Project Name

Developing a Technology Platform to Support Blended-Online Learning

Principal Investigator Douglas Summerville

Campus Binghamton University

Year of Project 2013

Tier Tier Two

Project Team

- Kyle Temkin, Binghamton University

Overview Summary

Development of several new prototype technologies which further the goals of blended-online education, including a system that allows the question generation and grading features of online questioning systems to be used in an offline lecture environment.

Outcomes Summary

Outcomes TBD

Project Abstract

As the technologies that power computer-enhanced education grow and mature, educational models are emerging which allow blended-online courses to provide benefits not feasible in traditional learning environments. Many blended models offer significant demonstrated increases in student engagement [1]—particularly in models centered around student-teacher interaction, such as the “flipped classroom” [2], and models centered around interactive engagement techniques [3].

The Electrical and Computer Engineering Department of Binghamton University has recently and successfully

piloted two blended-online courses, and has developed several new prototype technologies designed to enhance the blended-online model. These technologies (as summarized below) have been successfully tested over multiple iterations of our courses, and are believed to significantly increase student learning gains, but are currently specific to our program, and require educators with specialized technical knowledge.

To bring the benefits of these technologies to other educators, we propose a project whose goals are:
1. To generalize our existing technologies so they can be easily used in any educational discipline at any institution; and so their use will not require any specialized workflow or specialized technical knowledg
2. To create documentation, training, and support materials which will allow other educators to understand and use our tools; and which are prime for use by SUNY initiatives such as the SUNY Learning Network;
3. To evaluate the effectiveness of the developed tools via a series of case studies, which will expose otherwise unaffiliated instructors to our tools; and
4. To foster a partnership with the existing open-source educational community, facilitating the ongoing development and maintenance of such tools.

The project will focus on the generalization, evaluation, and documentation of the following three blended-online learning technologies:
• Student-customized, computer-graded online assessments.
Interactivity is one of the key assets of blended-online models. Many Virtual Learning Environments (VLEs) provide systems which allow students to undergo interactive online assessments and receive near-instant feedback— allowing each student to assess his or her own strengths. As feedback is provided rapidly, students are more likely to continue learning after an incorrect answer, rather than finishing a human-graded problem set while they still have misconceptions. A common obstacle that hinders the development of effective online problem sets is a lack of flexibility in VLE question engines. Blackboard, as an example, allows very little randomization of online questions which do not have a numeric answer. Our existing technology significantly extends the question engine for the Moodle VLE, allowing educators to craft sophisticated randomizable computer-gradable questions not normally possible within a general-purpose questioning system. The existing prototypal form of this question system requires knowledge of a basic scripting language to leverage its full functionality; this project aims to replace this scripting interface with an easy-to-use graphical user interface, which will be accessible to educators in all disciplines.
• Student-customized, computer-graded paper assessments.
Our extensions to the Moodle question engine also allow the computer grading, randomization, and student-customization features of the Moodle VLE to be used for assessment in an offline setting. These extensions are intended for situations where computer use isn't possible— such as in classes too large to use a computer lab— or in situations where the instructor wants to prohibit internet access— such as during an exam. Our prototypal extensions support fully-automated generation and computer grading of multiplechoice paper assessments; and computer-assisted grading of other question forms, but require use of the specific technologies already used by our university, including a specific line of "bubble sheet" answer forms and several pieces specialized of software. This project aims to generalize these technologies such that the same functionality can be achieved using only a standard printer and scanner.
• Rapid in-class marking of offline work.
Student-instructor interaction is central to most blended-online models, including the "flipped classroom" model, and is a potent educational tool. To this end, many of our classroom and lab activities involve a student completing an offline task, and articulating his or her solution to the instructor; this model allows the student to receive help, feedback, and guidance while requiring each student to engage the solution. To facilitate these kinds of interactions, we've developed a set of software that allows instructors to very rapidly mark in-class work. In a computer lab, marking such a demonstration question "complete" is as simple as pointing an instructor's smartphone at a QR code displayed on a student's screen; in a traditional lecture environment, handheld barcode readers can be used to check off students by scanning ID cards. Either form of entry is well-integrated with Moodle; grading is handled automatically by extensions to the Moodle software. In its prototypal form, our software requires that barcode data be captured in a particular format, and is designed to work with the data provided on a Binghamton University ID card. This project aims to generalize this technology so it can work with a variety of data capture devices and ID card formats.

[1] R. Schwartzman and H. V. Tuttle, “What can online course components teach about improving instruction and learning,” Journal of Instructional Psychology, vol. 29, no. 3, pp. 179–188, 2002.
[2] M. A. Nolan and S. S. Washington, “Flipped out: Successful strategies for improving student engagement,” 2012.
[3] R. R. Hake, “Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses,” American journal of Physics, vol. 66, p. 64, 1998.

Reports and Resources

- Mid project report

Assessment, Understanding, Monitoring Student Progress

- Outcomes Assessment

Faculty Development

- Faculty Digital Literacy

Instructional Design

- Hybrid/Flipped/Blended Learning