any methods are used to enhance student engagement in didactic nursing education courses (Moredich & Moore, 2007; Richardson & Trudeau, 2003), and methods are introduced as new technologies become available (Fink, 2003; Fitch, 2004; Roberts, 2005; Skiba & Barton, 2006; Weimer, 2002). This study examined the use of student response systems — clickers — incorporated in a didactic pediatric nursing course to enhance nursing student interaction and learning.

• With clickers, the instructor uses a computer with an attached receiver and projects a presentation (often in PowerPoint) for students to view. Questions may be displayed with possible answers, as in multiple-choice questions. Students have wireless keypads and select the answers they believe are correct by pushing the corresponding letter. Answers are then sent to the receiver attached to the computer. The clicker system software collects the results and the aggregate data are graphically displayed within the presentation for all participants to see. The system also stores individual student choices on all questions, allowing the instructor to use the data for grading purposes if desired (Hatch, Jensen, & Moore, 2005; Moredich & Moore, 2007; Ribbens, 2007; Stein, Challman, & Brueckner, 2006; Trotter, 2005). The purpose of this exploratory study was twofold: to determine if there was a difference in students’ exam scores with the use of clickers, and to assess student satisfaction when clickers were used in the classroom.

ABSTRACT

Research has shown that the present generation of students has a preference for digital literacy, experiential learning, interactivity, and immediacy; therefore, greater use of technology is being brought into university courses to aid in student involvement. Student Response Systems, called clickers, were incorporated as a teaching methodology to enhance student interaction and learning in a didactic pediatric nursing course. This course was taught over Interactive Television (ITV) with students at a distant site as well as face to face, creating the challenge of whole-class engagement. Clickers were used to actively engage students at both sites simultaneously and give immediate feedback to students regarding understanding of lecture material. Clickers also allowed small-group problem solving of questions. Exam grades and level of participation in case studies were monitored and exam scores and final scores were compared to those of a previous class. Student t-tests demonstrated that one of three course exams and final course grades were significantly higher for the students who used clickers in the classroom. Satisfaction feedback also supported the use of clickers as a tool to engage students and enhance learning outcomes.
Review of the Literature  

Today’s students have a preference for digital literacy, experiential learning, interactivity, and immediacy (Howe & Strauss, 2000; Skiba & Barton, 2006). Greater use of technology has been introduced into classrooms to encourage student involvement (Johnson & McLeod, 2004; Moredich & Moore, 2007; Ribbens, 2007). Research has shown that actively engaged students will absorb and retain more content (Moredich & Moore; Trotter, 2005). It has also been shown that using a variety of teaching/learning methodologies enhances learning for students with differing learning styles (Barell, 2003; Fink, 2003). A learner-centered teaching approach (Weimer, 2002) and the creation of significant learning experiences (Barell; Fink) are touted as means of creating interaction in the classroom.

Clickers, an emerging technology, have been used to actively engage students within the lecture and provide immediate feedback regarding their understanding of lecture material. Content students do not comprehend is identified so that difficult material may be clarified (Hatch et al., 2005; Howe & Strauss, 2000; Moredich & Moore, 2007; Stein et al., 2006; Trotter, 2005). Research has supported that clickers create an atmosphere of student interaction that enhances critical thinking and the ability to utilize knowledge in the safety of the classroom environment. Students come to class better prepared as they know there will be a quiz, and clickers support stimulating discussion among students about the plausibility of quiz responses (Fitch, 2004; Hatch et al.; Johnson & McLeod, 2004; Moredich & Moore; Ribbens, 2007; Skiba & Barton, 2006; Stein et al.; Trotter). By providing immediate feedback, promoting learning from peers, and encouraging the sharing of experiences, clickers support adult learning styles (Fitch; Moredich & Moore; Ribbens; Roberts, 2005; Stein et al.; Trotter).

Purpose and Significance  

In the nursing program where this study was conducted, the pediatrics course was traditionally taught using lectures, videos, and case studies. This course, “Nursing: Families and Children with Health Deviations,” is taught during the first semester of the senior year and focuses on the relationship between nursing practice and issues surrounding families and children. It is offered every semester, in the spring at the local site only with 40 students, and in the fall at the local site and via interactive television to include an additional group of 24 students.

Historically, it has been difficult to solicit student engagement, especially from the distant site. The course was primarily a lecture course supported by PowerPoint slides and the use of quizzes and case studies. Faculty noted that students often failed to attend to the topic at hand, even with the use of enhanced PowerPoint presentations. Lack of engagement and understanding was evident on exams; students found the multiple-choice application questions difficult to answer, even though they thought they were familiar with the information. Clickers were proposed as a way to assess student understanding of the information through immediate feedback, allowing faculty to determine if clarification of content was needed.

A survey tool was developed by six professors involved in a university-system-wide evaluation of the use of clickers in the classroom. This survey tool had been adapted by the math and biology departments of this university, and the tool was shared through the Network for Excellence in Teaching (NET).

Method  

Clickers were introduced in the fall 2006 first-semester senior pediatric course. The cost of purchasing clickers was subsidized by a Technology Innovation for Teaching grant. Sixty-five students were in this cohort, 40 at the local site and the others at a distant site; five were men. Students received a list of required texts (pediatric nursing, community nursing, and family theory), along with the process for obtaining clickers at a discounted price from the college bookstore.

Fall 2005 first-semester grades were used for comparison of student outcomes. The 2005 cohort consisted of 61 students, including four men. These students had been given take-home quizzes to be completed before each class meeting and collected at the end of the class meeting.

In fall 2006, the quiz questions from 2005 were revised to a multiple-choice format. After the questions were posed within PowerPoint slides, clickers enabled faculty to determine students’ understanding and expand discussion of the topic area. Instant feedback and discussion of why answers were right or wrong promoted greater discussion of topic areas and enhanced communication between the students and instructor.

Evaluation Methods  

Exam schedules, the exam process, and content were the same for both groups. Each of the three scheduled exams consisted of 50 multiple-choice questions. For the first two exams, students turned in their answer sheets and then noted incorrect answers. At home, they prepared rationales for the correct answers that they turned in during the next class session. They received half credit for correct answers, and the revisions were reflected in a revised score.

Students completed the final exam during the first hour of a two-hour period. They then met in small groups to discuss questions they were unsure of and could change their answers if they wished. Answer sheets and tests were then collected and graded.
Multiple-choice clicker questions posed during each lecture period during the fall 2006 semester were developed from take-home quizzes used the previous year. Quiz grades were documented in the online grade book. Each quiz was worth 10 points or 1 percent of the final grade. Students had an opportunity to take 13 quizzes, with their three lowest scores dropped from the grade book at the end of the semester. This method provided incentive to review material prior to class and offered flexibility in case a student missed a class or had difficulty with particular content. At the conclusion of the course, exams and grades were compared to those of the previous fall class. Students also completed a satisfaction survey.

The assessment of student learning was ongoing. Student clicker quiz responses were saved to document the initial responses. If a number of students responded incorrectly, discussion was encouraged and the question was asked a second time. Exam grades and levels of participation in case studies were monitored throughout the semester to note any needed changes.

The final grade for the course included exam scores, clicker quiz grades, and group work scores. The first two exams were each worth 15 percent of the final grade; the final exam was worth 20 percent; and clicker quizzes were worth 10 percent. Group work and a pharmacology module accounted for the other 40 percent of the final grade.

Student satisfaction surveys on the use of the clickers were also completed at the end of the semester. The survey tool consisted of 14 items that measured students’ attitudes regarding use of the clickers, how clickers helped in the understanding of content, and cost. Items were evaluated using a five-point Likert-type scale, with scores ranging from 1 (strongly disagree) to 5 (strongly agree). Scores were added and averaged for each group (the local and distant site groups).

Findings Clickers were found to bring about greater student involvement during the lectures. Exam scores expressed in percent correct were compared between the fall semester courses for 2006 and 2005 (see Table). When looking at the three exam grades and the course grade, the fall 2006 class averaged slightly higher in all areas. Student t-tests revealed significant differences for exam 2 and the course grade, but no statistical significance was noted for the other exams. Student outcomes with clickers will continue to be monitored to determine if this trend will continue.

Student satisfaction surveys showed that students enjoyed using the clickers, but were concerned about the cost. Survey items that students agreed with at an average of greater than 3.5 were: “The clickers were fun to use”; “Receiving credit just for answering made me more likely to participate in using the clickers”; “Receiving additional credit for the right answer would make me try harder to get the right answer”; “Discussions with other students during the clicker questions were helpful in understanding the concepts of this course”; and “It was easy to remember to bring the clickers to class.” Negative responses (less that 2.5 average) primarily related to cost (the grant deferred only about 40 percent of the cost). The survey statement most students disagreed with was: “I feel the cost of the clickers was worth it,” indicating that cost was a negative aspect.

A number of average scores were in the neutral range of 2.5 to 3.5. It is interesting to note that students at the distant site rated the following statements positively, while those at local site were neutral: “I would like to use clickers in more of my courses”; and “Using clickers helped me to pay attention during lecture.”

In general, student comments were positive: “The anonymity made me more likely to participate in quizzing, which didn’t feel like quizzing as we called it voting”; “When we are graded, I am less likely to participate, sometimes preferring ‘no participation’ to a wrong answer”; “If I know I’m not graded, I just go for it.” Other comments included: “Having questions… help(ed) me realize if I had grasped certain concepts or not.”

<table>
<thead>
<tr>
<th>Table. Differences Between Examination Scores and Course Grade for Classes Using Clickers (Fall 2006) and Not Using Clickers (Fall 2005)</th>
<th>FALL 2005</th>
<th>FALL 2006</th>
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<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>Exam 1</td>
<td>61</td>
<td>90.48</td>
</tr>
<tr>
<td>Exam 2</td>
<td>61</td>
<td>86.93</td>
</tr>
<tr>
<td>Final Exam</td>
<td>61</td>
<td>89.80</td>
</tr>
<tr>
<td>Course Grade</td>
<td>61</td>
<td>93.33</td>
</tr>
</tbody>
</table>

* two-tailed.
The theme of cost came up often: “Cost was a huge factor.” A few students recommended using the clickers throughout more nursing courses to see greater benefit from the cost involved.

**Discussion** The instructors in the course were looking for new avenues of facilitating engagement in the classroom. Students were bright, but often appeared bored and inattentive. With the use of clickers and more immediate awareness of areas where students needed help understanding content, it was possible to customize the course to fit student needs, limiting the time spent on areas that students had already mastered and introducing more challenging topics.

Statistically significant differences were noted in average scores for the second exam and overall course grades between the fall 2005 and 2006 classes. Scores were higher in the class using clickers. Narrative remarks from students provided support for the observation that clickers created a setting in which students interacted with classmates in discussion and were more engaged when responding to questions. To address concerns about the cost of purchasing clickers, the university has evaluated clicker systems and is working to bring down costs by working with a single vendor.

**Conclusion** The study occurred at one rural Midwestern nursing program offering a baccalaureate degree. Therefore, the findings may not be applicable to other settings. Although the student group using clickers was similar in size, student composition, and admission grade point average with the previous year’s control group, the classes were not matched for other characteristics. Other classes taken concurrently by the same students were not monitored for differences in curricular expectations.

Nevertheless, this exploratory study revealed that the students were more engaged in the classroom when clickers were used. Students reviewed materials prior to class session in preparation for the clicker quiz, and their interactions during the clicker question presentation revealed engaged thinking processes. Overall, students expressed a positive attitude toward use of the clickers in the classroom, but saw the expense as a negative attribute.

The researcher will continue to evaluate students’ responses to the use of clicker technology as more courses throughout the university begin to use clickers in the classroom. It is assumed that some students may come to the course with experience in the use of clickers and may already own a clicker device. With greater use of clickers in the classroom, it is hoped that the expense of this technology will be alleviated.

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**Key Words** Student Response Systems – Clickers – Student Engagement – Teaching Methods – Classroom Technology

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**References**


