

Model, Meet Classroom. Classroom, Meet Model. Introducing Models to the Classroom Using Technology

Presented by Stephen Thomas
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1425 Biomedical Physical Sciences Building

Abstract: As discussed in previous sessions of the STEM Teaching Essentials, modeling is a powerful way to engage students in an authentic exercise that encourages critical thinking of course content. Whether it is through sketches, concept maps, equations, simulations, or 3D visualizations student outcomes can be improved. However, even though a teacher's spirit may be willing to adopt these strategies, the professor's time-crunched flesh is weak. In this STEM Teaching Essentials workshop we will showcase various modeling technologies that can have your students simulating, drawing, and/or coding in no time. In addition, we will provide you with strategies for introducing modeling technology into your classroom, for assessing student performance on those exercises, and for meeting accessibility requirements. Bring your laptop, and be prepared to try a few technologies and build a new modeling exercise for your classroom.

Biography: Stephen Thomas is the Associate Director for the Center for Integrative Studies in General Science and the Digital Curriculum Coordinator for the College of Natural Science. In his teaching capacity, Stephen strives to integrate technology in ways that improve student understanding of course concepts and connection among students and between students and their instructor. He was funded by the Bill and Melinda Gates Foundation to create and run one of MSU's first massive open online courses (MOOCs) and has won three AT&T Awards at MSU for Best Online Course. His research and curriculum development work examines visual communication of science, which blends his interests in biology and art. Current projects focus on novice/expert drawings of the greenhouse effect, the development of a rubric for evaluating the efficacy of visuals, and Instruct 2020, a system for open source iterative design of visuals.

ACCESS:

Notes

- What is a model? A **model** is a representation of reality and can serve as a bridge to map theory onto the natural world
 - o Visual models
 - o Simulation
 - o Animation
 - o Physical models
 - o Mathematical/statistical models
- Importance of models (Dauer and Long 2015, Blumschein *et al.* 2009, Jonassen *et al.* 2005, Gobert and Pallant 2004), community driven (Vision and Change, NGSS, DBER Report)
- Applying model thinking and clickers

- 1) Have students write their own models
- 2) Have students compare their models
- 3) Have students analyze a new model (a more correct model) in a new setting, using clicker questions to evaluate their answer
- CMAP tools (free download)
 - Allows students to make concept maps
 - Can click on each bubble, and attach resources (students can find evidence for each part of their model and attach it)
- Google slides for facilitation
 - In general, can have 50 people modifying the document at the same time
- NetLogo, simulation software
 - Comes with a whole set of models already built into it
- TextExpander2
 - D2L, pre-populate sentences to send to your students as feedback
- Excel and R
 - Use Google to find simulations online you can incorporate into Excel and R (ex) predatory-prey dynamics
- Model-based activities (construction, use, evaluation, and revision) (Schwartz *et al.* 2009)
- D2L Discussion Forums
- Pick your flavor
- D2L rubrics (built in)
- Be Socratic
 - Means of stepping students through material where they can provide information and obtain immediate feedback (a formative tool, usually)
- What barriers are there for students in modeling and using technology to model?
 - Instructions
 - Motivation
 - Poor room set-up
 - Technical issues
 - Computer issues
 - Cost
 - Fear/anxiety
- Augmented reality
- Accessibility
 - Sight, hearing, cognitive, psychological, disability, etc.
- Drawing-to-learn component
 - Affect, visual literacy, model-based reasoning