Project Name

Development of an Interactive Case Study Capability

Principal Investigator Christopher Urban

Campus SUNY Polytechnic Institute

Year of Project 2012

Tier Tier Two

Project Team

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Overview Summary

Development of case study modules that simulate real-world situations and place the student in a decision-making role that requires the use of scientific data and knowledge. The prototype will facilitate learning theories and concepts related to energy and engineering related to a regional power grid.

Outcomes Summary

Developed a Community "Smart Grid" exercise to simulate various environmental conditions impacting the power grid.

Project Abstract

INSTRUCTIONAL TECHNOLOGY INNOVATION: Place student in decision-maker role by simulating real world situations using computer-based, interactive case studies.

BACKGROUND & SIGNIFICANCE: Instruction in math, science, and engineering areas often suffer from a lack of realistic applications for students learning key concepts or being motivated to learn more across

disciplines. To remedy this there have been efforts to create and archive case studies, as with the National Center for Case Study Teaching in Science at the University at Buffalo. Although case studies provided by such institutions are quite helpful, the approach usually is limited to non-interactive case studies that lack realistic experience for students. All the technology parts of (1) extensive databases, (2) computational resources, (3) graphical interfaces and (4) display capabilities are now available to create truly realistic computer-based interactive case studies. These parts just need to be creatively combined, which can be realized in the Learning Object Repository of the SUNY Learning Commons, which will empower SUNY colleagues to replicate and build upon this innovation. The capability can be modified to fit most grade levels.

PROPOSED INITIAL CASE STUDY: The student will 1) construct a virtual city, 2) decide how much electrical power is required for one day in the virtual city taking weather into account, 3) calculate amount of power required from a conventional power plant to 'balance' the student's forecast of power from alternative energy sources. A limited form of this decision-maker method was used in SUNYIT Alternative Energy courses and SummerITeens. The two key educational objectives to increase student 1) engagement and 2) learning were largely accomplished. The first objective increased the motivation to learn more about the subject because the student was able to apply the concepts. The second objective was accomplished because the interactive software gave students the capability to creatively examine and learn about more complex relationships.

MAJOR INNOVATION ADVANTAGES: The interdisciplinary and technical approach is dynamic, so the framework of the interactive case study can be modified easily for diverse educational levels, subject matter and objectives. For example, the same basic case study could readily be modified by the instructor. One configuration could address basic subject matter concepts, theory and mathematical calculations, while another configuration addresses decision-making strategies based upon the student's understanding of the content. The system will be able to utilize both historical and live (real-time) data as students test their decision making abilities. The expectation is this model could be modified and used in nearly every discipline. The broader vision is to extend the interactive case study capability to online courses.

COLLABORATION: of SUNYIT Computer Information Sciences and Electrical Engineering Technology with Sun Dog Science, LLC of Raleigh, North Carolina to develop modules to enhance existing, rudimentary, interactive case study software that will be shared via SUNY Learning Commons and CIT. Separate modules will be created to guide and allow students to:
(1) learn physical theories and concepts that govern environmental factors which influence energy consumption and engineering factors that impact building construction and power grid operation decisions
(2) apply learned energy physics, mechanical and electrical engineering concepts to evaluate electrical load requirements, formulate building and electrical grid decisions, then build a virtual city and electrical grid structure that meets load requirements
(3) evaluate real environmental factors on operation of a regional electrical grid tied with alternative energy
(4) formulate scientific and electrical grid management decisions based on realistic electrical load generation capabilities given real environmental data decisions in a realistic setting.

PHASE I PROJECT OBJECTIVES/ MILESTONES:
(I) Create an easy to use interactive case study that would help a student learn scientific theory and concepts of energy and engineering. Student would use that knowledge to analyze, assess and integrate environmental, social, engineering, computer science and energy concepts to make simulated realistic realtime
decisions concerning design and operation of a regional electrical grid. (see task 1 & 2)
(II) Create tools to assess educational value of method and investigate pedagogical strategies that would allow for most effective use of interactive case study approach for various instructional elements, e.g. teaching basic concepts, decision-making strategies, and testing of student learning objectives. (see task 4)
(III) Make case study software adaptable so other campus faculty can use it and/or create their own interactive case studies. (see task 2 & 3)
(IV) Make case studies available to others in SUNY system on a virtual network, e.g. SUNY Learning Commons. (see task 3)

TASKS: Phase 1 would be accomplished in four tasks during the 2012-2013 school year:
Task 1) create framework for interactive case study modules,
Task 2) develop software needed to implement modules,
Tasks 3) make modules available online for use within SUNYIT and SUNY wide
Task 4) create assessment tools needed to evaluate effectiveness of using interactive case study method, use online availability (created in Task 2) to allow limited assessment of innovation during Spring 2013 and present assessment results at 2013 CIT.

PHASE 2: If awarded, the interactive case study capability would be expanded to encompass decision making in other content areas, e.g. finance and global warming. The alternative energy case study would be further evaluated in the SUNYIT Alternative Energy class and revised as needed. The software system innovations would be ported to a SUNY wide system with access made to the entire SUNY community.

Reports and Resources

- Project website
- Presentation given at the 2013 CIT workshop on the interactive cases study project

Discipline Specific Pedagogy

- STEM

Instructional Design

- Gamification (Design)
- Online Education