

THE BLASTER METHOD: MATH GAMES TO MAKE YOU “MATH SMART”

Math fundamentals for a technological age: What makes students “math smart”?

What makes a student “math smart”? What kind of mathematical competencies are necessary for life in our technological age? NCTM president, Glenda Lappan, has stated that “To be successful in today’s world, students need proficiency with basic facts and they must be adept in reasoning, problem solving, and communicating mathematically” (NCTM website, 2/10/99) In addition to proficiency with the basic skills of computation, estimation, and mental math, students must be able to think and communicate mathematically; They must also be able to solve complex problems and think strategically. All of these abilities combine to create a student who is “math smart.”

Math Smarts and the real world: What parents want for their children

Most parents agree that it is not enough for a child to memorize math facts; children need to be able to apply that understanding in problem solving situations.

“Computational facility is not useful if students do not know when to use the mathematical processes they are learning.” (Findell, JoE, p.5 1996) Most parents and educators believe that students must know how to use computational skills in real world applications. Reading and mathematics skills are just the first steps on the road to being able to analyze data, create models, and solve complex problems.

Math Smarts and success: How math smarts adds up to a better future

The Department of Education (1997) points out that students who are strong in mathematics have a better chance of succeeding in both school and in the workplace. “In the job market, workers who have strong mathematics and science backgrounds are more likely to be employed and generally earn more than workers with lower achievement, even if they have not gone on to college.” (P.9 DoE) The Bureau of Labor Statistics reports that some of the fastest growing job areas (computer technology and health services) require substantial preparation in mathematics, beyond an understanding of basic computation. In addition, the Department of Education reports many jobs that once required little background in mathematics now call for specific skills in algebra, geometry, measurement, probability, and statistics. According to an industry-wide standard, an entry level automobile worker needs to be able to apply formulas from algebra and physics to properly wire the electrical circuits of any car. The National Coalition for Advanced Manufacturing has defined 25 specific standards of mathematics and measurement among their national skill standards for what a competent worker should know and be able to do. (P.11 DoE)

It is clear that today and in the future, the demand for mathematically prepared citizens will grow. Parents and educators understand that children who grow up to be confident with math will grow into successful citizens of a technological society.

The Blaster Method: Expanding the fundamentals of math for the future

The Blaster Method focuses on the skills that make kids math smart by emphasizing the math basics while building the foundation for more complex mathematical understanding. Dedicated to helping students prepare for the technological age, the Blaster Method presents games and challenges that help students master basic math skills and encourages them to apply mathematical thinking and problem solving strategies to challenging situations.

Family involvement, mathematics, and games

The level of mathematical success a child will experience depends upon a number of factors, including the kinds of mathematics courses a student takes, how rigorous those courses are, and parental involvement in school work (DoE p.3,4). We at Knowledge Adventure believe that home learning situations can teach children to enjoy the challenges of math, solve complex problems, and prepare students for the technological age.

Parents can encourage this learning by providing their children with mathematics activities at home that use basic skills and challenge children to solve problems, think and communicate mathematically. A recent issue of Teaching Children Mathematics (February, 1997) was devoted to how schools and parents can work together to help children learn mathematics. "Parents who help their children succeed in school mathematics establish a foundation for mathematical success in later life." (School-Family Partnerships...p.311) An important part of family involvement in mathematics can revolve around "playing" with mathematical ideas, numbers, and strategies (School-Family...p.310).

A number of programs designed to increase family involvement in mathematics include a focus on games as an important way of learning mathematical thinking and basic number skills. (Anderson, Parents as Partners; Ehnebuske, In the Comfort of Their Own Homes...) Even games not typically termed "math games" such as Scrabble or Monopoly, or mancala have components of mathematical thinking involved, and help children develop their "math smarts" (Caldwell, Parents, Board games and Mathematical Learning). The Eisenhower National Clearinghouse for K-12 Mathematics and Science provides a listing of games, such as mancala, that you can play with your child to help build math skills. (Hartog, et.al. Doing Mathematics With Your Child)

Dr. Mahesh Sharma, Director of the Center for the Teaching and Learning of Mathematics, recommends a number of popular games which help students develop math skills. Students who come to school having played games like these have already developed what he calls mathematics "pre-skills" and a proficiency with strategic thinking and basic mathematics language. The Blaster Method designs games that build mathematical "pre-skills" by emphasizing visualization, pattern recognition, memory, logical deduction and many other important thinking skills. Math Blaster has drawn from classic games such as the mancala game, to enable players to build skills in visualization, logical deduction and strategy. Using technology to enable players to visualize, experiment and solve problems Blaster presents visual geometric puzzles. In Math Blaster Mystery, players solve problems of percentages, decimals and weight as they strategically plan moves in a game based on a classic engineering puzzle. (

How The Blaster Method uses game design for learning

What is it about good games that makes them powerful tools for learning? In fact, good games mirror good instruction. Good games and good instruction include the same basic components: motivation, modeling, practice, evaluation, and active learning.

The Blaster Method believes that good games and good instruction motivate students. Well designed games draw students in, get them interested, and challenge them to engage in the task at hand. Blaster games are designed to provide challenges that match with the student's skill level--challenging enough to be interesting, but not so challenging as to be impossible (M. Csikszentmihalyi, Flow, 1990). There are four

aspects of intrinsic motivation which are found in good games: challenge, curiosity, control, and fantasy. Blaster games provide all these motivators for the players. They provide challenges by setting goals. Interest is maintained by methods such as varying levels of difficulty, randomizing events, and providing feedback on performance. Good games continually pique the curiosity of the player by providing some, but not all of the information necessary to complete a task. They encourage exploration and discovery. Finally, Blaster games, like all good games can provide a fantasy environment which players find interesting, and which can help learners understand new information. (Malone & Lepper, 1987 p.230-240)

In addition to motivating, good games model new learning. They are designed to provide a “learning ladder” for the player, so that new learning builds on accomplishments already achieved. Often, they do this by relating something new to something we already know, or prior knowledge. This technique is sometimes referred to as scaffolding or creating an “assimilation paradigm.” (Davis, *Classrooms & Cognition*, p.8) This is an important aspect of learning new information, especially when that information is conceptual like much mathematics learning. “Most people do not learn concepts by listening and repeating. We can learn facts in a rote manner, but in order to use those facts, we must be able to relate those facts to prior knowledge.” (Findell, p.10) The Blaster Method provides the “learning ladder” or scaffold to help students master new material. Each product in the Blaster line of math products builds on the information presented in the previous product. And within the products, learning builds on learning within each of the levels.

Both good games and good instruction ask students to practice a new skill until it is mastered. This may be one of the things that good games do even better than good instruction. Blaster games provide practice in an entertaining format. Depending upon the Math Blaster game, students may be asked to count, add, subtract, divide, multiply, or estimate. They may need to understand the rules of whole numbers or fractions. They may be asked to solve equations, take measurements, or recognize geometric shapes. There is no limit to the math skills which can be effectively presented and practiced in good games.

Because Blaster games present material multiple levels of difficulty, each level provides a new challenge and more practice. As they continue to practice skills they have learned, they become faster, better, and more competent the more they play the game. Blaster games provide additional benefits here, as practice can often be individualized to the needs of the player--the speed, frequency, and difficulty of problems can all be geared to the student. In this way, practice becomes both meaningful and appropriate for the student, rather than tedious and repetitious.

Good instruction and good games ask students to apply what they have learned to new situations. In the Blaster games, as in real life, students are asked to take a skill they have mastered at one level, and apply it in a slightly different way at a new level of the game. This interaction mirrors life, where people must take the skills they have learned in school and use them to solve problems at work and at home.

Just as a teacher lets students know how they are doing, good games evaluate children’s progress. Good games provide feedback so children know what they have done well and what they need to do better. Blaster games give children feedback all along the way, so they can stay on target and reach their goal.

Finally, good games allow for active learning. Good mathematics instruction must be active in order for students to learn appropriately. "Students ability to reason, solve problems, and use mathematics to communicate will develop only if they are actively and frequently engaged in these processes." (NCTM Professional Standards for Teaching Mathematics, 1991) Blaster games allow for this type of active learning. When a player is involved in a good game, he or she is participating in an "optimal experience." This has been described as a state of "flow" or being "in the zone." Players who are actively involved in a game are responding to the challenges of the game. "The challenges of the activity are what force us to concentrate." (Flow, p. 97) Blaster games are designed and tested to create this type of experience. Children enjoy what they are learning and are better able to retain and use the skills they have learned from their time in the Blaster world.

The Blaster Method helps parents help children

The Blaster Method of learning mathematics picks up where the teacher leaves off. Many times, children need time to practice what was introduced in the classroom. This extra time at home can often make the difference between a confident student and a nervous learner. The Blaster games rely on action, adventure and imagination to engage children in math long after the classroom has closed. Schools introduce students to mathematical concepts, then the Blaster Method expands upon those experiences and provides learning opportunities in an engaging and imaginative world. The Math Blaster games model mathematical concepts in challenging and imaginative game designs that involve to skill practice, situational applications, problem solving and learning feedback and evaluation.

The Blaster Method uses media to create a learning world

As we know, some children learn better visually, others kinesthetically. Some have strong logical minds, others are very intuitive (Markova, How Your Child is Smart, Gardner, Frames of Mind). Most children (and many adults) need to experience new learning in concrete ways prior to operating in the abstract. Teachers have typically used manipulatives to help students understand new math concepts. "Manipulatives have been used for many years to help students understand abstract ideas such as number, numeration, basic arithmetic operations, and spatial relationships." (Spungin, Teaching Teachers to Teach Mathematics, p.74 1996) In many Blaster activities, players manipulate physical objects to test a theory or solve a problem. This allows players to explore number concepts and begin to develop their own understanding of how number operations work.

Computer games provide visual, auditory, and kinesthetic feedback during the learning experience (as compared, for example, to a paper-pencil task). They accommodate various learning modalities, and allow children to learn in ways that match their own learning preferences. Blaster games provide students with various models for understanding complex mathematical concepts such as the expressions and logical thinking necessary for pre-algebra and algebra. The combination of visual, auditory, and kinesthetic presentations helps students grasp these concepts.

The Blaster Method and real world skills

Parents know how important it is for children to transfer school math learning to real life. Games like Math Blaster allow students to experience situations where they must use every day mathematics. For example, they may count change, tell time, measure and

weigh objects, or read charts and graphs. Given a challenging situation, the student may be asked to extract information from a set of data, draw conclusions and solve problems as he or she would in real life. Computer games provide the perfect way for students to try out important skills prior to doing these things in real life.

Finally, the Blaster Method helps students prepare for real life by developing mental math skills. In real life you don't always have a computer or even a pencil and paper handy. Mental math proficiency allows you to estimate, compute quickly, use your number sense, and exercise your memory power. The game design involved in the Blaster activities encourage children to use estimation skills and quick computation as part of the game play. Math and game play are completely intertwined, so that the flow of the game actually helps the child improve mental math skills. Math Blaster makes math skills "cool" because they help you win the game. And in the process of winning the game, students develop math power and "math smarts."

Conclusion

For over 20 years, Math Blaster has partnered with children and parents to create a learning experience that encourages children as they learn and use math. From computation to visualization to problem solving, Math Blaster has provided context for learning. The challenge of incorporating this learning into a classroom experience remains however, and must be address to assure that Math Blaster moves to the next level.