The Facts

• $3.4 billion spent annually by the federal government on STEM education and training

• Only one-fifth goes for sub-bachelor’s degree level training
More Facts... The STEM Pipeline is Leaking!

A Leaking STEM Pipeline

2001
4.01 million 9th Graders

2005
2.8 million High School Graduates

Fall 2005
1.9 million College Plans

Fall 2005
Only 1.3 million College Ready

2009-2011
278,000 Majoring in STEM

167,000 STEM Graduates

www.businessandeducation.org
What is being done to fix the STEM Pipeline?
Catalyze widespread adoption of empirically validated teaching practices including the establishment of discipline-focused programs funded by disciplinary societies to train current and future faculty in evidence-based teaching practices.
Questions

• What are you expecting STEM majors to learn?

• How do you document student learning?
Curriculum Map

- A visual representation of a curriculum
- Used to identify gaps and redundancies
- Analysis of map leads to program improvement

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<td>Identify and apply the methods and process of life science.</td>
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<td>Demonstrate proficiency in quantitative reasoning as it relates to life science data.</td>
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<td>Demonstrate an understanding of evolution.</td>
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<td>Demonstrate an understanding of the relationship between structure and function.</td>
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<td>Demonstrate an understanding of genetics.</td>
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<td>6</td>
<td>Demonstrate an understanding of the pathways of energy and matter that maintain a particular environment in living systems.</td>
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<td>Demonstrate an understanding of the levels of biological organization and the interactions among these levels.</td>
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<td>PLO 1 Sci. process</td>
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Answer the following questions:
1. **What changes should be made to the overall degree program?**
2. **What changes do you think should be made to the courses in the program?**
3. **What’s the next step if you want to measure student learning?**
Questions

• What are ways to assess student learning?

• What are some of the disadvantages of these assessment techniques?
Validated Tools - Concept Inventories

- Biology Concept Inventories: Overview, Status and Next Steps

- **Genetics Concept Assessment** (GCA) (25 MC items, diagrams)

- **Introductory Molecular and Cell Biology Assessment** (IMCA) (24 MC items, diagrams)

- **Physics**: Force Concept Inventory (FCI) instrument is designed to assess student understanding of the most basic concepts in Newtonian physics. This forced-choice instrument has 30 questions and looks at six areas of understanding

- **Math**: Calculus Concept Inventory
Rubrics

• **Engineering**: Gateway Coalition Freshman Design Project Faculty Team

Rubrics beyond the disciplines

• **Intellectual and Practical Skills; Personal and Social Responsibility, Integrative and Applied Learning**: AAC&U Value rubrics

Valid Assessment of Learning in Undergraduate Education
Rubrics- Examining Departmental Change

- Vision and Change Rubrics 1.0 [http://www.pulsecommunity.org/]
- Examine the success of life sciences departments to implement the recommendations of the Vision and Change report

Partnership for Undergraduate Life Science Education
Professional Societies- American Society for Microbiology

Two Programs

1- Science Teaching Fellow Program

Training for graduate students, post-docs and early career Ph.D.s in course design, assessment, student-centered learning and developing a teaching philosophy and writing a teaching philosophy statement.
Professional Societies: American Society for Microbiology

2- Biology Scholars Program

ASM's Biology Scholars Program

Apply for 1 of 3 pre-ASMCUE training institutes!

LEARN HOW TO:
- measure student learning outcomes
- conduct evidence-based education research
- publish research on teaching and learning

Application Deadline: February 1, 2016

www.biologyscholars.org
Resources

- ASM Curriculum Guidelines
- Vision and Change: A Call to Action
- Understanding By Design (Wiggins and McTighe)
- Creating Significant Learning Experiences (Fink)