Evaluation of SimNet Simulation Software in Large-enrollment Courses

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Abstract: A course at the University of Hawaii that has been redesigned to account for issues in cost savings, large-enrollment and quality of instruction is Information and Computer Sciences 101. This course has suffered from many of the issues that exist in large-enrollment courses like the inability to account for different student learning styles, inadequate student interaction with learning materials, and inconsistent learning experiences. Even though the course has been redesigned, nothing has been done to determine if computer-simulated learning software, SimNet, is an effective means of delivering course content. The investigators compared pre and post-test scores, collected student surveys, and interviewed teaching assistants to determine the effectiveness of this means of content delivery. The investigators found that the students' scores improved by an average of 26.07% for Microsoft Word, 38.29% for Microsoft PowerPoint, and 26.59% for Microsoft Excel. The investigators found that this computer-simulated learning software is a worthwhile investment, but should be investigated further.

Introduction

A major problem in higher education is the rising costs of education (Twigg, 1999). According to Twigg (1999), many higher educational institutions are striving to improve educational outcomes with less funding due to increasing enrollments in higher education and decreasing revenue growth. Therefore, many large-enrollment courses exist to ensure that a cost-savings is achieved. Administrators of higher educational institutions would like to lower the costs of these large-enrollment courses as long as the quality of instruction is not lowered (Twigg, 1999).

The University of Hawaii at Manoa has many large enrollment courses. One course that has been recently redesigned for improved learning outcomes and cost-savings is Information and Computer Sciences (hereby referred to as ICS) 101. This course has

suffered from many of the issues that exist in large-enrollment courses like the inability to account for different student learning styles, inadequate student interaction with learning materials, and inconsistent learning experiences (Twigg, 1999).

Problem Statement

Even though ICS 101 has been redesigned, little has been done to determine the effectiveness of the redesign. Determining the effectiveness of the redesign is a very large task and is not the focus of this evaluation. Therefore, the focus of this evaluation is to determine if SimNet, a computer-aided simulation program, as a mode of delivery is and effective way of instructing learners of basic computing skills in a large-enrollment course.

Large-Enrollment Courses

Rising costs in higher education is causing educational institutions improve educational outcomes with less funding (Twigg, 1999). Many colleges are posed with the problem of improving educational outcomes with less funding because there are increasing enrollments and decreasing revenue growth. One issue that is prevalent in large-enrollment courses is the lack of student interaction.

Another issue that exists in large enrollment courses is the lack of interaction between the students and instructor (Terman, 1978). Students infrequently have the opportunity to interact with the instructor or teaching assistants when enrolled in large enrollment courses because many large enrollment courses do not have the funding required to hire a large amount of assistants to aid with instruction. Many students also rarely interact with the instructor in a traditional large-enrollment lecture because they lack the self assurance (Marbach-Ad & Sokolove, 2002). Marbach-Ad and Sokolove (2002) state that students in large enrollment courses need to feel secure prior to participating.

Another issue that is persistent in large-enrollment courses is inconsistent learning experiences (Twigg, 1999). Inconsistent learning experiences causes many other course instructors on campus to not know exactly what students are learning, which causes much review and a lost of instructional time. The ICS 101 course at the University of Hawaii at Manoa has attempted to account for these different issues with the course, but would like to determine the effectiveness of the changes that have been made.

Information and Computer Science 101 at the University of Hawaii at Manoa

The University of Hawaii at Manoa has many large-enrollment courses to account for the demand to lower costs. One course that is classified as large-enrollment is ICS 101. Approximately 500-600 students enroll in ICS 101 each semester. ICS 101 is taught by one instructor, one course coordinator, 12 undergraduate teaching assistants, and 3 on-line learning assistants.

Course Redesign of ICS 101

The ICS 101 course has been redesigned through an Information Technology Services grant to improve student learning outcomes and decrease costs. The course content has been shifted from a traditional course delivery to a new model utilizing both podcasting and simulation technologies.

The podcasting technology is used to deliver course lectures as opposed to a traditional lecture in an auditorium. Podcasting is audio files that are available for download to pocket memory audio drives (Ferguson, 2005). The iPod is being used as the medium through which students are listening to and learning the course material. By using the iPod, the students enrolled in ICS 101 will have the lecture available to them and will be able to learn by listening to the lectures when and where they want as opposed to listening to a lecture delivered in an auditorium.

SimNet, a simulation software, has been be used for half of the teaching and learning in the lab portion of the course. SimNet was integrated into the course to teach the students how to perform different tasks in Microsoft Office. The SimNet simulation allows students to interact and engage actively with the course content to provide them with virtual experiences (Waks, 2001). The SimNet simulation software gives students personalized feedback, which helps to account for some of the lack of interaction in the course. The teaching assistants were available to the students if they needed help with the simulation. The teaching assistants also taught the students how to apply what they have learned to every day life once a week to ensure students receive real-world experience as opposed to only virtual simulations (Waks, 2001). This ensures that the instruction is in-line with a progressive style of teaching (Dewey, 1998).

Evaluation of ICS 101

Even though much has been done to improve the ICS 101 course for students, little has been done to evaluate the effectiveness of computer-simulated learning, the new mode of lab content delivery. Since the purpose of this evaluation is to determine the effectiveness of computer-simulated learning as a mode of delivery, the following research questions are posed:

1. How much do students improve in test scores from pre-test to post-test using computer-simulated learning?
2. How do students feel about computer-simulated learning as a mode of lab content delivery?

Methodology

Student Scores from SimNet. During the fall 2005 semester, the ICS 101 students were required to complete a pre-test in SimNet for each of the three Microsoft Office programs that are taught in ICS 101. Following the pre-test, the ICS 101 students completed a computer-simulated lesson to learn the objectives required for successful completion of the course. After completing the simulation, the ICS 101 students were required to complete a post-test to determine how much they improved after completing each simulation.

Data Collected Through Surveys. At the end of the semester, a course survey was distributed for the students to complete. No questions were specifically asked about the use of SimNet. However, one survey item on the course evaluation form was left open-ended for the students to complete. The open-ended survey item was, "Other comments". Through this survey item, many students expressed their comments and concerns about the simulation software.

Group Interview of ICS 101 Teaching Assistants: On-line Discussion Forum. The researchers used an on-line discussion forum to have three teaching assistants discuss and describe their thoughts about the delivery of lab content for the course. The researcher decided to gather data from the teaching assistants because they all had experience with the course, prior to becoming a teaching assistant, and with the current structure of the course. This will assist the researchers in determining effective the simulation software is toward student learning.

Results

Three pre-tests and three post-tests were given to the students to determine the effectiveness of the simulation software. The summarized results can be found in Table 1. A pre-test and post-test were each given for Microsoft Word, PowerPoint, and Excel. For the Microsoft Word Pre-test the ICS 101 students scored an average of 33.68%. For the Microsoft Word Post-test, the students scored an average of 59.75%. For the Microsoft PowerPoint pre-test, the students scored an average of 27.29%. For the Microsoft PowerPoint post-test, the students scored an average of 65.58%. For the Microsoft Excel Pre-test, the students scored an average of 20.34%. For the Microsoft Excel Post-test, the students scored an average of 46.93%. The students' scores improved by an average of 26.07% for Microsoft Word, 38.29% for Microsoft PowerPoint, and 26.59% for Microsoft Excel on the different SimNet tests.

Table 1. Summarized pre and post-test scores in SimNet.

	Average Pre-test Scores	Average Post-test Scores	Improvement from Pre to Post-test
Microsoft Word	33.68%	59.75%	26.07%
Microsoft PowerPoint	27.29%	65.58%	38.29%
Microsoft Excel	20.34%	46.93%	26.59%

Through the course survey, several themes emerged from the data. The first theme that emerged from the data was the idea that the consistency of lab content delivery was good. Many of the students felt that their learning experiences were very similar to those of students in other laboratory sections as their core instruction was delivered via the software simulation.

Another theme that emerged from the data was the idea that students could go back and review content that they learned in the lab from the simulations. Many of the students' opinion was that they had a central repository of information from which they could go back to review material that they had learned in lab as opposed to having to email their teaching assistant for clarification.

The final theme that emerged from the data was that the students' opinion was that the individual feedback that they received from the simulation software was helpful. Many of the students' perception was that they were able to receive immediate feedback from the software as opposed to waiting for a teaching assistant to assist the student with the issue that arose.

After discussing the simulation software with the ICS 101 teaching assistants, several themes emerged. The first theme that emerged was the idea that students receive individual and timely feedback. Rather than having to wait for a teaching assistant to offer help, the students were able to receive immediate assistance from the software. However, there were times that the students were not sure how to use the software itself; in which case, the teaching assistant instructed the student in software use.

Another theme that existed in the data was the idea that many 'bugs' existed in the software. In some cases, students were not able to complete their simulations because the software froze or did not send the data to the WebCT server. However, these bugs were minimal and the teaching assistants' opinion was that the benefits outweighed the detriments of using the software.

The last theme that emerged from the data was the thought that students were not putting much effort into the pre-test because hey were all given full credit for attempting it. After receiving this data from the teaching assistants, the investigators felt apprehensive about the data that was collected. Therefore, in the researchers' opinions, further investigation is needed to determine how pervasive this problem is in the different laboratory sections.

Conclusion

It is the investigators' opinion that the SimNet simulation software is an excellent piece of software and is beneficial to the ICS 101 students' learning experience. The students improved their pre-test to post-test scores by 26.07% for Microsoft Word, 38.29% for Microsoft PowerPoint, and 26.59% for Microsoft Excel. Even though the students did not master all of the learning objectives by only learning through the use of SimNet, they

were able to improve their scores across every program that utilized SimNet as an assessment of knowledge acquisition.

Overall, the students' perceptions of the SimNet software were very positive in nature although a few negative responses were given in regards to the 'bugs' and the interface. Many of the students felt positive towards the ideas that the software gave them a consistent learning experience, a central repository for the information acquired during lab sessions, and immediate personalized feedback.

One of the data points that triangulated among the different methods used in this study was the idea of personalized feedback. Both the students and the teaching assistants felt that the students were able to receive timely feedback from the software. In this case, it is the investigators' perceptions that the software was very beneficial as it is difficult for students to receive timely personalized feedback in large-enrollment courses.

It is the opinion of the investigators that more research is needed to determine the effectiveness of the software as the teaching assistants for the course were concerned about the data collected through the pre and post-tests.

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