Keystone Model

Keystone is a synergistic educational model for teaching and learning in mathematics. Students' difficulties correlate directly to specific patterns of behavior, attitudes, habits, and motivational issues that inhibit learning. The behavioral attributes that prevent students being successful in mathematics include short attention spans, limited time horizons, poor attendance patterns, passivity, failure to learn from mistakes, inattention to homework assignments, inattention to teacher's statements, and lack of motivation and self-esteem. Keystone addresses these by actively monitoring students' progress through formative assessments and constructive feedbacks, which lead to improved student learning and enhances student engagement in the learning process.

Essential Constructs of the Keystone Model:

- Frequent and dynamic assessment of student learning. By engaging in formative assessment practices through frequent quizzes, Keystone identifies valuable information regarding student learning at all times. Student outcomes inform the teaching which leads to addressing student learning difficulties. The continuous and dynamic interaction between students and the teacher improves student work and study habits. Students study regularly and continuously rather than in disconnected spurts, as in cramming for the test. Frequent quizzing also improves class attendance and punctuality and mitigates test anxiety. Research shows that students prefer frequent low-stakes quizzes to infrequent high-stakes tests which carry exorbitant weights.

- Immediate and constructive feedback. By providing immediate and constructive feedback on their quizzes and tests, students learn from their mistakes. By learning from mistakes students can achieve higher outcomes. This shows on follow up quizzes which provides an opportunity for students to improve their scores. Also, through feedback, students work on their difficulties, thereby attaining a better understanding of the material which will consolidate their learning.

- Adjusting teaching practices. Keystone combines a variety of techniques in teaching. This includes direct instruction through lecture, cooperative learning, and classroom discussions. Keystone provides a method for 'proving' teaching practices appropriate to a class. It can validate better instruction models. For example, the lecture method is used when students' progress occurs at a reasonable rate. When the class splits, cooperative group learning and peer tutoring is adopted. Peer learning experiences are also effective at addressing levels of student passivity since it engages students with different ability levels in the learning process. In some situations, depending on demands of the course syllabus, cooperative learning can be made an integral part of classroom instruction.

In the Keystone Methodology

- Quizzes and tests are cumulative, time-restricted, and based on homework assignments. Cumulative testing forces the students to review and practice the previous material taught, thus consolidating their learning and integrating their knowledge of topics covered at all times. Time-restricted quizzing improves students' concentration, automaticity of basic skills, and also improves their ability to do mental mathematics. Homework-based testing encourages students to do their homework assignments.

- Teachers use the item analysis (and other descriptive statistical measures) of the quizzes and tests to re-teach the troublesome topics and repeat the low-scoring questions on the next quiz so that students will attain mastery of the topics taught. By achieving a higher level of success each time, students get motivated to do better and become self reliant. Success of students improves their self-esteem and confidence to succeed. Achieving success is the best motivation.

- All grading of the quizzes and tests are to a standard (e.g., A for 90-100, B for 80-90, C for 70-80, etc.) rather than on a curve. There should be no quotas for grades. The grade earned by the student reflects the standards set by the teacher. Grading on a curve discourages cooperative learning since it rewards competitive position on scoring instead of the outcome meeting a standard.

  For further information, please read **AMATYC News**, vol. 20, No. 4, 2005.