

**Evidence of *MathImagine* as Designed in Accordance
to the Best Practices in Teaching Mathematics**

Abstract

There has been a great deal of research accomplished to find the best practices in teaching mathematics including standards-based mathematics, technology in the math classroom, and teacher understanding of teaching and learning expectations. This paper is designed to evidence these thoughts and practices as the building blocks and cornerstone of development of *MathImagine*, by L&M Instructional Resources, Inc., as an effective intervention tool for teaching students standards-based mathematics.

Standards-Based Mathematics, Specifically TEKS-based

In *Teaching Today*, 2005, certain essential characteristics of an effective standards-based mathematics program have been identified as contributing to success in learning mathematics. L&M Instructional Resources, Inc., has used these characteristics to guide the development of *MathImagine* as an intervention tool to meet the challenges of Texas students learning the State standards, the TEKS.

- Lessons are designed to address specific standards.

MathImagine is written specifically to the TEKS that are tested on TAKS. That is to say, all Knowledges and Skills which the State assesses through TAKS are presented in the program in the same format and with the same intent as the State designs.

- **Learning activities are student centered.**

MathImagine as a computer presented tool, is designed to engage the students in constructing their own understanding through interface with the online lessons, peers and teachers. Students are engaged both at an individual level and small learning group level throughout the entire teaching environment while using this intervention tool.

- **Lessons are focused in inquiry and problem solving.**

Because the nature of TAKS is problem solving, and *MathImagine* is written to the intent and rigor of TAKS, students are engaged during the entire learning experience in problem solving. Teachers, still an integral part of the intervention process, help students by questioning them to understanding.

- **Students must apply critical thinking and knowledge application skills.**

Once again, *MathImagine's* full design is to steep students in the critical thinking necessary to internalize the mathematics necessary for success in mastering the subscribed course of study. Students learn and apply as they progress through the program.

- **Adequate time, space, and materials are provided to complete the tasks.**

MathImagine is an individually paced online intervention program designed so that students can spend the time they need in the areas of concern for them. Students not only progress at their own pace but are integral in deciding which skills to practice. Designed to be flexible in scope, *MathImagine* is also an excellent tool for small group as well as whole class intervention.

- **Varied, continuous assessment, is designed to evaluate both student progress and teacher effectiveness.**

Students work through mini-lessons and teaching practice problems within each student expectation which provide instant feedback of student progress. Every known and anticipated approach to the teaching and assessing of the student expectation has been carefully crafted for the practice problems. The reporting system in the program provides students, teachers and administrators with cumulative data on individual students and classes which should be used to evaluate student progress as well as class progress.

More significant principles:

- Students' engagement is at a high level.
- Tasks are built on students' prior knowledge
- Scaffolding takes place, making connections to concepts, procedures, and understanding.
- High-level performance is modeled.
- Students are expected to explain thinking and meaning.
- Students self-monitor their progress.
- Appropriate amount of time is devoted to tasks.

As *MathImagine* was developed, L&M Instructional Resources, Inc., made certain that students learn from previous knowledge, and that connections are made from one

concept to another, between and among various strategies, and from concretely represented forms to standard procedures. To insure that student engagement is at a high level, L&M Instructional Resources, Inc., partnered with a private Research Institute to design a functional, intuitive and engaging interface. Through past experiences, L&M Instructional Resource, Inc., knew that small increments of intense immersion in selected skills with lessons and feedback that are short and concise which connect students to previous learning. Questions expect students to reach to a high level of understanding. Feedback models solution strategies at various levels to insure the scaffolding of learning. And, because there is instant feedback, individual quiz reports, and cumulative records, students are constantly self-monitoring their progress, helping them to recognize their growth and identify the areas in which they are still having difficulties.

Technology

The National Council of Teachers of Mathematics (NCTM, 2003) has endorsed the use of technology in the mathematics classroom, purporting that technology is a valuable tool in the learning environment. By its very nature, *MathImagine* engages the learner in online interactive learning. L&M Instructional Resources, Inc., were also conscientious of the need to include strategies which supported appropriate use of technological strategies such as graphing calculators in high school.

Staff Development

In a 2005 report prepared by the National Staff Development Council for the Legislative Oversight Commission on Education Accountability, the Council noted that “the single most critical factor in improving student learning is teacher quality,” and that experienced teachers must continue staff development to extend their content

knowledge and increase their understanding of new standards-based instructional strategies. The No Child Left Behind Act describes staff development as:

Professional learning needs to give teachers and school leaders the skills to support students' mastery of states' academic standards; enhance the content knowledge of teachers in their teaching subjects; be integrated into overall school and district improvement plans; be research based; align with state student standards; and be sustained, intensive, and focused on classroom practice. (U.S. Department of Education, 2002, p. 13)

Although *MathImage* was not purposely developed to be used as staff development, it has become an integral tool to help teachers understand the intent of the standards, the rigor of the assessment, and many and varied teaching strategies to help various students internalize mathematical concepts from conceptual understandings to standard processes and algorithms. Certainly, *MathImagine* is not in and of itself a staff development unit. The program does, however, provide an on-going vehicle for professional growth (both math and non-math backgrounds) while working with students throughout the year in the online program.

Conclusion

MathImagine online math intervention program has been designed and developed according to the most current and valid research available to support the successful teaching and learning of mathematics. The program:

- Specifically supports Texas standards and curriculum (TEKS);
- Clearly states the objectives to be mastered;

- Provides student-centered instruction;
- Provides guided practice and immediate teaching feedback;
- Engages students in the learning process;
- Builds on prior knowledge and scaffolds learning as is appropriate;
- Expects students to achieve at a high level of learning;
- Provides assessment opportunities that are totally aligned to the Texas assessment;
- Encourages students to self-assess;
- Provides cumulative records which can be used to evaluate student progress and teacher effectiveness;
- Provides technology strategies as are appropriate to the course or grade level;
- Inadvertently provides on-going, targeted professional development to teachers (math and non-math) who work with students in an ongoing program throughout the year.

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