A First Step towards the Implementation of an E-learning Environment using Interactive Technology

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Abstract—Educators know that today's students are in need of interactive learning environments. Interactivity is the key to successful on-line learning as it allows real time gathering of information. Interaction in the classroom is essential to improving student learning and using Classroom Performance System (CPS) technology is one way to promote interactions. CPS consists of student-operated remote controls and a receiver that records responses to multiple-choice and/or true-false questions posed by the instructor. Computer science students, surrounded by digital technology since infancy, are fundamentally focusing on skills rather than knowledge. As a result, a widening gap has formed between the knowledge and skills. As a first step toward bridging this gap, this study uses interactive learning to provide support for integrating technology into the curriculum and to provide evidence that interactive technology generates excitement and promote engaged learning.

This paper addresses the issue of how interactive technology can be a great asset in teaching computer science courses. Used effectively, technology tools can help engage students while addressing different learning styles through involving the multiple intelligences. This paper presents a first step towards the implementation of an E-learning environment through the assessment of CPS use. The aim of the assessment phase is to specify the educational institution's advancement stage with regard to purchasing new technologies.

Index Terms—E-learning, interactive technology, learning motivation, teaching improvement

I. INTRODUCTION

Communicate effectively and analyze and interpret data are critical to students' success in the workplace [7]: students must have a range of skills to express themselves not only through paper and pencil, but also audio, video, animation, design software as well as a host of new environments (e-mail, Web sites, message boards, blogs, streaming media, etc.). Besides, students must have the ability to crunch, compare, and choose among the flood of data now available Web-based and other electronic formats. Thus, many different types of technology can be used to support and enhance learning. Technologies available in classrooms today, range from simple tool-based applications (such as word processors) to distance learning classrooms. Each technology is likely to play a different role in students’ learning. This paper rather than trying to describe the impact of CPS, emphasizes the use of CPS as a tool that can be applied to a variety of goals in the learning process and can serve as a resource to help developing online curriculum [9] by improving teaching, learning and assessment.

This paper reports on student experience in using interactive technology, specifically CPS (commonly referred to as "clickers," ) for computer science courses. The objective is to engage student by having student participate, by capitalizing on their existing needs and by helping them to enjoy their success. Therefore, one of the major keys to motivation is the active involvement of students in their own learning [10]. Students love to be needed. For example, collecting feedback about the course and/or the teacher makes the students feel proud knowing that it was their contribution and their accomplishment. Moreover students learn by doing, making, writing, designing, creating, and solving [1]. Using new technology stimulates students’ motivation and curiosity. Besides, students learn best when incentives for learning in a classroom satisfy their own motives for enrolling in the course. Satisfying such needs is rewarding in itself, and such rewards (such as rewarding in-class activities using clickers) sustain learning more effectively than do grades. Finally, breaking learning into small packages [5] that can be conquered and that will in some way produce a feeling of accomplishment and success will help motivate students to go forward, even through very difficult material.

This study was undertaken at University of Houston. The evaluation of the results’ study focused on students' engagement and motivation, their learning using clickers, and their preferences on use of clickers. The study also investigated students’ perceptions of clickers’ effectiveness use in motivating attendance. It discusses the benefits and limitations of using interactive technology in computer science courses and how the use of clickers can be improved so that student education will be a successful combination of knowledge, skills and learning.

In other words, the first purpose is to identify students’ perceptions of using CPS so as to support decision making with regard to whether to adopt it as an interactive teaching resource or not. This focus may help leaders and faculties determine whether to pursue this solution in improving online curriculum. The second purpose of this study is to generate a set of high-level key level guidelines for future development. Thus, the next section describes the method used to support change process involving interactive technology [3].
II. METHOD

Participants in this study include 45 students in two different classes. The majority of students were full time students aged between 18 and 23 years old. The samples are comprised of students of different levels (freshman, sophomore, junior, senior) and different degrees.

For the researcher of this study, clickers are being used to evaluate student mastery of content, to identify concepts that are proving difficult for students to grasp, and to provide students a quick way to validate their own learning, helping them identify areas that need improvement. The clickers were utilized as an avenue of assessing what the students knew and tailoring lecture content accordingly. They consist of at least one receiver, one response pad per student and CPS software (in this study CPS for power point is used).

Students respond to questions presented in a power point using response pads by sending an answer, and the host computer keeps track of each participant responses. After the responses are recorded, the host computer displays a histogram of answers. The instructor is able to see the responses immediately and can comment on the results or make changes to the instruction as needed to ensure that the students fully comprehend the content.

In fall 2008, as a first CPS experience, the teacher implemented CPS in COSC 4390, Internet computing (small-size class (11), referred as s_class). For this class, the instructor used cps as an average of one time per two chapters; she spent approximately 1.5 hours per week preparing CPS questions for this class. The instructor implemented CPS in COSC 2320, data structure (mid-size class (34), referred as m_class). For this class, the instructor used cps as an average of one time per three chapters; she spent approximately 0.5 hours per week preparing CPS questions for this class. The teacher authored approximately 100 questions (mixed true/false and multiple choices) for each class. Student were asked about 10-15 questions per sessions. Each correct answer earned the student 2 points. Each incorrect answer earned the student 1 point, and of course unanswered question is valued zero points. The clickers’ answers made up a total of 20% of the final grade. At the end of the semester, all students completed a course survey measuring students’ perceptions of meeting course objections as well as preparing CPS questions for this class. The final results will be used to identify benchmarks of accomplishing the course objectives and satisfaction and to pinpoint areas of low satisfaction requiring strategic action (Table II).

The first part of the survey collected some information regarding students’ perceptions and attitudes towards learning and technology in general. Data gathered from participants regarding their preferences of learning, 70% of s_class and 54% of m_class preferred learning by doing rather than lecture and written notes (40 % of s_class and 33% of m_class). Almost all the students (100 % of s_class and 90% of m_class) rated the ability to see immediate visual feedback is important to them. 60 % of s_class and 32% of m_class students’ attention span last about 30 to 40 minutes. Although they rarely thought about their own learning strategy (57 % of s_class and 40% of m_class), they like getting regular information about their own performance that they can use to change their study strategies before it is too late and they prefer interactive classes. Most of the participants have never done any inquiry-based research (30 % of s_class and 70% of m_class) and they are less willing to speak in a large group (60 % of s_class and 30% of m_class).

B. Students’ perceptions

Students were queried regarding their satisfaction with the use of clickers in classroom, with a goal of determining how they assess their learning experiences. The final results will be used to identify benchmarks of satisfaction and to pinpoint areas of low satisfaction requiring strategic action (Table II).
TABLE II. STUDENTS PERCEPTIONS

<table>
<thead>
<tr>
<th>Question</th>
<th>s_class</th>
<th>m_class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clickers helped them understand</td>
<td>55%</td>
<td>50%</td>
</tr>
<tr>
<td>the contents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clickers effectiveness to measure</td>
<td>64%</td>
<td>54%</td>
</tr>
<tr>
<td>student comprehension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clickers effectiveness to take</td>
<td>70%</td>
<td>64%</td>
</tr>
<tr>
<td>quizzes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clickers enhance student learning</td>
<td>80%</td>
<td>63%</td>
</tr>
<tr>
<td>Clickers website enhances</td>
<td>90%</td>
<td>70%</td>
</tr>
<tr>
<td>satisfaction rate</td>
<td></td>
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</tr>
</tbody>
</table>

Five areas of the survey drew exceptionally high marks for the use of CPS. Of those students responding, 55 percent reported that the daily usage of cps helped them understand the contents. In addition, 64 percent of the respondents expressed their satisfaction that the use of clickers is effective in regard to measuring student comprehension and 70 percent found the clickers effective or very effective in regard to taking. The fact that the use of clickers enhances their learning, or engagement with subject material and time management, also earned extremely high praise, with 80 percent of students indicating that they agreed or strongly agreed with such fact. As a result, the mainstream was satisfied with the quality of the clicker, and recommended CPS to others. However, the students are not willing to pay, 90 percent reported that the university should provide the clickers. Moreover, the need for a website to support clicker use also earned a 90 percent satisfaction rate.

When looking at individual comments, the theme of the batteries failure cost came up often. However, many students felt clickers’ were beneficial, as one student wrote, “the anonymity made me more likely to participate in quizzing.” The theme of being able to find out their mistakes was supported in many comments also such as “cps is a good incentive and useful tool for learning, I like it because I learn my mistakes and was able to see what I misunderstood; I did like the instant feedback and the fact that we discuss answer afterwards; I like using clickers because we can think about a question and then get feedback on it right away. not only the right answer but the concept behind the answer; it is a good experience I was able to see my mistakes and the solution, I was able to discuss the answer on the spot rather than waiting two days they also encouraged me to do better next quiz and to see how well I did compared to class; clickers are useful it made me read the material at home to prepare for quizzes; clickers are good way of managing time, they are good feedback for teachers I think it should be done at the end of each class.”

In several other areas that were assessed, students reported average satisfaction levels and sometimes dissatisfaction. Less favorable ratings included: 40 percent like to use a set of remote control units to answer questions posed by the instructor; 34% percent reported being dissatisfied or very dissatisfied with the fact that clickers enhanced their learning; 27 % percent reported that attendance is not important to succeed and 44% reported that clickers did not increase the frequency of their participation in the class.

IV. IMPLICATIONS FACTOR TO CONSIDER

These findings have implications for every district and school using or planning to use CPS. These considerations are specifying educational goals, providing professional development for teachers [2] and adequate technical support to help them focusing on the content not on the technology tool itself, and assuring a continuous evaluation process of students achievement.

“The active ingredient in any successful implementation of clickers is the result of diligent teacher preparation, and the employment of empirically based pedagogical methods, rather than sole dependence on technology.” [4] I agree with this statement. Therefore, any low levels of satisfaction reported by students in the present study may have been caused by the lack of harmonization between class size, technology, pedagogy and the time invested in administering and managing the CPS ( for example time allocated for preparing questions).

Regardless the way most faculty teaches and the way most faculty tests learning, class size has surprisingly modest impact on learning. In small and mid-size classes, such as the ones in the present study, students are more likely to dislike the clickers or to be neutral regarding the clickers use. As a result, using clickers in larger classes might enhance the students’ engagement, where the use of clickers allows teachers to better interact with students and track their attendance.

The researcher of this study found that using clickers allows her to conduct classroom activities faster and more efficiently. Also, the students who are less likely to speak in a large group appreciated the use of clickers, unlike other students who are more likely to speak, are less likely to use the clicker. Another observation is that in the present study, this was the first time the instructor had utilized clickers in the classroom. There were ambiguity in some questions; therefore the chance of success is minimized. As a result, students may find CPS as a valuable teaching tool once the teacher becomes more familiar with them and develops appropriate questions (short and simple) to effectively use them. Thus this study supports the statement, “To ensure success with clickers, it seems likely that professors need specific training in the use of the technology and in writing appropriate questions for use with the clickers. Questions of most use might be those designed to enhance discussion and those that probe for more conceptual or applied understanding on the part of students.” [8]

In the present study, grades are assigned to ensure the participation of everybody, a grade of two points is assigned to a correct answer and a grade of one point is assigned to incorrect answer. It is certainly possible that students may have performed better if a grade of one point is assigned to a correct answer and a grade of zero point is assigned to incorrect answer. Any strategy may be used to shape strategies and initiatives to improve students’ engagements.

The cost was not an issue as the researcher was using a free set of old clickers’ technology. However this has a drawback on the use of clickers, students faced battery problems. In another evaluation the faculty may use new hardware where the CPS performance has improved.

The study concluded that early faculty involvement and training are keys to course development in order to fully incorporate clickers’ resources. In fact, the challenge
ahead is designing a website to support clickers’ users (teachers and students) and to build different databases questions related to different classes, providing workshops on the use of clickers. This can help instructor design lessons that will be easier for the student to comprehend and the teacher to evaluate.”[6]

V. CONCLUSION

To some teachers, clickers are an excellent in-classroom technology, allowing professors to measure students’ comprehension and attendance. To others, clickers diminish engagement. Of course, there are professors who can use clickers productively and encourage students to respond thoughtfully. Conversely, there are professors who can engage a large auditorium of students without the use of an audience response system.

One of the most troublesome problems encountered by the teacher of this study was the shortage in time for preparing questions. The most two problems, which badly had affected the students’ efficiency in answering questions, were: the limited time assigned to each question and the frequent batteries failures.

The long-term purpose of this study is to explore student perceptions of an online curriculum to help decision makers and researchers determine whether they would pursue the use of such a tool to support online curriculum development. The students have a mixture of abilities and talents; the use of clickers at this stage offers them an opportunity to help in designing a learning environment that is compatible with their needs. However, the adoption of clickers should depend on their pedagogical advantages, thus more studies are needed to answer some questions such as: what are the pedagogical benefits of clickers’ use?

REFERENCES


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Submitted for review April 9th, 2009. Accepted May 5th, 2009.