Beginning-Student Socialization with STEM Experiences

Science, Technology, Engineering, and Math (STEM) Student Interest Groups (SSIGs)

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I want to be an engineer
What am I doing here?
What does this have to do with being an engineer?

\[ i\hbar \frac{\partial}{\partial t} \Psi = \hat{H} \Psi \]
I want to be a geologist
What am I doing here?
What does this have to do with being a geologist?
I want to be a doctor
What am I doing here?
What does this have to do with being a doctor?

\[ \frac{d}{dx} \int_a^x f(t) \, dt = f(x) \]

The First Law of Thermodynamics

\[ \Delta U = Q - W = Q - P^* \Delta V \]

- \( \Delta U \) = internal energy change
- \( Q \) = heat flow
- \( W \) = macroscopic work
- \( P^* \) = constant pressure
- \( \Delta V \) = volume change
Issue 1

• Lacking explicit connections, not all students are motivated to succeed in gateway courses outside of their major field.
I like science...but I can’t understand this stuff
What does it mean to...

...think like a scientist

...solve problems scientifically

...think about thinking

Am I learning?
How can I learn better?
Issue 2

• Even capable students struggle with complex thinking and problem solving
What is going on in there?
Issue 3

- Students don’t get involved with their major departments as early as they should
SSIGs as a Solution

STEM Major

Gateway Courses

STEM Student Success

Learning to Learn
Making Connections Between STEM Gateway Courses and Majors

Gateway course: Chemistry

Engineering: Designing safe mines to reduce arsenic exposure

Biology: Toxic effects of arsenic

Earth and planetary sciences: Natural sources of arsenic.
Developing Learning-to-Learn Habits of Mind

Soloman/Felder’s Inventory of Learning Styles

- Active Learners vs. Reflective Learners
- Global Learners vs. Sequential Learners
- Visual Learners vs. Verbal Learners
- Sensing Learners vs. Intuitive Learners

Metacognition

Thinking about my thinking

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Engaging in the Major Department

- Exploring Research Opportunities
- Degree Planning
Engaging in the Major Department

Building relationships with other students and faculty in the major

Lab Tours
Student responses to: As a result of taking this course, my appreciation of science and math courses required outside my major department can best be described as...
Student Quote About Connections Between Gateway Courses and Major

“The instructor had a holistic approach and was very versatile- by this I mean we could focus on chemistry in biology in interesting applications, but we also discussed increasing learning proficiency, graduate school, and research opportunities.”
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Problem Solving Ability

- Number of students
- Greatly increased
- Somewhat increased
- About the same
- Somewhat decreased
- Greatly decreased

Students responses to: As a result of taking this course, my ability to analyze and solve a problem can best be described as...
Student Quote about Developing a Learning-to-Learn Habit of Mind

“We went over the blooms taxonomy pyramid and while doing the reading I was immediately reminded of my college career. The apply section is like going from lecture to lab. I would love to get myself to the create section. I hope that I can get there and perhaps publish my research.”
Three Key Issues

1. Lacking explicit connections, not all students are motivated to succeed in gateway courses outside of their major field.
2. Even capable students struggle with complex thinking and problem solving.
3. Students don’t get involved with their major departments as early as they should.
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SSIGs are having a positive impact but are not attracting sufficient student participation.

Therefore, STEM Gateway project leadership is exploring expanded formats beyond the current SSIGs in order to meet the three objectives.

Including potential partnerships with:
• University College learning communities and other general education initiatives
• Student Services organizations
• Academic departments
What Else Can We Do That Connects to The Three Issues?

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