Learning Today's Math Curriculum: Theoretical & Methodological Foundations

Overview

Learning Today's math program combines innovative use of educational technology with a comprehensive research-based curricula. Providing student-centered instruction in a motivating, real-world setting is the guiding philosophy behind Learning Today's instructional mathematics program. The scope and sequence is based on national and state standards for teaching mathematics.

Teachers and specialists in both school and after-school environments can use the program through *Smart Tutor* [TM], Learning Today's web-based differentiated instruction system. It can also be used as an instructional resource. While the program is geared to Kindergarten through 5th grade levels, it can be differentiated for at-risk learners in higher grade levels as well.

Research-Based Principles

The following five research-based principles have guided the development of Learning Today's math curriculum:

" The curriculum should be developed grade by grade and be well articulated. "

Smart Tutor [TM] lessons are arranged in a meaningful manner so students are able to construct new meaning based on previous lessons and background knowledge. References to prior knowledge in everyday settings are used to stimulate learning and build understanding. For example, students at Level 1 learn the meaning of subtraction by helping members of the Riminy Rabbit family jump off a diving board at a swimming pool. Students at Level 3 exercise their problem solving skills through estimating total costs while shopping at the grocery store with Michiko and Hiromi. Students learn best when mathematics topics are appropriate for their level and presented in a

way that is interesting and challenging to their intellectual development.

" The curriculum should be more than arithmetic; measurement, geometry, algebra and data analysis should be taught in elementary school. "

Learning Today's math curriculum includes standards-based interactive tutorials, practice activities, and benchmark assessments that teach concepts on Number and Operations, Algebraic Thinking, Measurement and Geometry. New strands consisting of lessons in Algebra and Data, Probability and Statistics for elementary school are also scheduled for release in the near future.

" The curriculum should include rich application problems, mathematical modeling and cross-curricular connections and a balance between concepts, skills facts and tools "

Learning Today's lessons have an integrative approach to teaching and learning mathematics. Students build meaningful connections between math and personal experiences, both inside and outside the classroom environment. Mathematical concepts are achieved through interactive activities, engaging animations of diverse characters, and virtual manipulatives and models.

Examples of rich themes and concepts within math lessons include deciding how much to spend on a gift card in a store, comparison of large numbers in the context of distances of planets in the solar system, and an ATM machine that makes change and combines bills into larger units. Active

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student involvement is possible through this integrative approach to constructing conceptual and procedural knowledge in mathematics.

" The curriculum should include the use of manipulatives and models to aid learning mathematics. "

Use of familiar math manipulatives and models enables students to have purposeful interaction with the lessons and to make meaningful connections from the online environment to personal experiences. Virtual tools such as counters, ones, tens and hundreds blocks, rulers, calculators and scales provide interactive simulation of concrete experiences students. In level 3, a model of an array is used to represent two-digit multiplication problems, clearly demonstrating conceptual and procedural methods of learning. The use of virtual manipulatives and models enables students to use *Smart Tutor* ^{TM} not as an insolated method of learning, but rather as a part of the entire learning experience

" The curriculum should use technology. "

Technology-enhanced learning environments should provide:

constant and meaningful interaction

Usability studies conducted with young students provide information results on the importance of *constant and meaningful interaction*. *Smart Tutor* ^{TM} lessons ask students to interact with the program every six seconds. Purposeful interactions engage students and enhance understanding of the mathematical concept. Clicking on train cars to count ordinal numbers, using the keyboard to type answers to division problems and plotting data points on a graph are some of the ways in which *Smart Tutor* ^{TM} requires students to constantly and meaningfully interact with the program.

♦ *immediate feedback*

Students are constantly given immediate audio and visual feedback to their answer choices. Correct responses are rewarded with explicit audio such as "That's right! Two plus five equals seven!" and a visual animation of a reward such as a piece of a puzzle coming together or a frog catching a fly as he jumps on the next lily pad. Students are given two tries, depending on the number of answer choices, and encouraged with hints and feedback such as "That's too many - try again!" if they have selected an incorrect response. After the final incorrect answer, the program provides both an audio and visual explanation for the correct answer.

♦ *multiple representation formats for learning*

The use of sound, graphic and movement further enhance the learning experience of young students. Not only are they able to hear instructions and see how to operate a balance scale, but they are able to "play" with it by clicking and dragging virtual weights to measure a variety of grocery items and can watch pieces of a pizza and chocolate bars morph into fractions

♦ *a safe and non-threatening environment in which to learn*

The use of technology in education is a motivational factor for students due to its challenging, yet non-judgmental and non-threatening environment. With *Smart Tutor* ^{TM}, students learn mathematic skills and concepts at an individualized level and pace. Research shows that young students, particularly those considered 'at risk' often report feeling more comfortable in technology-based learning environments compared to traditional classrooms. In the Learning Today math program, responses that students make during a tutorial or practice activity are not scored, so as to encourage students to attempt to solve problems and answer questions without fear of penalty. Great care is taken to ensure that animations and sounds that play are informative and encouraging, particularly when a student answers incorrectly.

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Learning Today's advanced system revolutionizes mathematical teaching in a 21st century learning environment. Enhanced learning environments ensure success with today's young learners. The lessons provide meaningful, engaging and interactive tools necessary for building knowledge of mathematical procedures and concepts.

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