need to know
  - Emphasize increased understanding
  - Requirements depend on teaching level (elementary v secondary)
- Rethinking core subject matter courses

Using Evidence to Guide Program Revision

- Collaboration with MSU NSF Math-Science Partnership to connect pupil learning to preparation program
  - Cross-program differences at topic level
  - Teachers from many programs wish for stronger preparation in some topics
- Information used in program review
- Challenges using state assessment data

Changes in STEM courses: Science

- TNE Science Team – focus on model-based reasoning
- Revise pedagogy in large introductory biology course
- NSF support for new assessments needed to measure revised goals for student learning
- Extending to other introductory classes
- Changing education classes in light of better understanding

Changes in STEM courses: Mathematics

- TNE Mathematics Team
  - New course in data representation and interpretation for elementary teachers
  - Studying the development of the mathematical knowledge – elementary
  - Capstone course for secondary
- NSF-funded development of assessment for mathematical knowledge for teaching algebra

Producing Excellent STEM Teachers: Opportunities and Challenges

- Deepening the discussion of teachers' content preparation:
  - What content is important for teachers?
  - What connection to K-12 curriculum and to standard university content majors?
- Gathering usable evidence
  - Of teachers' knowledge and skills
  - Of teacher contributions to pupil learning

Producing Excellent STEM Teachers: Opportunities and Challenges

- Learning from international comparisons
- Fostering and learning from innovative approaches
  - To increasing the quantity of STEM teachers
  - To increasing the quality of STEM teachers
  - To gathering and using evidence about STEM teaching and learning