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2007-2009

Increasing Student Engagement in College Algebra Using Clickers

Purpose/Goal of Activity

The purpose of this activity is to increase student engagement and success by developing a set of multiple choice questions for use with a student response system (clickers) in College Algebra. This set of questions will incorporate a multi-modal approach to address varying learning styles to support increased student success.

Student success nationwide and at Palm Beach Community College in College Algebra continues to present a problem for faculty and administration. The pragmatic reason most students take College Algebra is to fulfill a college or state requirement.

The high percentage of students receiving grades of F or D or withdrawing – is a major reason for seeking new materials, technology and teaching strategies. Research on the use of 4MAT and Curriculum Design clearly indicate the need to address the individual learning styles of students. Assessing individual student’s learning does not necessarily lead to individualizing instruction in the classroom. It is possible, however, to design and deliver instruction that incorporates varying learning styles for all students in a class.

This project supports PBCC strategic plan objectives #1 & #3: “PBCC will increase retention, graduation and completion rates by 10% by 2008” and “PBCC will continue to incorporate current technology in teaching, learning, curriculum and administrative functions.”

Project Description

A major aspect of this multi-modal approach is to incorporate active learning strategies into teaching and learning. Classroom response system technology can facilitate some of these active learning strategies, such as student-student discussion of concepts. The technology includes a handset (a.k.a., a *clicker*) that allows a student to respond, anonymously, to a multiple choice (MC) question. Software records the response and offers a bar graph of class responses. Use of this technology enables timely and frequent feedback to both students and instructors, which leads to cognitive gains through increased student engagement in active learning and possible affective gains including increased student attendance, and enthusiasm.

I intend to create a set of multiple choice (MC) questions for use with clickers in College Algebra courses. A significant amount of time will be spent on developing the questions and compiling the results and observations to each question. The development process will emphasize three fundamental principles of learning: engaging students in their initial understanding so they may grasp new concepts and information, developing students’ competence in the area of inquiry, and promoting a self-monitoring approach to help students

develop the ability to take control of their own learning. In particular, I will develop conceptual and intuitive questions at both basic and complex levels. The compiling of results and observations will emphasize analysis of assessment of each question.

To develop the clicker questions I will be using Turning Point and Equation Editor, the first is power point based software and the latter is a symbolic math writing tool. The questions will be incorporated through the lecture to assess the understanding of the students throughout any given time in class. The objective is to create 4 to 6 clicker questions per lecture presentation to transform the classroom into a more learner knowledge and assessment centered environment. To accomplish this I will need the help of a student assistant that could provide the technology support in the classroom and the administrative support in creating the power point presentations using Turning Point and Equation Editor.

The research encourages student centered rather than instructor centered pedagogy: hands-on activities rather than all lecture (Johnson, Johnson & Smith, 1998). At the present time, I am using cooperative learning as the principal mode of instruction and will continue to use it with the clickers. Approximately 100 clicker questions will be created and all materials created will be available to all faculty interested.

There will be 4 to 6 questions during each class period. Some of the questions will be asked individually and others in group. The development process will emphasize three fundamental principles of learning: engaging students in their initial understanding so they grasp concepts and information, developing students' competence in the area of inquiry, and promoting a self-monitoring approach to help students develop the ability to take control of their own learning. Immediate feedback from clicker questions will assist students' self-assessment of their performance and needs. In particular, I will develop conceptual and intuitive questions at both basic and complex levels. The compiling of results and observations will emphasize analysis of assessment of each question.

The first semester will be the developing stage of the project. The second semester will be used to pilot the clicker questions in my college algebra class. As the project continues, I hope to discover answers to the following questions:

- How have clickers changed the dynamics of the classroom with respect to student learning and pedagogical methods?
- What impact does the use of clickers in the classroom have on student retention and engagement?
- What type of clicker questions work best in lectures?

The second year will emphasize the examination and assessment of successful materials to be incorporated and disseminated to all interested faculty. Feedback will be solicited from faculty for further recommendations. I will present the results at PBCC Professional Development Day and at the American Mathematical Association of Two Year Colleges (AMATYC) Conference.

Expected Outcomes

Students in my College Algebra classes will

- Be able to use the clickers approach successfully
- Improve attendance record
- Show improvement in their perception of communication interaction in class
- Demonstrate proficiency in College Algebra concepts.

Project Evaluation

I will use both quantitative and qualitative methodologies in evaluation of the project outcomes. I will observe for an increase in retention as well as in success rates.

Qualitatively, I will survey students to assess the usefulness of student response system in a math course. I will gather these anonymous student evaluations, which will contain a series of questions asking about student's attitudes towards the use of clickers in the classroom as well as their evaluation of the course itself. In addition the survey will ask for students' satisfaction with the clicker (i.e. ease of use, cost), satisfaction with the course design, perceived communication interaction in lecture, overall effectiveness, and perceived performance.

Benefits to students and college

- Students' retention rate will increase by 10%
- Students' success rate will increase by 10%
- The project supports PBCC strategic plan objective to continue to incorporate current technology in teaching and learning
- The project will provide a tool for other faculty to use
- The project is connected to other College projects.

Why I should be awarded

I am currently serving on:

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| • Combo Cohort Pilot Faculty Group | • Distance Learning Steering Committee |
| • Diversity Committee | • FACC Scholarship Committee |
| • Faculty Development QEP Committee (Co-Chair) | • General Education Committee |
| • Golf Tournament Committee | • LW Academic Council |
| • LW Math Awareness Week (Co-Chair) | • LW PTLC Committee |
| • LW Strategic Plan Committee | • LW Student Access & Success Committee |
| • Precalculus Textbook Selection (Chair) | • Title III Advisory Board |

Besides several interviewing and selection committees, I have contributed to SACS Review (chair 1998-2001), Curriculum committee (chair 1995-1996) and the Institutional Effectiveness online process. In addition, I have served in the past on many other committees and initiatives of the College.

Budget

Year 1:	Fall 2007	Student Assistant (\$7/hr)	120 hours	\$840.00
		<ul style="list-style-type: none"> • In classroom technical support (45 hours- Includes setting up the software (folder) for each class, helping with students and collecting data per question) • Administrative support (75 hours – Includes training in Turning Point and Equation Editor) 		
	Spring 2008	Student Assistant (\$7/hr)	120 hours	\$840.00
		<ul style="list-style-type: none"> • In classroom technical support (45 hours- Includes setting up the software for each class, helping with students and collecting data per question) • Administrative support (75 hours – Includes making changes to questions and assist with the report) 		
		<ul style="list-style-type: none"> • Supplies (Reproduction of materials) 		\$200.00
Year 2:	Fall 2008	Presenting and disseminating results of clicker project.		
		Additional funds without stipulation		<u>\$2620.00</u>
Total Budget:				\$4500.00