Barriers & Opportunities

Curriculum

Professional Development
What are the barriers and opportunities to the development and implementation of pathways between K12 and college?
Barriers to the development and implementation of pathways between K-12 and college

• The information-focused nature of thinking about what defines a discipline

• The ability of students to understand:
  • What’s possible in and after college
  • What’s reasonable in and after college
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• The inability of many colleges and universities to articulate the ways in which students can craft a valuable and, ultimately, useful college experience
Opportunities for the development and implementation of pathways between K-12 and college

• Through new accountability initiatives, teachers are now incentivized to take advantage of professional development opportunities and college/university partnerships

• Colleges, universities and departments are highly motivated to attract students in a world that is increasingly fragmented when it comes to higher education

• Social media and technologies have enormous potential in their ability to reach and connect with students
Pathways: K-12 to College

Why Science Majors Change Their Minds (It’s Just So Darn Hard) (NY Times, Nov 2011)

• Goal to increase the number of students in the STEM pipeline
• Increased interest in STEM majors at K-12
• But 40% of STEM students switch majors
• Lower grades in STEM subjects
• Theory over application
(Less) Popular Science
The three largest fields in science have lost ground in recent decades.

GENDER GAP While women lag in engineering and computer science, they dominate in biology, where pay is lower. Salaries start at $40,000 to $50,000, compared with $55,000 to $65,000 for the other fields.

Number of women for every 10 graduates, 2009-10:

- 1.7 engineers
- 5.8 biologists
- 1.8 computer scientists
Development of pathways between K12 and college

• Barriers
  – Few opportunities for K12 and college teachers to interact
  – Lack of time
  – Lines of communication are lacking
  – Many districts, few colleges

• Opportunities
  – State/NSTA/NABT science teaching conferences
  – Citizen science projects
What are the barriers and opportunities to the development and implementation of pathways between K12 and college?
What curriculum already works and what changes are needed?
Curriculum

Do they know I don’t want to be a biologist??

There is SO much to memorize!

The teacher just talks and talks....
Curriculum

Maybe if we learned one thing properly?

Maybe if you taught us something important?
Curriculum

$$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$$
What works?

Advanced Technological Education

Summer Academic Enrichment Programs

Authentic Science Curriculum
Advanced Technological Education

- Creates clear links from HS to college to the workforce
- Focused on problem and project-based learning
- Real world problems addressed through the creative use of technology
Summer Academic Enrichment Programs

• Provides students with a college-level academic experience
• Learn from more than 15 faculty and 5 college student staff
• Come to understand what it means to ask questions about the environment from a myriad of perspectives
• Attracts students who already are interested and gives them a deep and meaningful experience
Authentic Science Curriculum
What curriculum already works and what changes are needed?
What types of teacher and faculty professional development are needed?
Professional Development needed

• Taught by college faculty or mixed with classroom teachers

• Authentic scientific opportunities for teachers
  – relevant to HS classrooms
  – Inquiry based
Teacher Professional Development

- Focus on authentic science problems
- Model scientific and environmental inquiry
- Make explicit links among high school, college and careers
- Involve college students as role models for both teachers and students
Faculty Professional Development

• Support the disciplinary and subject-specific adaptation of resources, technology and opportunities

• Help faculty better understand today’s HS students, teachers

• Involve teachers as co-participants, presenters or partners

• Develop, articulate and employ models of student recruitment and preparation
Professional Development

What research says about quality PD

• Coherence
• Focus on content knowledge
• Active learning
• Sufficient duration
• Collective participation
What types of teacher and faculty professional development are needed?
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Professional Development