Creating a Coherent STEM Gateway at Michigan State University

A project funded by the AAU STEM Education Initiative Project

“The first two years of college are the most critical to the retention and recruitment of STEM majors”

- President's Council of Advisors on Science and Technology (PCAST, 2012)
**Change model:** build faculty consensus around the aims and rewards of reform through:

1. Developing a shared vision for gateway curriculum reform
2. Developing policies and structures to support and reward reform
A shared vision for curriculum reform:

Engage faculty in focused, facilitated conversations to build consensus on key issues.

- What are the core ideas in the discipline?
- What scientific practices are important? (e.g. developing models, arguments and explanations)
- What teaching methods will most effectively help students master these ideas and practices?
- How can we best assess student learning of these ideas and practices?

Implement this consensus to reform gateway STEM courses across campus.
Structures to reward and support reform

- STEM gateway fellows
  - For faculty who excel in STEM gateway courses (modeled on the prestigious MSU Lilly Fellowships)
- STEM alliance
  - An institution-wide alliance of all entities involved in STEM education (colleges, research centers etc.), to facilitate communication and coordinate activities
- DBER postdoctoral fellows to assist faculty in implementing reform efforts
This Fall

- Base-line data collection on
  - Faculty practices, Student demographics, Course artifacts (exams, activities etc.)
  - Goal: to develop a description of what is happening now in gateway courses
- Course reform pilots in chemistry and biology
- Faculty conversations in chemistry, biology, and physics
This Fall: continued

- Development of assessment rubrics for
  - Course examinations and activities
    - Do exams contain a core idea, a practice? What is the cognitive level? What information can the instructor and student learn from the student response?
  - Classroom practices
    - What practices are faculty using? What is the level of engagement? What kinds of activities are occurring? What is the level of practice development? What kinds of questions are being asked and answered?
Spring

- Recruitment of STEM Gateway Fellows
- Continue collecting baseline data (bio, chem, phys)
- Test and validate rubrics (do they assess what we want to measure?)
- Develop workshop and activities for STEM Gateway fellows
Anticipated Changes

- Reformed STEM gateway courses – that address core ideas and practices of the discipline.
- Reformed teaching practices (emerge as a consequence of changes in expectations)
- Cultural change emerges from shared vision