

## Fund for Innovative Teaching Grant, 2016

### FINAL REPORT

Authors: Mary Gene Saudelli, PhD & Robin Kleiv, PhD

Title of Project: Technologically enhanced experiential learning in physics: an action research study using PhET computer simulations

#### Summary of the Learning Activities Planned & Undertaken

This FIT funded, Scholarship of Teaching and Learning project was an exploration of change to teaching practice of a course, PHYS 105, involved the integration simulation based computer learning opportunities into teaching practice. Thus the project represents both a change to teaching practice and a scholarly study of the change to teaching practice through a participatory action research study methodology.

Several learning activities were involved, not just for the principle researchers, but also for the research assistants hired to assist with the project.

- a. An study of the course to explore where and how PhET simulations could be involved
- b. Completion of informal researcher training in qualitative, action research methodology
- c. Robin and research assistants completed CORE 2 Tutorial from Canada Tri Council
- d. Research Ethics Clearance
- e. Recruitment of student participation in surveys
- f. Completion of faculty debriefing pre study, during study, and post study
- g. Reflection journals of faculty member
- h. Data collection and analysis
- i. Presentation at STLHE conference
- j. Development of 3 manuscripts for publication (almost complete) listing all researchers as authors including research assistants
- k. Future activity: attending to peer review feedback in the publication process

#### Identify Individuals Involved in the Delivery Project Activities & Outcomes

Drs. Saudelli and Kleiv led the project activities and outcomes. Three research assistants were hired and involved: Jessica Davies, Martin Jungmark and Rebecca Robertson. Initially, Jessica Davies and Martin Jungmark were the research assistants hired. Just after data collection completed, it became clear that we needed another research assistant to assist with the data analysis and Rebecca Robertson was hired.

Intended outcomes of the project:

1. Investigate the applications of PhET (Physics Education Technology) computer simulations to the design of physics instruction.
2. Explore the integration of PhET simulations before, during and after class time.
3. Illuminate the impact of PhET simulations in fostering an active, engaged learning experience for students in a physics class.
4. Strengthen students' understanding of physics concepts through experiential, inquiry-based and reflective learning via the use of simulations.
5. Provide experiential learning opportunities for one or more undergraduate research assistants
6. Participate in Interdisciplinary research (Education and Physics).

Degree to which the Significant Goals and/or Objectives of the Proposal were Achieved

All significant goals and objectives were achieved. Not only did a faculty member engage in a SoTL project, but so did 3 undergraduate research assistants. This project at first anticipated 1 manuscript for publication, however, we have 3 manuscripts. They are entitled:

- a. PhET Simulations in Undergraduate Physics: Constructivist Learning Theory in Practice. Mary Gene Saudelli, Robin Kleiv, Jessica Davies, Martin Kurt Jungmark, Rebecca Robertson, To be submitted this month to Canadian Journal of Higher Education
- b. The Road to Pedagogical Change: An Action Research Study on PhETs in Undergraduate Physics. Robin Kleiv, Mary Gene Saudelli, Martin Kurt Jungmark, Rebecca Robertson, Jessica Davies. To be submitted to Canadian Journal of Action Research or Educational Action Research hopefully by the end of October
- c. Engagement Using PhET Simulations in Undergraduate Physics Pedagogy, PhETs, Physics: Engagement for the Experience. Mary Gene Saudelli, Robin Kleiv, Rebecca Robertson, Jessica Davies, Martin Kurt Jungmark. To be submitted to Journal of Technology, Pedagogy and Education hopefully by the end of November.