Title: Using Manipulatives to Enhance Developmental Mathematics Success

Project Member(s): Kirk Bradley

Describe the problem, issue, or area of interest and the context.
Research in the area of developmental mathematics has shown, a great deal of students taking developmental mathematics, are kinesthetic (hands on learners). This was a learning style that my teaching techniques did not accomodate. It is for this reason that I chose to do my project on using manipulatives in the developmental mathematics classroom. I chose this project to see if by teaching to a variety of learning styles student success and retention would increase.

Define your desired goals, or "outcomes."
My project had two main goals.

1. To increase student retention and success in the developmental mathematics classroom.
2. As a teacher to learn how to effectively use manipulatives in the developmental mathematics classroom.

Describe your "indicators" of success.
One indicator of success for the project was the end of semester survey that the students completed. The survey let me know what the students viewpoint was on using the manipulatives and also how I as a teacher could improve in using the manipulatives. To indicate whether student retention and success were improved I used a comparison to a control group in which no manipulatives were used.

Describe your project.
For my project I introduced the use of manipulatives in the developmental mathematics classroom. The course that I implemented them in was a developmental arithmetic with algebra classroom. The list of materials and how they were used is as follows:
Base 10 Blocks: used in the chapter on whole numbers to help model the base-ten number system
Integer Casino- used in the chapter on integers, to aid in the concept of working with positive and negative numbers.
Rainbow Fractions Circles, Squares, Tiles and Overheads- used to illustrate how fractions work and how to perform arithmetic operations on fractions.
Decimal Squares and Transparencies- used to illustrate decimal numbers
DecimalMods- used to illustrate arithmetic operations on decimals
Giant GeoSolids Set/Geometric Shapes Set- used to illustrate geometric solids and measure volume by filling
Brass Mass Set- used to illustrate various masses in the metric system
Hands On Equations Classroom Set- used when modeling algebraic equations.

Describe your results.
Overall I would say the project was very successful. Student comments indicated that they benefited from using the manipulatives. Experimental test group statistics verified the student comments, showing improved scores compared to the control group. As a teacher I saw an improvement in the culture of the classroom, enthusiasm and motivation toward the subject was higher in the experimental group. The project also sparked the idea for me to write a successful $60,000 developmental studies grant to aid our developmental mathematics program.

Describe your evaluation methods.

In order to evaluate the effectiveness of the effectiveness of the use of these manipulatives a comparison to control group was necessary. The experimental group was a developmental arithmetic with algebra class that used the manipulatives taught by Mr. Bradley in the spring semester of 2006. The control group was defined as a developmental arithmetic with algebra class that did not use any manipulatives taught by Mr. Bradley in the fall semester of 2005. Both experimental and control groups used the same textbook, math study skills workbook, homework assignments, tests, and mymathlab assignments. The only difference was the use of manipulatives. Descriptive statistics were calculated for each exam during the semester and for the final exam, to evaluate the results. The results showed that the median test score is higher for the experimental group in each of the testing periods where a manipulative was used. The results also showed that the median final exam score for the experimental group was higher. I did not modify the project during the semester but, I will definitely use the manipulatives again and will modify that handouts and activities to incorporate for better class time management. Overall I believe that varying teaching techniques to accommodate for all learning styles is important and will enhance that success and retention of developmental mathematics students.