Research-Based Program Design

Why Smart Tutor Works

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Introduction

Smart Tutor™, published by Learning Today, is an advanced learning system designed to accelerate learning, develop motivation, and increase potential in low-performing students. Through the use of web-based technology, individualized instruction is focused on building a strong foundation in reading and math. The design basis for building that foundation is supported by research in the areas of cognitive development, motivation, behavioral analysis, and instructional design theory as well as solid best practices in curriculum design.

This white paper describes the research that supports the instructional approach of Smart Tutor and some of the important features that enable it to be a powerful learning solution. Four of those key features are covered in this paper on "Why Smart Tutor Works" (Assessment, Differentiated Instruction, Explicit Instruction, and Intrinsic Motivation).

Diagnostic Assessment

Assessment plays a central role in student learning and is an integral part of instruction that enhances, empowers, and directs student learning. It is a systematic process of gathering information about what a student knows and is able to do. The Smart Tutor "ATLAS" Assessment is a research-based diagnostic assessment tool that provides the foundation for decision-making and planning for instruction and learning. It is an integral component of the Smart Tutor instructional process. In order to effectively address the learning needs or gaps in a student's knowledge base, the assessment provides a clear picture of "what is known" and "what is not" and initiates the necessary instructional path to facilitate student learning.

The assessment serves to define sub-skill deficiencies and sets up an individualized instructional program precisely aligned with the students' needs. Each of the Smart Tutor assessments assesses key domains in reading and math, takes approximately 30 to 45 minutes depending on the level of the student and adapts to each test-taker as he or she undertakes the assessment. The detailed reports produced for each student are comprehensive, providing teachers with timely and informative information about each student.

Differentiated Instruction and Individual Tutoring

Students vary in their need for instruction. Based on this knowledge, differentiated instruction applies the principle of meeting and teaching each student where they are cognitively. One of the key features of the Smart Tutor design is the ability to provide individualized instruction that appeals to different learning styles as well as different learning abilities. Carol Anne Tomlinson (1995) asserts that in differentiated classrooms, teaching begins where students are, not at the front of a curriculum guide. Learning is best achieved by adjusting the curriculum and presentation of information to learners rather than expecting learners to adjust themselves to the curriculum (Hall, 2002, Tomlinson, 1995, Tomlinson, 1999). One of the challenges teachers are faced with is a curriculum that has become a prescribed set of academic standards. According to Tomlinson (2000), instructional pacing has become a race against a clock to cover the standards, and the sole goal of teaching has been reduced to raising student test scores on a single test. Through the use of technology, Smart Tutor solves that challenge by first determining the students' reading and math readiness profile, then providing true differentiated instruction by delivering explicit instruction to match a student's profile and learning ability.

Smart Tutor's use of individualized instruction provides each student with the equivalent of their own individual tutor, one that is engaging, encouraging, motivating, challenging, non-threatening, non-judgmental and capable of targeting specific needs. Bloom (1984) shows that students provided with individual tutors typically perform at levels about two standard deviations above

where they would perform with ordinary group instruction. Translated, that means that a student that scores at the 50th percentile on a standardized test after regular group instruction would score at the 98th percentile if personalized tutoring augmented or replaced the group instruction (Bloom, 1984).

Explicit Instruction

There are two modes of delivering instruction to students, implicit and explicit. Implicit or embedded instruction, as it is sometimes called, assumes that students possess certain knowledge when presented with new concepts or concepts that may be unfamiliar, while explicit instruction or direct instruction is a systematic, clear and precise instructional approach that leaves nothing to implication. It includes a set of delivery and design procedures derived from effective instructional design research merged with behavior analysis.

Smart Tutor uses explicit instruction as the basis for its instructional approach for at-risk students. Swanson (2001) argues that for students with disabilities and students who are at risk, this approach is crucial for the retention of new skills. The teaching practice of explicit instruction has been used in classrooms since the late 1960s, and research has indicated that explicit instruction is an instructional approach that is most effective for teaching basic or isolated skills (Kroesbergen & Van Luit, 2003). This is especially true and important when teaching phonics. Key findings in scientific research on phonics instruction conclude that systematic or explicit phonics instruction is more effective than implicit instruction (Hall, 2002).

Hall (2002) describes a meta-analysis of over 350 publications on various studies on explicit instruction conducted by G. Adams that established the overall success of explicit instructional practices is substantial. Adams & Engelmann (1996) reported that:

- Students receiving explicit instruction in reading, mathematics, language and spelling achieved well in these basic skills, as well as reading comprehension, problem solving, and math concepts.
- A review of the research on beginning reading using explicit instruction strategies found that students considered disadvantaged and students with diverse needs, like other students, benefit most from early and explicit teaching of word recognition skills, including phonics.
- Systematic and explicit phonics instruction makes a bigger contribution to children's growth in reading than instruction that provides non-systematic or no phonics instruction.

Intrinsic Motivation

The shift in education from an instructor-centered to a learner-centered focus requires learners to be self-directed and motivated (Gabrielle, 2002). This is a major challenge when the population you are trying to teach typically suffers from low motivation, low self-esteem, and low achievement. Learning Today believes that motivation is essential to learning and performance, particularly in technology-mediated environments where students must take an active role in their learning by being more self-directed (Lee, 2000). Smart Tutor uses the ARCS Model of Motivational Design, a well-known and widely applied model of instructional design that is rooted in a number of motivational theories and concepts (Keller, 1983). Small (1997) identifies one of the most notable concepts, expectancy-value theory.

> In expectancy-value theory, "effort" is identified as the major measurable motivational outcome. For "effort" to occur, two necessary prerequisites are specified: (1) the person must value the task and (2) the person must believe he or she can succeed at the task.

> Therefore, in an instructional situation, the learning task needs to be presented in a way that is engaging and meaningful to the student, and in a way that promotes positive expectations for the successful achievement of learning objectives.

Keller (1983) determined that, among the various constructs that might be applied to the problem of students putting forth effort, motivation was the most appropriate and useful.

Smart Tutor applies four essential design components for motivating instruction consistent with the Keller ARCS psychological model of motivation (attention, relevance, confidence, and satisfaction).

Through the engaging use of bright colors, Adobe Flash programming and interesting characters, Smart Tutor gains attention and sustains curiosity and interest. Content is relevant because it appeals to different learning styles and uses real world examples and themes. Also, the content is based on the results of the diagnostic assessment and is therefore directed specifically towards the students' needs and interest. The learning material is challenging, but allows students to be successful, and that success brings about increased confidence and positive expectations. The use of positive feedback reinforces learning and brings about satisfaction, motivating the student to continue to use Smart Tutor and to spend more time on task in the learning activity. Smaldino (2002) indicates that intrinsically motivated students will work harder and learn more because of their personal interest in the material.

Conclusion

By combining research on instructional design, motivation and web-based technology along with best practices, Smart Tutor's advanced learning system is designed to reach and motivate all students with its features:

1. an online diagnostic pre-assessment (formative) to determine where the gaps are in a student's reading and/or math knowledge base
2. an automatically generated differentiated instruction program in reading and/or math that is explicit and focuses on key concepts, allowing students to call to conscious attention what is being taught and clarify learning objectives
3. a 'tutoring' approach that allows students to receive individualized instruction and remediation in a challenging, yet non-threatening and nonjudgmental environment
4. a design based on current motivation theory enhanced through the use of technology

Through the use of web-based technology and individualized instruction, Smart Tutor enables students to build a strong foundation in reading and math.

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