PROPOSAL 24
Using a Student Response System to Improve Student Learning

Principle Investigator:
Prakash H. Bhuta, Professor of Biology

Co-Principle Investigators:
Susan Stearns, Professor of Communication Studies
Linda McCollum, Professor of Geology
Pushpa Venkatesan, Assistant Professor of Chemistry
Laurie Flaherty, Adjunct Professor of Biology

Meeting the Strategic Planning Goals

This proposal is aimed at 2 goals of the University Strategic Plan. Goal 1: A rigorous and engaged student learning experience and the Goal 2: Academic community culture that supports and engages faculty through their career. Both these goals can be met using new teaching technology on our campus. It is generally accepted that active learning is more effective then the passive learning process. Using the Student Response System (SRS), we plan to (1) engage students in an active learning process while simultaneously the use of technology will promote better interactions amongst the instructors using it in classrooms, and allow us to research (i.e. analyze) the impact upon students learning and faculty pedagogy. Thus, the technology that permits active learning processes in the classroom will also tie faculty from different disciplines to a shared, common experience building a network of instructors. This proposal will therefore benefit both, the students through engaged learning and the faculty via teaching, research, and eventually service as they offer the results of their work to other EWU faculty.

Introduction

Every teacher’s dream is to teach his/her students everything they know. They walk into a classroom with a desire to succeed in this dream and often come out of it with disappointment and disillusion. Students on the other hand have different objectives in taking a class. Their interest in learning is somewhat overshadowed by their desire to get a better grade, distraction by what is happening in their surroundings and lack of direct involvement in the classroom activities. Most instructors are comfortable with the traditional style of teaching, lectures. A number of studies have shown that this one-way transfer of information does not remain with the students for long. No matter how good a teacher one is, exclusively relying on lectures to teach is not an effective way of teaching (Greer and Heaney, 2004 and references cited therein). In a lecture, class students are not actively involved in learning and are passively sitting through lecture. Use of alternative teaching techniques
such as in-class demonstration, frequent but short quizzes, use of multimedia presentations, group discussions, etc., does increase student participation and learning. Use of alternative techniques by an instructor is limited in scope due to large class sizes, lack of availability of technology equipped classrooms, shyness of students, fear of being proven wrong in front of their peers, lack of time, etc. However, when the lecture only teaching style is embellished by use of alternative teaching methods it does improve student learning.

In 1984-85, the IBM Corporation carried out an interesting study of their Manager Training program (Horowitz 1988), finding that the majority of newly appointed managers lost attention in first 20 minutes of the lectures. The average number of managers paying attention in the class after 20 minutes had dropped to 47%. One has to keep in mind that the audience here was made up of mature, motivated and talented individuals. Furthermore, he found that engaging students via periodic questions-answer period improved their attention. Now, 67% of them were paying attention to what was being said. Another observation was that during the question answer period, 10-20% of the students dominated the session and remaining 80-90% participated only occasionally. Engaging students through discussion has its own drawbacks. In large classes, it is physically impossible to allow each and every student to voice their opinion or to reply to a question. The student-teacher interaction can be limited by the ‘intimidating factor’, i.e. no one wants to give a wrong answer in front of their friends and peers. Hesitation to voice their opinions if the topic under discussion is controversial or a difficult concept is another factor affecting in-class discussions.

We would like to use technology to overcome these disadvantages and to increase student participation in their own learning. Hake (1998) has compared standardized tests scores in a course on mechanics for 6000 students and has noted that use of an interactive teaching approach was twice as effective as the traditional lecture approach. It is apparent that to teach effectively, one needs to move away from traditional lecture style to a style that will promote more student teacher interactions. The Student Response System (SRS) or Audience Response System (ARS), or Interactive Student Response system (ISR) or simply “clickers” enables an instructor to draw students into classroom discussions and can facilitate active learning.

The strength of SRS is in engaging students interactively in the classroom. Rickey-Hatfield (1995) has identified 7 principles to improve undergraduate teaching. They are (1) increased student-faculty contact, (2) group learning, (3) active learning, (4) prompt feedback, (5) maximizing time on
task, (6) clearly communicating expectations, and (7) respecting diverse talents and ways of learning. The SRS can effectively address these practices to various degrees in a classroom. The SRS has been available for the last 15 years and is more frequently used in K-12 grades than in colleges and universities. However, they are finding their way to many colleges and university campuses. University of Massachusetts, University of Missouri, Pennsylvania State University, and Western Washington University are some of the examples where the SRS is being used in the classrooms. If this proposal is funded, the Eastern Washington University will join their ranks.

**Student Response System (SRS)**

SRS consists of two components, a handheld device to transmit signals in response to a question and a receiver to collect the responses from a class. The receiver then transmits accumulated data to the instructor’s computer and the proprietary software analyze the student responses and displays them in a form of a histogram. The immediate feedback is crucial to enhanced student learning and faculty interaction with, and adjustment to, student need (Fink, 2003). The instructor can now use this data to either proceed with the classroom activity, revisit the topic, or initiate discussion. The students in the classroom can compare their responses with those of their classmates. Because of the flexibility in their use, the response systems can be used for taking short quizzes, attendance, generating discussion, review, collaboration, data collection (e.g. surveys), assessment, etc.

SRS basically works in one of two ways. Some use infrared light to transmit and receive signals whereas others use radio frequency to transmit/receive the signals. All SRS are wireless transmitters/receivers. The transmitters function very much like a TV remote and hence they are not an unfamiliar object to most TV watchers. The receivers on the other hand may be a wireless device or it may be connected to the instructor’s computer with a cable. They require proprietary software. The software either works through PowerPoint or has a very similar feel to PowerPoint software and hence is easy to learn. Manufacturers also provide initial training in their use to teachers. In addition to differences in hardware and software, they also come with different price tags for students. Students may end up paying $35-50 per SRS system per quarter while the instructor receives the free software and a receiver.

To avoid the use of multiple response systems, many universities have either adopted one system on their campus or are in the process of evaluating multiple systems with an aim to select one system for their faculty. On our own campus, we have just begun to explore the use of SRS in classrooms.
Professor William Williams in the Department of Psychology is using the SRS (manufactured by Turning Technologies) in his R2R project. The Teaching & Learning Center has limited numbers of “clickers” from two additional manufacturers (eInstruction company and Quizdom) and I have used the “clickers” manufactured by GTCO CalComp. Each system has its own advantages and disadvantages (See a comparative analysis in Table 1). For example, the “clickers” used in psychology class requires students to buy them and resell back to bookstore. This adds $ 35.00 per quarter to their textbook bill. The product manufactured by eInstruction requires a quarterly license fee of $15.00 per student. The response system I used is based on infrared and requires more than one receiver in a classroom with more than 40 students and can handle simultaneously less numbers of responses in comparison with radio frequency based system (see Table 1). All three of these systems generate light signals to confirm that the student’s response was received and recorded. Students have to wait till everyone is finished to see how their answer compared with that of others or whether they were correct or wrong. Of the 4 systems showed in the table, only one of them has an LCD panel to display the result of the student’s answer. Thus the students get an instant answer telling them whether they were right or wrong.

**Our Plan**

After analyzing the strengths and weaknesses of the various SRSs, we have placed priority on (1) students having immediate feedback, (2) faculty having access to the chosen SRS on either computer platforms (Macintosh or Windows PC), and (3) cost factors. This has led us to choose Quizdom SRS. Since the T&LC does not have enough clickers of one kind for any one of us, we plan to purchase 220 “clickers” and 5 receivers from the Quizdom corporation. This will enable a minimum of two faculty per quarter to use them in large classes (enrollment of 100 students each) at the same time or four faculty members teaching 50 students each. The extra 20 “clickers” and one receiver is a backup in case of their during the instruction period.

Since the pre-proposal was written, more faculty are showing interest in using them, especially in large classrooms. In addition to myself and the Co-PI listed, three more faculty have expressed interest in using the “clickers” in their classes. The Table 2 lists their names, their discipline and a list of classes in which they would be using them. Because of over-whelming demand for use of the “clickers” in terms of number of classes and the number of students enrolled where they could be used, we will have to make these “clickers” available to faculty through a random selection process such as a raffle. In the beginning of Winter 2006 quarter, each one of us will draw a number (monitored by someone other then the interested parties) to establish priority ranking. Those who get to use them first in Winter 2006 will
then pass it on to the faculty next in line for Spring 2006 quarter and so on. The students will be charged only a nominal fee for the use of SRS. Our plan is to distribute these “clickers” through university bookstore. Initially the students will pay $40.00 for these “clickers”, but they will be refunded $30.00 when they bring them back in good condition. Of the remaining $10.00, the bookstore will keep $5.00 for their overhead and the remaining funds will be used to acquire additional “clickers”. Thus, slowly but surely we will be generating small pool of funds to buy additional “clickers” for the use of other faculty. The Principle Investigator has met with the general manager of the EWU bookstore and they have agreed to participate in this scheme.

Additionally, as you will see in the section below, we plan to research this pedagogy culminating in a referred publication. And based on what we learn through our own experiences with SRS, and our research results, we would be happy to share our experience with EWU faculty explaining the effective and ineffective aspects of SRS.

**Budget**

We are requesting funds for the following items which at a typical costs would be:

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>220 “clickers” @ $ 85.00</td>
<td>$18,700.00</td>
</tr>
<tr>
<td>5 Instructor remote + Charger @ $ 149.00</td>
<td>$ 7455.00</td>
</tr>
<tr>
<td>5 RF Base receiver + Cable @ $ 200.00</td>
<td>$ 1000.00</td>
</tr>
<tr>
<td>Software license (for 5) @ $ 525.00</td>
<td>$ 2625.00</td>
</tr>
<tr>
<td>Technical support</td>
<td>$ 2500.00</td>
</tr>
<tr>
<td>Miscellaneous items (batteries, manuals, etc.)</td>
<td>$ 1085.00</td>
</tr>
</tbody>
</table>

**TOTAL** = $ 26655.00

But via a special quote to EWU we could buy these products for:

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost to EWU (see quote)</td>
<td>$12935.00</td>
</tr>
<tr>
<td>Shipping &amp; handling (5 %)</td>
<td>$ 645.75</td>
</tr>
<tr>
<td>State Tax (8.5%)</td>
<td>$ 1099.48</td>
</tr>
</tbody>
</table>

**GRAND TOTAL** = $ 14680.23

**Assessment**

Assessment will take place via a research project designed to examine students’ perception of engagement and learning, along with the faculty perception of how the use of clickers in their classrooms changed their conception of teaching, both positively and negatively, at the time of experience and their expectations regarding future changes in teaching. IRB approval will be sought by co-principle investigator Susan Stearns. All students and faculty members participating in this project
will be asked to voluntarily participate. It is anticipated that the majority of data collected will be a survey format, with additional open ended questions. The assessment rubrics used by Greer and Heaney (2004) and Slain, D. et al (2004) will help us design our own sets of questions and methods for assessment. A sample of questions used by Slain, D. et al (2004) is shown in Table 3. Additional questions will be developed. SPSS will be used to analyze the survey type questions and NVivo, a qualitative analysis software will be used to analyze the open-ended responses.

**Conclusion**

As you can see, this proposal addresses the needs of our students for engaged learning by placing a specific emphasis on interactive involvement in classes (Strategic Plan Goal #1). In addition, this will enhance the campus culture encouraging faculty in their careers (Strategic Plan Goal #2). Pedagogically, faculty are being encouraged to design creative ways to make their courses more interactive and engaging. Faculty representing different disciplines are working together as a team to assess student learning and engagement.

**References Cited:**


