

**A PARENT HANDBOOK
TO MATHEMATICS
GRADES K-6**

ICTM

**ILLINOIS COUNCIL OF TEACHERS OF
MATHEMATICS™**

Illinois Council of Teachers of Mathematics™ 1998

The Illinois Council of Teachers of Mathematics™ is a nonprofit organization that promotes, supports, and encourages mathematics education excellence for all educators and students through the ongoing collaboration of more than 2,300 members.

The Illinois Council of Teachers of Mathematics™

- promotes mathematics through research, programs, policy development, annual meetings, and publications;
- promotes statewide access to high standards of mathematics learning, value, and accountability;
- supports equity of opportunity for mathematics learning; and
- provides financial support so that Illinois educators and students are continuously prepared for mathematics to provide success throughout their lives.

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1998

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STATE FARM INSURANCE

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I Hear, I Forget

I See, I Remember

I Do, I Understand

Chinese Proverb

Dear Parents,

Parents are often frustrated by not knowing enough about their children's math programs to help them or by not understanding the mathematics their children are studying. One of the major concerns of a parent is how **you** can help your child improve mathematics learning. The primary purpose of this handbook is to provide parents with some suggestions of things they can do at home to help their child.

Parents should realize that the mathematics instruction their children receive may be very different from the mathematics instruction they received in their own school experiences. Mathematics in our schools is no longer just arithmetic and basic skills. Today, mathematics instruction is richer in problem-solving, reasoning, communication, and making mathematical connections with the real world.

The education of our children is one of the most important tasks facing our nation. This is a task that requires the efforts of all responsible citizens of the United States.

The Illinois Council of Teachers of Mathematics™ (ICTM) is a professional organization dedicated to the improvement of mathematics teaching and learning at all levels. The dedication is supported by the National Council of Teachers of Mathematics (NCTM) and the Illinois State Board of Education (ISBE). This commitment extends beyond the school and includes the improvement of mathematics in the homes and communities of our children.

As our children progress through mathematics, it is essential that they develop an ability to visualize spatial relationships (geometry, measurement, patterns), to approximate (estimation and number sense), to interpret data (probability and statistics), to reason mathematically (logical thinking and reasoning), and to know why it is important to study and know mathematics.

Problem-solving skills include the ways in which people learn how to think about a problem using such strategies as looking for patterns, drawing a picture, working backwards, working with a partner, or eliminating possibilities. When your child has a variety of strategies, this allows him/her different ways to start looking at a problem and relieving the frustration of not knowing how or where to begin. The more strategies your child has, the more confident he/she becomes, the more willing he/she is to tackle new problems, and the better problem solver he/she will become.

Hands-on materials include using concrete objects (blocks, beans, pennies, etc.) or manipulative materials and models to help your child understand what numbers and space means, and to help them solve problems.

To help your child understand the importance of mathematics, it is necessary for parents to talk about mathematics and identify how it relates to all aspects of life - at home, at work, and at play.

Educators, parents, and our children must understand that learning mathematics, as with all learning, takes hard work, discipline, and a commitment on the part of everyone to ensure success.

Sincerely,
Illinois Council of Teachers of Mathematics™

WHAT TO LOOK FOR IN A MATH CLASSROOM

Mathematics is the language of the 21st century. Thinking, reading, writing, picturing, and talking about mathematics are basic skills that help us understand and explain our world.

A math classroom should provide practical experience in mathematical skills that prepare students for the real world. Mathematical skills go beyond memorization and extend into a world of problem solving and reasoning.

Help your schools to provide the best mathematics available. When you look into a classroom, you should observe the following actions by students and teachers.

Students are . . .

- √ **using math manipulatives (such as blocks, tangrams, and scales), technology (such as calculators and computers), as well as textbooks.**
- √ **applying math to real-life problems and not just practicing isolated skills.**
- √ **working independently, as well as interacting with other students.**
- √ **working actively together in groups to test solutions to problems.**
- √ **working in teams to challenge and defend possible solutions to enable students to learn from one other.**
- √ **seeking a best solution among several solutions to a problem, explaining to others how the solutions were reached, and defending the choice of one solution over another.**
- √ **communicating mathematical ideas to one another through examples, demonstrations, models, drawings, and logical arguments.**

Teachers are . . .

- √ **developing skills, facilitating student learning, and creating real-life learning situations.**
- √ **moving around the room to keep students engaged in productive work.**
- √ **establishing and maintaining high expectations for the students.**
- √ **encouraging students to gain mathematical competence and confidence by finding their own solutions.**
- √ **guiding students in exploring multiple solutions to any problem and challenging them to think.**
- √ **guiding students in making appropriate use of technology and math manipulatives.**
- √ **promoting student use of creativity, inquiry, and higher levels of learning.**
- √ **bringing a variety of learning resources into the classroom to increase learning opportunities for all students.**
- √ **using assessment that focuses on problem solving and understanding rather than on memory and speed.**
 - √ **making mathematical connections between disciplines to show how math is a part of other subjects that students are studying.**
 - √ **helping all students to explore career opportunities that use the mathematics they are learning.**

PARENTS ARE THEIR CHILD'S MOST IMPORTANT TEACHER

Parents can help their child(ren) succeed in mathematics by . . .

- Encouraging your child to attend school everyday, to be prepared, to do his/her very best, and to value education and learning.
- Being positive about your own and your child's mathematics ability.
- Showing a real interest in your child's assignments and homework and being available to assist, if necessary.
- Talking with your child about his/her mathematics learning experiences at school.
- Discussing with your child the importance of mathematics in his/her daily life and pointing out examples of how people use mathematics in daily life.
- Providing activities and objects that make mathematics interesting and fun at home.
- Encouraging your child to ask questions, solve problems, and to explain his/her solutions.
- Modeling how to solve math problems.
- Challenging your child in his/her areas of math strengths and providing support in areas of math weaknesses.
- Communicating often with your child and his/her teacher about your child's mathematical progress, and ask how you can help at home.
- Familiarizing yourself with books, games, resources, web sites, and television programs that encourage mathematics learning.
- Becoming actively involved in your child's school experiences through volunteering to help out in the classroom, by preparing necessary materials outside of the classroom, and or by helping to organize Math Fairs and/or Family Math Nights.
- Continuing to learn mathematics with your child!

WELCOME MATHEMATICS IN YOUR HOME

Have these available in your home . . .

GAMES

board games, dice, cards, dominoes, tri-ominos, bingo, checkers, chess, strategy games

CALCULATORS

CALENDARS

CAMERAS

COMPUTER

CONSTRUCTION SETS

blocks, tangrams, attribute blocks, Legos, puzzles, model kits, Etch-A-Sketch

KALEIDOSCOPIES

MAPS and SCHEDULES

MATH CD ROMS and VIDEOS

MATH ORIENTED BOOKS and MAGAZINES maze books, DynaMath, Highlights

MEASURING OBJECTS measuring cups, rulers, protractor, compass, tape measure, scales, balance, clocks, watches

NEWSPAPERS and CATALOGS

PENCILS and PAPER Origami supplies

SMALL OBJECTS buttons, coins, poker chips, dried beans, toothpicks

HELP YOUR CHILD SEE HOW MATHEMATICS IS A PART OF DAILY LIFE

Parents and other family members can influence their student's math skills. Perhaps you do not realize it, but whenever you sort objects, read maps or schedules, compare prices, make change, or use a calculator or calendar, you are a model of mathematical behavior. When you measure, weigh, work with family finances, or figure out how much wallpaper will cover a wall, you are a living textbook!

The best help you can give your student in math is simply to make your child aware of when and how to use math. Whenever possible, talk through activities with your child and encourage him/her to take part in them. Think out loud, make estimates, check them, correct mistakes, and try more than one way to solve a problem. When you do, you provide your child with important experiences in mathematical thinking.

Here are a few math activities that **you** can do with your child . . .

Estimation Activities -

1. Young children can estimate by using items like pencils, crayons, or parts of their own bodies. Older children can use regular units of measurement like rulers or measuring cups and spoons.
2. Ask your child to guess the number of items in your home. Make a list. Then count them together. Examples may include pillows, windows, doors, chairs, and shoes. Then compare estimates with an actual count. Make comparisons between items to help young children understand the concepts of "more" or "less" and put them into categories.
3. Ask your child to determine how much time he/she will have to wait until his/her favorite TV program comes on.
4. Have your child estimate how many minutes or hours he/she spends watching TV each evening, weekend, or during an entire week.
5. Have your child complete his/her own height and weight charts. Begin by estimating, actually measure, and then graph the information. Keep a record over a period of time.

Traveling Activities -

1. Discuss directions (north, south, east, and west) to give your child a sense of coordinates. Have child use street maps to find travel routes and addresses and estimate the time of your arrival and compare that to the actual time it took to arrive at a given destination.
2. Have competitions when traveling. Have child count red cars or see who can find the largest number formed by the numerals on a license plate.
3. Have child practice, record, and read the large number on license plates viewed. Find the largest number in a given time period of travel.
4. Have child estimate, then time how long before a street light changes. Estimate, then count how many stores are in a block.
5. Point out speed limits and distances between towns. Talk to child about the time it takes to get from one town to another when you drive at different speeds.
6. Have child practice reading the numbers on the odometer.
7. Have child check odometer in the car to determine distances on a trip - starting point and ending destination.
8. Have child find the differences between certain distances traveled. Find out how much farther you traveled on the first day than you did on the second day.

Cooking/Shopping Activities -

1. Let child help with the cooking by measuring the ingredients and checking cooking times and temperatures. Older children can increase or decrease recipes.
2. Have child figure out how to cut a pizza, cake, pie, or sandwich for different numbers of people.
3. Have child determine how much or how many of a grocery item is needed for the entire family, or how much is needed for a given recipe.
4. Have child check a grocery receipt to find five items that add up to less than \$1.00, \$5.00, or \$10.00.
5. Let child help with the shopping by checking and comparing prices, weights, and quantities. Allow him/her to use a calculator to make these comparisons as he/she also keeps track of the total cost of your purchases. If available, allow your child to use the calculator on the shopping cart to keep track of how much money is being spent on groceries while you shop.
6. Have child determine how much change you will receive once you've paid the clerk. Older children can practice writing a check for the total amount of the grocery bill.
7. Using catalogs or newspapers, have child spend a specified unit of money (figure in tax, shipping, and handling charges) and complete order forms.
8. Have child look at the sales flyer and determine how much money you could save by buying the sale items.
9. Have child determine and select the "best buys" and then prepare the shopping list (i.e., one item costs \$7.50 and 2 items cost \$14.00).
10. Notice large and small numbers all around in magazines and newspapers and have child practice reading the numbers (i.e., weather, cost of a new car, grocery items, price of toys, etc.).
11. Have child determine how much a single item costs that is sold by the package (i.e., a single roll of toilet tissue purchased in a four-pack, one roll of paper towels purchased in a two-pack, the price of one can of soda packaged in a box of 12 or 24, etc.).

Household Activities -

1. Have child see what items in the house come in sets of two (hands, feet, shoes), sets of six (cans of soda), and sets of twelve (eggs in a carton).
2. Have child help with the laundry by matching the socks, sorting the clothing into appropriate colors, discussing clothing size according to each family member.
3. Have your child determine how much laundry soap to use per load size.
4. Have your child graph daily chores, money earned from chores, and/or purchases.
5. Have children find pictures or items that are sold in sets (i.e., 4 batteries to a package) and have them determine how many batteries there would be in three packages.

Playing -

1. Encourage child to play games that involve counting, finding patterns, using strategy, and solving patterns.
2. Allow child to use a calculator and encourage "messing around" with it to explore numbers, look for patterns, and investigate number patterns.
3. Relate sports and the stock market to mathematics. The daily newspaper is full of scores, schedules, statistics, and graphs.
4. Card games provide excellent opportunities for learning math concepts. "Go Fish" and "War" helps younger children to recognize numbers and things that are alike, to group and sort, and to use strategy in discarding to win. Gin Rummy, Casino, Canasta, and Cribbage are more complex card games for older children.
5. Ask child questions that require simple mental math. Use questions such as, "What are two numbers that add up to 7? What number is two less than 17? Eighteen is twice as big as what number? Can you name two numbers that multiply to 12 at the same time they add up to 7?"
6. Play math "Jeopardy" with your child. Give child a number and ask him/her to find a question for which the number is the answer.
7. Plan art activities that use measurement, patterns, and/or geometry.
8. Plan math scavenger hunts and have child look for lists of specific math related items (i.e., geometric shapes, number of items, etc.) in the house, yard, or in the neighborhood.
9. Have child design and make his/her own math practice games.

PARENTS' TIPS FOR HELPING WITH HOMEWORK

Parents can . . .

- √ **set aside a regularly scheduled time for your child to complete his/her homework**
- √ **provide a quiet environment for your child to work**
- √ **be positive about your child's efforts**
- √ **offer guidance, NOT solutions**
- √ **help your child explain what is being asked**
- √ **have your child "tell a story" that illustrates the problem**
- √ **point out real life applications of the problems**
- √ **keep lines of communication between home and school open so you are aware of mathematical concepts being discussed in class**

Note To Parents: If you have a question or concern about your child's mathematics, you should talk to the following people in the **order** listed below.

- 1. Your child**
- 2. Your child's teacher**
- 3. Principal**
- 4. Director of Curriculum and Instruction**
- 5. Superintendent**

WHAT ROLE SHOULD TECHNOLOGY PLAY IN MATHEMATICS' EDUCATION?

Calculators, computers, and other technology are driving what our students need to know. Today, students must learn when it is appropriate to use technological tools in mathematics as well as how to use them. Our students must learn to think of technology as a tool they can readily and easily access and use to supplement, reinforce, and expand their problem solving skills.

Our students will be using all types of technology as they study mathematics, and calculators often receive a good deal of emphasis in the math curriculum. Although calculators should never replace learning basic operations, they certainly make a significant contribution to student learning. The National Council of Teachers of Mathematics has identified the following ways in which calculators may assist student learning:

- ◇ **To teach students to experiment with technology in order to instill creativity.**
- ◇ **To show students how to use calculators in everyday life.**
- ◇ **To reinforce addition, subtraction, multiplication, and division facts.**
- ◇ **To teach students how a step-by-step process works and what the process is all about.**
- ◇ **To serve as a flexible, instant "answer key."**
- ◇ **To solve problems that previously have been too time-consuming or impractical to be done with paper and pencil.**
- ◇ **To formulate generalizations from patterns of numbers that are displayed.**
- ◇ **To increase student confidence in problem solving.**

WHY MODIFY THE MATH CURRICULUM?

In 1989, the National Council of Teachers of Mathematics (NCTM) published a document designed to establish the Curriculum and Evaluation Standards for School Mathematics. This document provides a broad framework to guide reform in school mathematics and a national vision for effective mathematics curricula.

The Illinois Council of Teachers of Mathematics supports the NCTM Standards as the foundation for improving mathematics for the State of Illinois. The state's goal is to integrate the philosophies, beliefs, and content of the national document as a basis for change so that the teaching and learning of mathematics in Illinois schools is continuously improving and changing to meet the needs of and to better prepare our students for the 21st century.

The NCTM Standards suggest that **All** students . . .

- ◇ **learn to value mathematics**
- ◇ **become confident in their abilities to do mathematics**
- ◇ **become mathematical problem solvers**
- ◇ **learn to communicate mathematically**
- ◇ **learn to reason mathematically**

NCTM STANDARDS

The Standards suggest **FIVE** major shifts in mathematics education . . .

AWAY FROM:

**Classrooms as simply a
collection of individuals**

**The teacher as the sole
authority for right answers**

**Merely memorizing
procedures**

**An emphasis on mechanistic
answer-finding**

**Treating mathematics as a
body of isolated concepts
and procedures**

TOWARD:

**Classrooms as
mathematical
communities**

**Mathematical evidence as
verification**

**Logical and mathematical
reasoning**

**Conjecturing, inventing,
and problem-solving**

**Connecting mathematics,
its ideas, and its
applications**

WHAT ARE THE NCTM MATHEMATICS CURRICULUM STANDARDS OUR STUDENTS WILL STUDY?

CORE CURRICULUM	K-4	5 - 8
Standards 1 & 3	Problem Solving and Reasoning	Problem Solving and Reasoning
Standard 2	Mathematics as Communication	Mathematics as Communication
Standard 4	Mathematical Connections	Mathematical Connections
Standard 5	Estimation	Number and Number Relationship
Standard 6	Number Sense and Numeration	Number Systems and Number Theory
Standard 7	Concepts Whole Number Operations	Computation and Estimation
Standard 8	Whole Number Computation	Patterns and Functions
Standard 9	Geometry and Spatial Sense	Algebra
Standard 10	Measurement	Statistics
Standard 11	Statistics and Probability	Probability
Standard 12	Fractions and Decimals	Geometry
Standard 13	Patterns and Relationships	Measurement

THE ILLINOIS LEARNING STANDARDS FOR MATHEMATICS

The Illinois Learning Standards for Mathematics were developed by Illinois teachers for Illinois schools. They are the outgrowth of the 1985 Illinois State Goals for Learning and the 1989 NCTM Standards. The Illinois Learning Standards for Mathematics suggest that all students in Illinois schools need to have the opportunity to engage in learning experiences that foster mastery of these goals and standards. It is believed that those students reaching these goals and standards will have an understanding of how numbers are used and represented; use basic operations to both solve everyday problems and confront more involved calculations in algebraic and statistical settings; be able to read, write, visualize and talk about ways in which mathematical problems can be solved in both theoretical and practical situations; and be able to communicate relationships in geometric and statistical settings through drawings and graphs.

According to the Illinois Learning Standards for Mathematics, these skills will provide Illinois students a solid foundation for success in the workplace, a basis for continued learning about mathematics, and a foundation for confronting problem situations arising throughout their lives.

The Illinois Learning Standards for Mathematics emphasize the following applications of learning:

- ◇ **Solving Problems - recognize and investigate problems; formulate and propose solutions supported by reason and evidence.**
- ◇ **Communicating - express and interpret information and ideas.**
- ◇ **Using Technology - use appropriate instruments, electronic equipment, computers and networks to access information, process ideas and communicate results.**
- ◇ **Working on Teams - learn and contribute productively as individuals and as members of groups.**
- ◇ **Making Connections - recognize and apply connections of important information and ideas within and among learning areas.**

WHAT ARE THE ILLINOIS MATHEMATICS STATE GOALS OUR STUDENTS WILL STUDY?

STATE GOAL: Demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios, and proportions.

Learning Standards

- A. Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings.
- B. Investigate, represent and solve problems using number facts, operations (addition, subtraction, multiplication, division) and their properties, algorithms and relationships.
- C. Compute and estimate using mental mathematics, paper-and-pencil methods, calculators and computers.
- D. Solve problems using comparison of quantities, ratios, proportions and percents.

STATE GOAL: Estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.

Learning Standards

- A. Measure and compare quantities using appropriate units, instruments and methods.
- B. Estimate measurements and determine acceptable levels of accuracy.
- C. Select and use appropriate technology, instruments and formulas to solve problems, interpret results and communicate.

STATE GOAL: Use algebraic and analytical methods to identify and describe patterns and relationships in data, solve problems and predict results.

Learning Standards

- A. Describe numerical relationships using variables and patterns.
- B. Interpret and describe numerical relationships using tables, graphs and symbols.
- C. Solve problems using systems of numbers and their properties.
- D. Use algebraic concepts and procedures to represent and solve problems.

STATE GOAL: Use geometric methods to analyze, categorize and draw conclusions about points, lines, planes, and space.

Learning Standards

- A. Demonstrate and apply geometric concepts involving points, lines, planes and space.
- B. Identify, describe, classify and compare relationships using points, lines, planes and solids.
- C. Construct convincing arguments and proofs to solve problems.

STATE GOAL: Collect, organize and analyze data using statistical methods; predict results; and interpret uncertainty using concepts of probability.

Learning Standards

- A. Organize, describe and make predictions from existing data.
- B. Formulate questions, design data collection methods, gather and analyze data and communicate findings.
- C. Determine, describe and apply the probabilities of events.

TARGET WORDS/CONCEPTS ADDRESSED IN THE MATHEMATICS CURRICULUM STANDARDS AND STATE GOALS

Primary Level - Grades K-3

add	greater than	remainder
area	length	rotation
average	less than	scales
bar graph	line graph	slide
Celsius	mean	sphere
certainty	multiply	spin
circle graph	odd	square
combinations	pattern	straight line
coordinates	perimeter	subtract
decimal	probability	sum
diameter	product	symmetry
difference	quotient	triangle
divide	radius	turn
double	range	Venn Diagram
estimate	reciprocal	whole number
even	rectangle	width
flip		

Elementary Level - Grades 4-6

absolute value	graph	proportion
acute angle	histograph	Pythagorean Theorem
adjacent	hypotenuse	quadrilaterals
angle	integer	random
base	intersection	ratio
box plot	isosceles	rational number
centigrade	mark down	revolution
centimeter	median	right angle
circle	midpoint	right triangle
circumference	mode	sale price
consecutive	multiple	speed
cube	negative number	square number
denominator	numerator	square root
diagonal	opposite	surface area
digit	original price	symmetrical
dimensions	ounces	tessellation
discount	parallel	triangular number
equation	percent	triple
exponent	perpendicular	twice
factor	pint	unit of measure
flow chart	place value	variable
fraction	positive number	volume array
frequency	pound	x-axis
gallon	prediction	y-axis
geometry	prime number	

MATHEMATICS LITERATURE FOR CHILDREN

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MATH RESOURCES FOR PARENTS

Organizations and Associations

Illinois Council of Teachers of Mathematics™ (ICTM)
PCC
P.O. Box 340
Park Forest, IL 60466-0340

Illinois State Board of Education (ISBE)
100 North First Street
Springfield, IL 62777-0001

National Council of Teachers of Mathematics (NCTM)
1906 Association Drive
Reston, VA 22091-1593

National Congress of Parents and Teachers
The National PTA
700 North Rush Street
Chicago, IL 60611

Office of Educational Research and Improvement (OERI)
U.S. Department of Education
Washington, D.C. 20208-5648

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MATH WEB SITES

AIMS Educational Foundation
www.aimsedu.org/AIMSalt.html

Bob's Internet Source
<http://u-r.inept.org/bob/webhelp.htm>

Cut The Knot - Games, Quotes, and Mathematical Topics
www.cut-the-knot.com

Eisenhower National Clearinghouse (ENC)
<http://enc.org/>

Illinois Council of Teachers of Mathematics
www.ictm.org

Illinois Mathematics and Science Transformation
www.isbe.state.il.us

Mathematics Problem Solving Task Centers
www.srl.rmit.edu.au/mav/PSTC/index.html

Math Teacher Link
www-cm.math.uiuc.edu/mtl/

MacTutor History of Mathematics
www-groups.dcs.st-and.ac.uk:80/~history/

National Council of Supervisors of Mathematics
<http://forum.swarthmore.edu/~ncsm/>

Public Broadcasting Service (Mathline; Ready to Learn)
www.pbs.org

TeachNet
www.teachnet.org

The Largest Known Primes
www.utm.edu/research/primes/largest.html

American Mathematical Society
www.ams.org/new-in-math/home.html

Community Update - US Department of Education
www.ed.gov/G2K/community

Eastern Illinois Uni. Mathematics Education
www.ux1.eiu.edu/~cfmog/

Houghton Mifflin Mathematics Center
www.eduplace.com/math/index.html

Illinois Mathematics and Science Academy
www.imsa.edu

Math Forum
<http://forum.swarthmore.edu>

MathsNet
www.anglia.co.uk/education/mathsnnet/index.html

Mathematics Hot Lists
<http://sln.fi.edu/tfi/hotlists/math.html>

Metropolitan Mathematics Club of Chicago (IL)
www.glenbrook.k12.il.us/gbsmat/MMC/MMC.html

National Council of Teachers of Mathematics
www.nctm.org

Public Understanding & Engagement in Math Init.
www.ed.gov/inits.html#2

The Geometry Junkyard
www.ics.uci.edu/~eppstein/junkyard

The School Page
www.eyesoftime.com/teacher/

The Teacher Web Page

www.geocities.com/SunsetStrip/Palms/2605/teacherpage.html

Third International Mathematics and Science Study (TIMSS)

www.ed.gov/NCES/timss>

Voluntary National Tests in Reading and Math

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