**Math Trailblazers**

## Frequently Asked Questions

**Q. How is *Math Trailblazers* different from other mathematics curricula?**

A. Traditional Programs:
Traditional mathematics curricula generally focus on the sequential development of individual skills, with the greatest emphasis placed on the development of paper-and-pencil arithmetic skills and procedures. Most of the treatment of arithmetic is isolated from any context.

*Math Trailblazers*:
This is a balanced program where students actively engage in solving a wide variety of mathematics problems that arise from many different contexts. Students become resourceful and proficient problem-solvers as they explore different ways to solve problems and different ways to represent mathematical situations using such tools as manipulatives, calculators, graphs, pictures, data tables, and numbers. Skills and procedures are introduced conceptually to enhance students' understanding and retention. Regular, distributed practice is provided throughout the curriculum. Connections to other content areas, especially science and language arts, are common. Important mathematical content that generally receives inadequate attention in traditional texts, such as estimation, geometry, measurement, and probability, are significant topics.

**Q. The "math wars" are about the two philosophies of teaching math: Traditional/Classical that emphasizes learning math facts, computation skills and applying those with word problems, and the other is Constructivist math which emphasizes discovery in group activities but is supposedly very weak in basic math facts and computation.**

A. Not true. First of all there are not only two philosophies of teaching mathematics. Some people may be able to divide the world into black and white, but reality is more complex. *Math Trailblazers* was developed by the TIMS (Teaching Integrated Mathematics and Science) Project at the University of Illinois at Chicago. It was founded and is directed by Philip Wagreich, a mathematician, and Howard Goldberg, a particle physicist. Goldberg and Wagreich were motivated by the appalling quality of mathematics and science teaching, and textbook, in their children's schooling. In addition, they were confronted daily with college students who could not do the most basic mathematical and sientific reasoning.

In 1984, they decided to take time away from their demanding research activities to find ways to improve education for all children. Before the NCTM Standards, before Math Wars, before they had even known there was a "philosophy of constructivism", they set to developing the foundations of "the TIMS Philosophy." The hallmarks of the TIMS Philosophy are to make mathematics meaningful to children, to challenge them with a rigorous and mathematically

sound curriculum, and to help children learn the reasoning skills that are so important in the workplace of today (and will be absolutely essential in the world they will meet when they graduate -- say, in 2012).

**Q. With Math Trailblazers, will students learn the skills, such as proficiency with math facts and whole-number operations that are emphasized in a more traditional program?**

A. *Math Trailblazers* has a carefully designed math fact and computation program that is based on the research on how children learn these skills. Practice of these basic skills is integrated into the *Math Trailblazers* Daily Practice and Problems as well as homework. In each of grades 2 through 5 there is a Math Facts Resource Guide to give teachers additional support and flexibility in teaching these skills.
A major goal of *Math Trailblazers* is to prepare students to compute accurately, flexibly, and appropriately in all situations. Standard topics in arithmetic--acquisition of basic math facts and fluency with whole-number operations--are covered extensively.

**Q. What is the opinion of the scientific community regarding the Standards set by the National Council of Teachers of Mathematics?**

A. *Math Trailblazers* meets the Standards set by the National Council of Teachers of Mathematics. These standards have undergone extensive review. The opinion of the scientific community is accurately represented by the The Council of Scientific Society Presidents (CSSP)-the leadership organization for more than 1 million scientists and science educators. It commended NCTM for producing its most recent standards document, *Principles and Standards for School Mathematics* (2000). On its certificate of commendation, the CSSP noted that *Principles and Standards* is "a significant and high-quality contribution toward the improvement of mathematics education for all students." The Council also encouraged "prompt, thoughtful, and careful consideration of and thorough review of the recommendations and ideas for implementation by all who share a stake in the effective teaching of mathematics."

The CSSP is a nonprofit organization comprised of the presidents, presidents-elect, and immediate past presidents of more than 60 scientific societies and federations, whose combined membership numbers more than 1 million. CSSP serves as a strong voice in support of science and science education, as the premier national science leadership institute, and as a forum for open, substantive exchanges on current scientific issues.

Its praise continues recognition from the scientific community for NCTM's work. A National Research Council report, released in May 2004, gave NCTM high marks for process of creating *Principles and Standards*. The report says, "The committee finds the process established by NCTM to solicit comments from the field to be commendable and the process established by them to analyze those comments to be exemplary." The National Research Council is the operating arm of the National Academy of Sciences, the preeminent scientific organization in the United States.

**Q. What science does *Math Trailblazers* include?**

A. *Math Trailblazers* takes the heart of science--the Scientific Method--and adapts it for use as a tool for solving a wide variety of problems. Students learn, through repeated use of the TIMS Laboratory Method, how scientists approach and solve problems and how to design and carry out controlled scientific experiments. Students systematically examine relationships among variables in a scientific experiment, a concept fundamental to the study of math and science. *Math Trailblazers* focuses on science content that is essential to all areas of science: the variables of length, area, volume, mass, and time. Measurement is presented in meaningful, experimental situations. Strong connections are made between the real world and abstract ideas. *Math Trailblazers* is aligned in many ways with the National Science Education Standards from the National Research Council (NRC).

**Q. How does *Math Trailblazers* integrate mathematics with other content areas?**

A. Rich contexts and diverse content offer unlimited opportunities for integration with other subject areas, particularly science and language arts. Connections to other subject areas are often highlighted in the teacher's guides, but teachers who are looking for ways to integrate math with other subject areas will find many other opportunities to do so. The TIMS method also encourages teachers to quantify other areas of the curriculum, such as social studies. The extensive use of writing and other communication skills, the varied contexts that are used to explore mathematics, and the TIMS Adventure Books provide a solid start in connecting the mathematics in *Math Trailblazers* with language arts.

**Q. What kind of assessment does *Math Trailblazers* use?**

A. There are three major purposes for assessment in *Math Trailblazers*:
1) to help teachers learn about students' thinking and knowledge--this information can then be used to guide instruction
2) to communicate the goals of instruction to students and parents
3) to inform students and parents about progress toward these goals and suggest directions for further efforts

Assessment in *Math Trailblazers* reflects the breadth and balance of the curriculum. Numerous opportunities for both formal and informal assessment of student learning are integrated into the program. Many of the assessment activities are incorporated into the daily lessons; others are included in formal assessment units. Assessment activities include a mix of short, medium-length, and extended activities. Some are hands-on investigations, others are paper-and-pencil tasks. In all cases, assessment activities are designed to be worthwhile educational experiences and to elicit more than just an answer.

**Q. Does *Math Trailblazers* make use of collaborative learning?**

A. Scientists and mathematicians have always worked in groups and the benefits of collaborative work in schools are well known. *Math Trailblazers* includes a balance of group work, individual work, and whole class instruction. Many activities are intended to be carried out in groups of two or more students who work together. These include relatively long (three- to five-day) activities and shorter problem-solving tasks.

**Q. Can *Math Trailblazers* facilitate teaching children with diverse learning styles and ability levels in a heterogeneous classroom?**

A. Extensive use of math tools, such as manipulatives, calculators, pictures, tables, and graphs, provides students with multiple entry points for learning. Some students can approach a problem concretely using manipulatives or patterns while others may solve it symbolically with numbers. Mathematical situations are represented in different ways, giving students different ways to look at a problem. With *Math Trailblazers*, schools should find that they do not need to ability-group in mathematics, even if they ability-group for other subject areas. Extra opportunities are provided throughout the program for students who are looking for special challenges. Many activities include extensions that take a lesson a bit further or in a new direction. The Daily Practice and Problems in Grades 35 regularly include "TIMS Challenges", interesting problems that can be assigned to the entire class or to students who are ready for additional work.

**Q. Has *Math Trailblazers* been around long enough to demonstrate its effectiveness?**

*A.* *Math Trailblazers* was the end product of 12 years of research and development, partially supported by grants from the National Science Foundation. It has been pilot tested, revised, field tested and revised once more. The TIMS Project is constantly researching ways to improve student learning as well as ways to help teachers be more effective. This is our passion. Contrast this with the dozens of commercial publishers who put together their textbooks using consultants and development houses that have little deep knowledge of the subject matter and few thoughtful ideas on how to make our children better learners. They just go with the fad of the year.

The TIMS Project and Kendall/Hunt have collected data on student achievement that show that schools adopting *Math Trailblazers* have made significant improvements on standardized test (See Student Achievement) Moreover, a rigorous scientific study of student achievement on standardized tests comparing students using NSF funded reform curricula to students using traditional curricula showed that the students using reform curricula performed at a statistically significantly increased level (See ARC Center study). In short, *Math Trailblazers* is not new and it has been proven effective.

**Q. What materials do you have for parents/families?**

A. A Just for Families brochure is available for distribution at the beginning of the school year. Information can also be found in our Just for Families section of the web site. Every unit begins with a letter home to parents. These letters include information about the important math concepts and skills in the unit and suggestions of simple activities parents can do at home with their children to explore math concepts further and continue to develop number sense. The parent letters have been translated into Spanish. Many activities, particularly in the primary grades, include special explorations for parents. The Teacher Implementation Guide includes a special section with suggestions for working with parents.