Drafting a Blueprint for Educating Tomorrow's Engineers Today

engineers
TOMORROW

Student Success

- Students develop deep learning and understanding of engineering concepts
  - Develop command of tradition engineering education outcomes
- Students see engineering as relevant to their lives and understand its impact on society
  - Traditionally underrepresented students engaged in engineering
  - Students view engineering as a way to help others and solve problems with both local and global implications
- Students use knowledge innovatively
  - Students' approach to problem-solving changes; students ask different questions in their approach to problem-solving
- Students' performance on MCAS and other standardized testing improves
  - Achievement gap on standardized testing closes
- More students express interest in engineering as career
  - More students choose STEM high schools, continue STEM courses

Research Design

Hypothesis: The use of narrative engages students' imaginations, improves student engagement in engineering, and increases student understanding of engineering concepts.

- Narrative and imaginative approach will result in better understanding on the part of learners
  - Deep learning of engineering concepts in context
  - Engineering as pedagogy to prepare students for a knowledge economy
    - Students use knowledge innovatively, see and conceptualize engineering problems and contexts in new ways
    - Students use learning to advance toward problem solutions that cannot be solved by routine or already learned procedures
  - New knowledge about how students learn engineering is generated
- Requirements of planning instruction using a narrative and imaginative model will help teachers increase their subject matter knowledge and design more effective learning environments

Challenges

- Elevation of engineering in middle school curriculum - "engineering across the curriculum"
  - Embedded, integrated approach to engineering education; student exposure increased
- Establishment of vibrant, meaningful professional learning community for K-12 teachers
- Implementation of research design in both formal and informal educational settings
- Identification and analysis of barriers to institutional change at K-12 level
- Strengthening of academic partnerships between IHE and local K-12 districts
  - Increase number of IHE STEM faculty working with K-12 teachers & collaborating on STEM projects
- Creation of sustainable and replicable model for engineering education that can be scaled to any district, grade level, or demographic
  - Elevate work of Partnership beyond local level

Partner Roles

- IHE STEM faculty teach teachers how to apply educational theory and learning sciences in classroom
  - Provide meaningful professional development and mentoring in engineering for K-12 teachers based on educational theory and research in the learning sciences
  - Develop educational tools to fully integrate engineering across middle school curriculum
  - Develop interactive, engaging, and technologically relevant platform "Talk to Me"
- K-12 districts implement highly innovative, cutting edge engineering educational approach
  - Focus on emphasis, elevation, and reframing of engineering education in middle school curriculum
- Evaluator designs data collection on student learners, teachers' knowledge and conceptions of engineering, and K-12 outcomes for both students & teachers
  - Evaluation of institutional barriers to change and curriculum reform; efficacy of Partnership

A Partnership Between the Springfield, MA Public Schools, Springfield Technical Community College, and Smith College

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