

Ideas for Improving CMT and CAPT Performance in Mathematics

Questions for Assessing How Well Prepared Students Are for the CMT and the CAPT

(taking a proactive positive toward state assessment)

1. Is the testing environment conducive to students doing their best work?

- Testing should be done in well-lit classrooms
- Teacher/proctors should be well-prepared
- All necessary materials should be present, having been checked the day before the testing
- All student should have eaten breakfast

2. Are students knowledgeable about the test and familiar with test formats?

- Students should have completed and discussed practice test materials
- students should have read the appropriate CMT or CAPT brochures
- Students should have practiced grid-in procedures and should be familiar with open-ended items formats

3. Are teachers familiar with test specifications?

- Teachers should have reviewed and discussed test objectives or specifications
- Teachers should be familiar with and using CMT and CAPT Handbooks
- Teachers should have seen released forms of the CMT and released CAPT items.

4. Have appropriate content reviews been conducted?

- During September, 4th, 6th and 8th grade teachers should incorporate review of skills and competencies that students will face on the CMT
- During April, 10th grade teachers should incorporate released CAPT items and sample CAPT tasks into classroom and homework

5. Are students given the message that the tests are important and need to be taken seriously?

- Parents should be informed about the testing - perhaps using one of the CMT or CAPT brochures - and reminded to tell their children that CMT and CAPT scores are important
- Teachers should set a clear and consistent tone for students that the CMT and CAPT are important indicators of how well students are performing academically
- School should consider conducting special events before, during, or just after CMT or CAPT testing to better communicate the importance of taking these tests seriously

6. Are the curriculum and instruction effectively aligned with test content?

- Curriculum modifications should have been made to assure alignment with CMT and CAPT objectives
- Teachers should regularly use realistic problems and current issues to apply academic skills
- Teachers should regularly present open-ended problems with a variety of appropriate solutions, and use student work to focus on thinking and reasoning skills
- Teachers should regularly ask for oral and written explanations that focus on justifying answers and explaining reasoning
- All professional observations and supervision should incorporate discussion of these practices

PREPARING STUDENTS FOR THE MATHEMATICS CAPT

Questions Often Asked, Things To Do

1. **How can we best assure that our students are sufficiently familiar with test formats?**
 - Make full use of practice tests for at least the week before the CAPT so that students are familiar with grid-in procedures and open-ended items.
 - Make full use of released items for at least the month before the CAPT so that students fully understand item formats, the four-point scoring rubric, and what is expected of them.
 - Incorporate sample tasks from the *CAPT Mathematics Handbook* into ongoing instruction in Grades 8, 9 and 10 so that students are experienced with performance tasks.
2. **How can we best assure that our students are sufficiently encouraged to take the CAPT very seriously?**
 - Share and discuss the CAPT brochure for students ("The CAPT and You") in Grade 10 classes prior to testing.
 - Make sure that students understand the importance of the CAPT Certificate of Mastery and its potential implications for college admission and employment.
 - Send notes home with the CAPT brochure for parents ("The CAPT and Your Teen-ager") enlisting parental support for taking the test seriously, including a good night's sleep the nights before and a good breakfast on the days of testing.
3. **Is our mathematics curriculum sufficiently aligned with the CAPT mathematics specifications?**
 - Ensure that all mathematics courses in Grades 7 through 10 – including traditional algebra and geometry courses – include a blend of new work and review work in the areas of number, statistics, algebra **and** geometry.
 - Make calculators – preferably graphics calculators – everyday components of **all** middle school and high school mathematics instruction.
 - Continue to provide curriculum and instruction which provides ample opportunity to solve real-world problems that apply computational skills and build conceptual understanding of the big ideas of mathematics.
4. **Are our instructional practices sufficiently effective to best prepare students for the CAPT?**
 - Use realistic problems, real-world contexts and current issues to launch instruction and apply mathematical skills and concepts.
 - Consistently ask for oral and written explanations of reasoning and understanding, including "Why?" "How do you know?" "Justify your answer" and "Explain your reasoning."
 - Regularly provide students with open-ended problems with a variety of appropriate solutions or solution paths and focus classroom discourse on alternative approaches to solving problems.
 - Incorporate observation and discussion of these practices into all professional supervision activities.

Nudging Math CAPT Scores Along

- 1. Get Buy-in: A shared belief that the test has value and should be taken seriously.**
- 2. Use Handbook Tasks and Released Items.**
- 3. Closely review item data and build "action plans."**
- 4. Monitor instructional use of "why?", "explain your reasoning", "how do you know."**
- 5. Create and use Grade 9 Pre-CAPT test.**
- 6. Incorporate or embed CAPT-like tasks into all units and on all tests; use self- and peer-scoring.**
- 7. Encourage daily use of writing - to explain, for projects and reports, in journals.**
- 8. Adjust curriculum:**
 - percents and proportions**
 - statistics and data**
 - measurement**
 - which operation and why**
 - calculators**
 - formulas, equations and graphs for all**

Instructional Resources for Implementing High Quality Mathematics Programs

Suggested Instructional Resources for Implementing High Quality Mathematics Programs

The diverse materials suggested in this listing represent a broad sampling of print and non-print, core and supplemental, instructional resources that can assist teachers in implementing high quality mathematics programs. These materials were selected because of their perceived alignment with the vision of the NCTM Standards and with the performance standards delineated in Connecticut's Mathematics Curriculum Framework. While comprehensive, this listing is not exhaustive, and instructional materials not found here may also be valuable resources.

Elementary Level Programs

- Mathematics Their Way (grades K-1) from Addison-Wesley
- Box It or Bag It Mathematics (grades K-2) from Math Learning Center
- Explorations (grades K-2) from Addison Wesley
- Trailblazers (grades 1-5) from Kendall-Hunt Publications
- MathLand (grades 1-6) from Creative Publications
- Everyday Mathematics (grades K-5) from Everyday Learning Corporation
- Growing with Math (grades K-5) from Mimosa Publications
- Investigations in Number, Data and Space (grades 1-5) from Dale Seymour
- Opening Eyes to Mathematics (grades 3-4) from Math Learning Center

Middle School Level Programs

- Mathematics in Context (grades 5-8) from Encyclopedia Britannica
- Visual Mathematics (grades 5-8) from Math Learning Center
- Connected Mathematics (grades 6-8) from Dale Seymour
- Interactive Mathematics (grades 6-8) from Glencoe
- STEM (Six Through Eight Mathematics) from University of Montana

High School Level Programs

- Contemporary Mathematics in Context (grades 9-11) from Everyday Learning
- Interactive Mathematics Program (grades 9-12) from Key Curriculum Press
- Math Connections (grades 9-11) from the Connecticut Business and Industry Association, published by It's About Time
- SIMMS (Systemic Initiative in Montana Mathematics and Science) from University of Montana, published by Prentice Hall
- ARISE (Applications/Reform in Secondary Education) (grades 9-11) from COMAP

Textbooks

- Gateways to Algebra and Geometry (grades 7 or 8) from McDougal-Littell
- Transition Math (grades 7, 8 or 9) from Scott Foresman
- Algebra: Themes, Tools, Concepts from Creative Publications
- Discovering Geometry from Key Curriculum Press
- Advanced Algebra Through Data Explorations: A Graphing Calculator Approach from Key Curriculum Press
- Contemporary Precalculus through Applications from Everyday Learning Corp
- Contemporary Calculus through Applications from Everyday Learning Corp

Replacement Units

- Number Power (grades K-6) from Dale Seymour Publications
- Math by All Means (grades 1-4) Marilyn Burns replacement units from Cuisinaire
- Used Numbers: Real Data in the Classroom (grades K-6) form Dale Seymour Publications
- Math and the Mind's Eye (grades 5-9) from Math Learning Center
- Manuevers with Mathemaitcs (grades 5-8) from Dale Seymour
- Middle Grades Math Project (grades 6-8) from Addison Wesley
- Seeing and Thinking Mathematically (grades 6-8) from Heinemann
- Equals Investigations (grades 6-8) from Dale Seymour Publications
- Fantasy Baseball (grades 6-8) from Dale Seymour Publications
- Data-Driven Mathematics (grades 8-12) from Dale Seymour Publications
- Quantitative Literacy Series (grades 7-12) from Dale Seymour Publications
- Baker's Choice (grades 8-10) from Key Curriculum Press

Supplemental Resources

From Dale Seymour Publications:

- Teach-Stat (grades 1-6)
- Techniques of Problem Solving (TOPS) Decks (grades 1-9)
- TOPS Communication Decks (grades 1-6)
- Problem Solving in Mathematics: The Lane County Mathematics Project (grades 4-9)
- A Collection of Math Lessons (grades 1-3, 3-6, 6-8)
- Critical Thinking Activities (grades 1-3, 4-6, 6-8)
- 50 Problem Solving Lessons (grades 1-6)
- Group Solutions (grades K-4)
- Mega Projects (grades 1-8)
- Wollygoggles and Other Creatures (grades 3-12)
- Puzzle Tanks (grades 3-8)
- Symmystries with Pattern Blocks (grades 3-8)
- Get It Together: Math Problems for Groups (grades 4-12)
- United We Solve: More Math Problems for Groups (grades 5-8)

Supplemental Resources (continued)

From Dale Seymour Publications (continued):

- Spaces (grades 4-10)
- Developing Skills in Estimation (grades 7-9)
- Mental Math in the Middle Grades (grades 4-6)
- Mental Math in Junior High (grades 7-9)
- Guess (grades 4-12)
- More Quizzles (grades 7-12)
- Logic Number Problems (grades 7-12)
- Logic Algebra Problems (grades 9-12)
- Problem of the Week (grades 7-12)
- Algebra Problems: One Step Beyond (grades 7-12)
- Geometry Problems: One Step Beyond (grades 10-12)
- Super Problems (grades 7-9)
- Aha! Insight (grades 7+)
- Aha! Gotcha (grades 7+)
- Quizzles (grades 7-12)
- Algebra Experiments I and II
- The Language of Functions and Graphs (grades 8-12)
- Problems with Patterns and Numbers (grades 9-12)
- Investigating Probability and Statistics using the TI-81 and TI-82 Graphics Calculators (grades 7+)
- Graphing Power: Activities for the TI-81 and TI-82 (grades 6-12)

From Addison- Wesley:

- Developing Number Concepts Using Manipulatives (K-2)
- Problem Solving Experiences in School Mathematics (grades 1-8)
- Make It Simpler (grades 4-8)

From Critical Thinking Books and Software:

- Mathematical Reasoning through Verbal Analysis (grades 2-8)
- Mind Benders (grades K-adult)
- Math Mind Benders (grades 3-adult)
- Classroom Quickies (grades 6-adult)
- Brain Stretchers (grades 5-adult)
- Cranium Crackers (grades 3-adult)
- Building Algebraic Thinking with Progressive Patterns (grades 4-9)
- Scratch Your Brain Where It Itches (grades 1 and up)

From Open Court:

- Willy the Wisher and Other Thinking Stories (K)
- How Deep is the Water (grade 1)
- Measuring Bowser (grade 2)
- Bargains Galore (grade 3)

Supplemental Resources (continued)

From Creative Publications:

- Windows on Math (PreK-2)
- Logic Problems for Primary People (grades 1-3)
- Puddle Questions (grades K-8)
- The Problem Solver: Activities for Learning Problem Solving Strategies (grades 1-8)
- Cooperative Problem Solving series (grades 1-9)
- Hands On..... series (grades K-3) including Attribute Blocks, Base Ten Blocks, Geoboards, LinkerCubes, Pattern Blocks, Pentominoes, Tangrams, and Unifix Cubes
- Moving On with....series (grades 3-5)
- Constructing Ideas series (grades 1-3 and 3-6)
- Connections: Linking Manipulatives to Math (grades 1-6)
- 20 Thinking Questions series (grades 1-6)
- Think About It! Primary Math Problems of the Day (grades 1-3)
- Think About It! Mathematics Activities of the Day (grades 4-8)
- Fractions Factory (grades 3-8)
- Decimal Factory Activity Binder (grades 5-8)
- Job Cards series (grades 3-8)

From Marcy Cook Math Materials:

- Try-A-Tile materials
- Tile Teasers
- Justify Your Thinking
- Team Estimation and Analysis
- Numbers Please! Questions Please!
- Reason Together
- any many task cards and books

From Other Sources:

- Curriculum and Evaluation Addenda Series (grades K-12) from NCTM
- Packets Activity Units (grades 6-8) from Houghton-Mifflin
- Problem-A-Day (grades 1-8) from McDougal-Littell
- Calculator Cards (grades 1-3) from Mimosa
- Family Math from Dale Seymour
- The New Mathematics Library from the Mathematical Assn. of America
- HiMAP modules from COMAP
- Quantum Magazine from the National Science Teachers Assn.

Software

From Sunburst:

- Hot Dog Stand: The Works (grades 5+)
- The Pond (grades 2-6)
- Safari Search (grades 3-8)
- Puzzle Tanks (grades 3-8)
- How the West Was One + Three x Four (grades 4-8)
- How the West Was Negative One (grades 6-10)
- Green Globes and Graphing Equations (grades 9+)
- The Super Factory (grades 6+)
- Blockers and Finders (grades 2+)
- Building Perspective (grades 4+)
- The King's Rule (grades 4-8)

From Other Sources:

- Tenth Planet Explores Primary Math: Geometry Units (grades K-3) from Tenth Planet, Half Moon Bay, CA
- MathKeys from MECC
- TesselMania from MECC
- The Geometer's Sketchpad 3 from Key Curriculum Press
- DataWonder! from Addison Wesley
- Money, Time and Measurement from IBM

Calculators

K-4: A 4-function calculator

5-8: A fraction/scientific calculator (e.g., TI Math Explorer)

7-12: A graphics calculator (e.g., TI-83)

Videos

From Key Curriculum Press:

- Three Dimensional Geometry
- The Platonic Solids
- The Stella Octangula
- The Fractal Geometry of the Mandelbrot Set

From NCTM:

- Similarity
- The Theorem of Pythagoras
- Sines and Cosines, parts 1 and 2
- The Story of Pi

Videos (continued)

From COMAP:

- Statistics: Decisions Through Data
- Geometry: New Tools for New Technologies

From Cuisenaire:

- Marilyn Burns: What are You Teaching My Child
Assessing Understanding (2-8)
Manipulatives Series (K-6)
Teaching for Understanding (K-6)
Middle School Mathematics (6-8)
- Kathy Richardson: A Look at Children's Thinking

From GPN:

- Square One Fun and More Square One Fun (5-8)
- Mathnet (5-8)

From Annenberg/CPB:

- Teaching Math: A Video Library (K-4, 5-8, 9-12)

Manipulative Materials

The commercially available manipulative materials listed below are basic to a developmentally based mathematics program. The quantities listed are for a classroom of 20 students. These quantities give the teacher and students ready access to materials for whole class activities as well as allow for the establishment of a series of learning stations so that students may use the materials as they proceed at their own pace.

- Kindergarten: Pattern Blocks (5 tubs)
 Unifix Cubes (1000 cubes)
 Primer Balance (1)
 Color Cubes (2 sets)
 Additional materials such as Legos, Lincoln Logs, and
 other building materials, plus beansticks and
 set boards
- Grade 1: Pattern Blocks (5 tubs)
 Unifix Cubes (1000 cubes)
 Geoboards (20)
 Primer Balance (1)
 Color Cubes (3 sets)
 ESS Attribute Blocks (6 - 8 sets)
 Additional building materials, beansticks and set boards

Grades 7 and 8: Pattern Blocks (5 tubs)
 Base Ten Blocks (2 intermediate classroom sets)
 Cuisenaire Rods (12 trays of 74 rods)
 Geoboards (25)
 Color Tiles (3 sets)
 Tangrams (25 sets)

Miscellaneous Resources

- The Daily USA Today
- The latest Guinness Book of World Records

Vendor Addresses

Addison Wesley, One Jacob Way, Reading, MA 01867 800-521-0011
Annenberg/CPB, Box 2345, South Burlington, VT05407 800-965-7373
COMAP, Suite 210, 57 Bedford St., Lexington, MA 02173 800-772-6627
Creative Publications, 5623 W. 115th St., Worth, IL 60482 800-624-0822
Critical Thinking Books and Software, Box 448, Pacific Grove, CA 93950
800-458-4849
Cuisenaire, Box 5026, White Plains, NY 10602 800-872-1100
Dale Seymour Publications, Box 5026, White Plains, NY 10602 800-872-1100
Encyclopedia Britannica Educational Corporation, 310 South Michigan Ave,
Chicago, IL 60604
Everyday Learning Corporation, Box 812960, Chicago, IL 60681 800-382-7670
Glencoe, 15319 Chatsworth St., Mission Hills, CA 91345 800-423-9534
GPN, Box 80669, Lincoln, NE 68501 800-228-4630
Heinemann, 361 Hanover St., Portsmouth, NH 03801 800-541-2086
It's About Time, 84 Business Park Drive, Armonk, NY 10504
Key Curriculum Press, Box 2304, Berkeley, CA 94702 800-995-MATH
The Learning Center, Box 3226, Salem, OR 97302 503-370-8130
Marcy Cook Math Materials, P.O. Box 5840, Balboa Island, CA 92662McDougall
Littell, Box 1667, Evanston, IL 60204 800-462-6595
Mimosa, 90 New Montgomery St, Suite 1414, San Francisco 94105
800-443-7389
National Council of Teachers of Mathematics, 1906 Association Drive,
Reston, VA 22091 800-235-7566
Open Court, 315 Fifth St., Peru,IL 61354 800-435-6850
Prentice Hall, Rt. 9, W. Sylvan Ave., Englewood Cliffs, NJ 07632
800-848-9500
Sunburst, Box 100, Pleasantville, NY 10570 800-321-7511

Other Resources for Building Effective Programs



Mathematics into the 90s and Beyond

1. Conditions have changed, society's needs, employment needs and student needs have shifted:

- technology is everywhere;
- we are bombarded by data;
- world of work and need for mathematically literate workers;
- need for life long learners and an informed electorate;
- we know far more about how students learn,

meaning we need MORE MATH, BETTER MATH, FOR MORE KIDS!

2. So curriculum and instruction must shift:

- from skills to concepts and applications
- from abstract to concrete and pictorial
- from written to written and oral
- from formal to more intuitive
- from individual work to group work
- from exclusively paper and pencil to technology
- from isolated skills without context to contextualized instruction
- from addition, subtraction, multiplication and division to buying and selling, comparing, measuring, predicting, interpreting and visualizing
- from arithmetic to number, change, chance, shape and dimension
- from answers to solutions with explanations
- from how to how, when and WHY?

3. Enabling conditions for giving ALL students access:

- context
- collaboration
- technology
- materials

4. Overall outcomes:

- thinking and reasoning capabilities
- problem solving confidence and capability
- ability to communicate mathematically
- number sense, spatial sense, data sense, symbol sense

Three Practical Strategies for Improving Mathematics Achievement

Here are three straightforward strategies for raising mathematics achievement that teachers are urged to consider and adopt:

1. Ongoing Review. Almost no one masters something new after one or two lessons and one or two homework assignments. That's why one of the most effective strategies for fostering retention and mastery is **daily, cumulative review** at the beginning of every class. Some teachers call it warm-ups, others call it daily mini-math. Some days it's delivered orally, other days it's written on the board or shown on the overhead. But everyday it's 5 to 8 quick problems to keep skills sharp. Everyday teachers present:

- a **fact** of the day (e.g., 7×6);
- an **estimate** of the day (e.g., if one item costs 32¢ and another costs 29¢, about how much will it cost to buy both items?)
- a **measurement** of the day (e.g., about how many meters wide is our classroom?)
- a **place value** problem of the day (e.g., what number is 100 more than 1584?)
- a **word problem** of the day and any other exercises or problems that reinforce weaker, newer, or needed skills and concepts.

2. De-emphasizing Irrelevant Skills. An amazing amount of time and energy is still expended - by you and by your students - on skills no longer considered important, nor even assessed on the CMT, the CAPT or the SAT! Teachers need to give each other permission to skip textbook pages that no longer serve a useful purpose. This will free up valuable time for increasingly important skills like estimation and problem solving. So give yourself and your colleagues permission to omit such things as:

- pencil and paper multiplication problems with two-digit or larger factors (3 digits by 1 digit should be enough);
- paper and pencil division problems with two-digit or larger divisors (4 digits by 1 digit should be enough);
- computation with fractions and mixed numbers with unreasonable denominators like sevenths or ninths (halves, fourths, eighths; thirds and sixths; fifths and tenths should be enough).

3. Asking "Why?" But probably the best way to implement a thinking curriculum, to help focus on alternative approaches, and to create a language rich classroom, is by regularly asking "**Why?**" or "**How do you know?**" or "**Can you explain what you did and why you did it?**" A student who can explain his or her answer usually has a stronger understanding of mathematics. Classrooms where students are regularly explaining how and why - in groups and in whole class discussions - help other students learn mathematics. So monitor yourself, or ask your students to monitor how often you ask "why" - especially when students call out correct answers.

Produced by Steve Leinwand and Mari Muri, CT State Department of Education

INSTRUCTIONAL PRACTICES



Teachers provide the environment in which students learn to reason logically, find solutions to problems, find the connections among mathematical concepts and between mathematics and other disciplines, and learn to communicate their growing mathematical understandings.

Do K-12 teachers of mathematics:

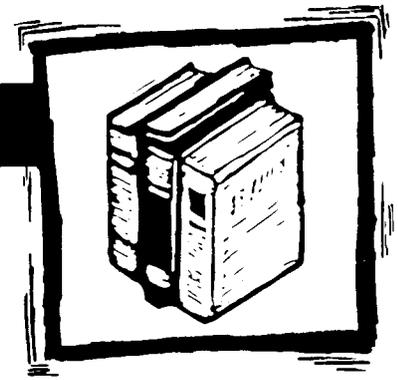
1. Provide all students with equal opportunities to engage in worthwhile mathematical tasks?
 Yes No
 A F S N
2. View problem solving as a process that should permeate the entire mathematics program and provide the context in which concepts and skills can be learned?
 Yes No
 A F S N
3. Appeal to a variety of learning styles in both instruction and assessment?
 Yes No
 A F S N
4. Develop concepts using multiple representations (concrete, geometrical, graphical, numerical, symbolic)?
 Yes No
 A F S N
5. Help students develop spatial relationships and reasoning?
 Yes No
 A F S N
6. Use questioning techniques that encourage higher order thinking skills?
 Yes No
 A F S N
7. Monitor and adjust instruction according to student needs?
 Yes No
 A F S N
8. Use manipulatives routinely?
 Yes No
 A F S N
9. Provide frequent opportunities for students to conjecture, explain, predict, and defend their ideas in a variety of ways?
 Yes No
 A F S N
10. Encourage students to share mathematical reasoning, understandings, and strategies for mathematics learning?
 Yes No
 A F S N
11. Encourage students to model, represent, and reflect on mathematical ideas and situations in written, oral, and pictorial forms?
 Yes No
 A F S N

A = Always F = Frequently S = Sometimes N = Never

12. Encourage students to use mathematical language, vocabulary, and notation to represent ideas, describe relationships, and model situations? Yes No
 A F S N
13. Provide frequent opportunities for students to participate in collaborative learning experiences? Yes No
 A F S N
14. Give students opportunities to explore open-ended problems that have multiple solutions? Yes No
 A F S N
15. Recognize relationship among different topics and make connections both within mathematics and with other curricular areas? Yes No
 A F S N
16. Provide students with experiences to demonstrate the power and usefulness of mathematics in the world around them? Yes No
 A F S N
17. Provide activities which help students select appropriate computation strategies among estimation, mental math, pencil and paper, calculators, and computers? Yes No
 A F S N
18. Use calculators and computers to assist students in discovering and investigating mathematical concepts? Yes No
 A F S N
19. Ensure that each student uses appropriate educational technology (calculators, computers, software, CD-ROMs) routinely? Yes No
 A F S N
20. Encourage parental awareness of the goals and objectives of the mathematics program? Yes No
 A F S N
21. Keep current with subject matter and trends in the field of mathematics?
a) attend professional conferences and workshops? Yes No
b) take college courses or participate in institutes? Yes No
c) regularly read professional journals and periodicals? Yes No
22. Reflect on instructional practices?
a) review instructional lesson designs daily? Yes No
b) routinely confer with colleagues about instruction and program? Yes No
c) videotape lessons for self evaluation? Yes No
d) use test data as feedback for instruction? Yes No

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CURRICULUM



The curriculum is the district's plan for instruction. In detail, the curriculum specifies what mathematics students need to know and be able to do, and it includes examples of activities and resources designed to lead students to the achievement of school and district goals.

Does the K-12 mathematics curriculum:

1. Follow developmentally appropriate goals and objectives? Yes No
 A F S N

2. Reflect state and national standards and objectives?
 - a) the CMT? Yes No
 - b) the CAPT? Yes No
 - c) the "Curriculum and Evaluation Standards" of the NCTM? Yes No
 - d) the forthcoming Connecticut Mathematics Curriculum Framework and the forthcoming Connecticut State Department of Education Guide to K-12 Program Development in Mathematics? Yes No

3. Reflect the collective thinking of teachers, administrators, mathematicians and other users of mathematics, and parents? Yes No
 A F S N

4. Include a process for ongoing development and evaluation? Yes No
 A F S N

5. Include instructional guides for teachers? Yes No
 A F S N

6. Exist in sufficient quantity that copies are available in every classroom? Yes No
 A F S N

7. Require that all students have equal opportunities to engage in worthwhile mathematical tasks? Yes No
 A F S N

8. Connect instruction to real life experience? Yes No
 A F S N

9. Articulate content logically, both at grade level and across grade levels? Yes No
 A F S N

10. Arrange instructional content sequentially, moving from concrete, to pictorial, to symbolic? Yes No
 A F S N

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11. Relate mathematics content to previous learning? Yes No
 A F S N
12. Relate mathematics to other curriculum content areas? Yes No
 A F S N
13. Specify that instruction be activity based? Yes No
 A F S N
14. Specify routine use of manipulatives in all grades? Yes No
 A F S N
15. Include activities that accommodate various student learning styles? Yes No
 A F S N
16. Include activities that develop critical and creative thinking skills? Yes No
 A F S N
17. Include non-routine problem-solving activities? Yes No
 A F S N
18. Include activities that engage student interest and help students develop appreciation for the power and beauty of mathematics? Yes No
 A F S N
19. Include activities that provide students with opportunities to conjecture, explain, predict, and defend their ideas in a variety of ways? Yes No
 A F S N
20. Include activities that require students to use mathematical language, vocabulary, and notation to represent ideas, describe relationships, and model situations? Yes No
 A F S N
21. Include activities that incorporate the use of calculators and computers into instruction in order to assist students in discovering and investigating mathematical concepts and to solve problems? Yes No
 A F S N

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ASSESSMENT



Assessment of students should be based on multiple sources. Tasks which assess student performance should be essential, authentic, rich, engaging, active, feasible, equitable, and open.

Are assessments of students in K-12 mathematics:

1. Aligned with the goals and objectives of the curriculum?
 Yes No
 A F S N

2. Aligned with the developmental level and maturity of the students being assessed?
 Yes No
 A F S N

3. Aligned with instruction?
 Yes No
 A F S N

4. Embedded in instruction?
 Yes No
 A F S N

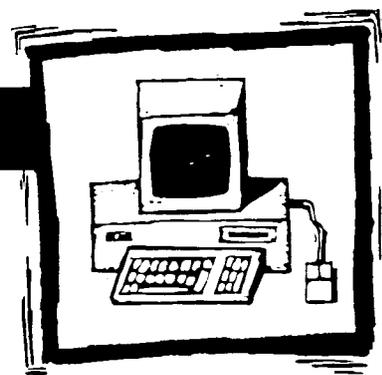
5. Based on multiple sources and types of information?
 - a) written tasks? Yes No
 - b) observations? Yes No
 - c) oral questions? Yes No
 - d) oral presentations? Yes No
 - e) problem solving projects? Yes No
 - f) portfolios? Yes No
 - g) journals? Yes No

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6. Used for the purpose intended? Yes No
- a) instructional feedback? Yes No
- b) analysis of student understanding and progress? Yes No
- c) diagnosis of student needs? Yes No
- d) assignment of grades? Yes No
- e) communication with parents? Yes No
- f) curriculum review? Yes No
7. Based on tasks that present the same mathematical content or procedures in different contexts, formats, and problem situations in order to reflect different learning styles and cognitive levels? Yes No
 A F S N
8. Based on tasks that make appropriate use of technology? Yes No
 A F S N
9. Designed to integrate knowledge and provide opportunities for further learning? Yes No
 A F S N
10. Based on a range of skills, concepts, and procedures? Yes No
 A F S N
11. Designed to include self assessment? Yes No
 A F S N

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SUPPORT FOR INSTRUCTION



Successful implementation of district goals for mathematics requires a commitment from the entire school community that all involved in the educational process be provided with ready access to up-to-date instructional materials and equipment, and with ample time to prepare, reflect, collaborate, teach, and learn.

Does the district provide:

1. Active and effective administrative support for the mathematics program? Yes No
2. Leadership and personnel to support and coordinate K-12 mathematics programs? Yes No
3. A process specified in a district plan which requires ongoing development, review, and revision of the mathematics curriculum? Yes No
4. Ample time for teachers to prepare, reflect, and collaborate? Yes No
5. Release time for teachers to observe one another in the teaching of mathematics? Yes No
6. A requirement that students be instructed in mathematics only by teachers who demonstrate a strong conceptual understanding of mathematics? Yes No
7. A schedule which provides mathematics instruction in compliance with State guidelines? Yes No
8. Convenient access to appropriate manipulatives, textbooks, and alternative resources? Yes No
 A F S N
9. Convenient access to problem solving materials in addition to the textbook? Yes No
 A F S N

A = Always F = Frequently S = Sometimes N = Never

10. Convenient access to appropriate technology?

- a) overhead projectors and materials?
- b) calculators?
- c) computers?
- d) software?
- e) calculator and computer projection devices?
- f) laser disk players?
- g) data collection probes?
- h) CD ROMs?
- i) video's?
- j) VCR equipment?

- Yes No

11. Convenient access to professional journals and literature?

- Yes No

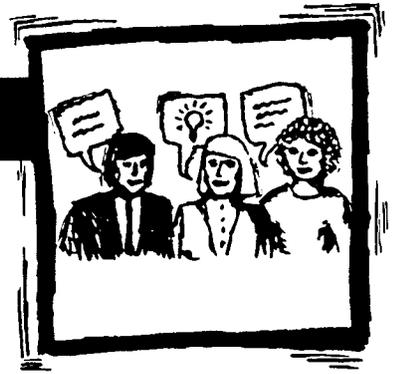
12. Support for partnership arrangements with business and industry?

- Yes No

13. Support for partnership arrangements with colleges or universities?

- Yes No

PROFESSIONAL DEVELOPMENT



An effective professional development program provides teachers help and encouragement, and with opportunities to enhance knowledge of subject matter, students, and pedagogy.

Does the district provide:

1. Active and effective administrative support for an ongoing professional development program for teachers of mathematics? Yes No
2. Evaluation of teachers by supervisors and administrators who have expertise in each of the following?
 - a) the Connecticut Competency Instrument? Yes No
 - b) the content of the mathematics curriculum of the district? Yes No
 - c) current curriculum issues in mathematics education? Yes No
 - d) current instructional practices in mathematics? Yes No
 - e) current issues in mathematics assessment? Yes No
 - f) learning styles? Yes No
 - g) child development? Yes No
3. A requirement that for all teachers of mathematics, at least one of the district staff development days each year be allocated to programs on mathematical content? Yes No
4. Encouragement, training, and a variety of resources for teachers to use to gain additional knowledge and understanding of mathematics? Yes No
5. Information, financial support, and time for teachers to participate in on-going professional development activities?
 - a) conferences and workshops? Yes No
 - b) school sponsored in-service programs? Yes No
 - c) college courses and institutes? Yes No
6. Time for teachers of mathematics to discuss, review, evaluate, and revise the mathematics program? Yes No

A = Always F = Frequently S = Sometimes N = Never

7. Time for teachers to observe one another in the teaching of mathematics? Yes No
8. Opportunities for teachers to share what they have learned from recent professional development opportunities? Yes No
9. Encouragement and support for teachers who participate in programs of recognition for excellence, (e.g., Celebration of Excellence, Presidential Award, National Board Certification)? Yes No
10. Encouragement and support for teachers to contribute to the field of mathematics education? Yes No
- a) make a presentation at a conference or workshop? Yes No
 - b) hold office in a professional organization? Yes No
 - c) serve on a committee or task force? Yes No
 - d) write for professional journals? Yes No

A = Always F = Frequently S = Sometimes N = Never



MATHEMATICAL THINKING is an all-purpose tool. It can be applied throughout a lifetime to recognize and clarify problems, to locate and make sense of information, to explore several solutions in search of a best solution, and to argue with confidence for acceptance of that best solution.

Look Closely at a Math Class in Today's Schools.

Mathematics is the language of the 21st century – those who want to be heard will have to speak it. Reading, writing, picturing, and talking about mathematics are basic skills that help us to understand and explain our world.

Mathematics is nourishment for 21st century minds. It's non fattening and cholesterol free. It can be available in your local classrooms if you know what to ask for. Help your schools to serve up the best mathematics available, and make certain that the students in your community take some home today.

The Math Connection

Members of the Math Connection are:

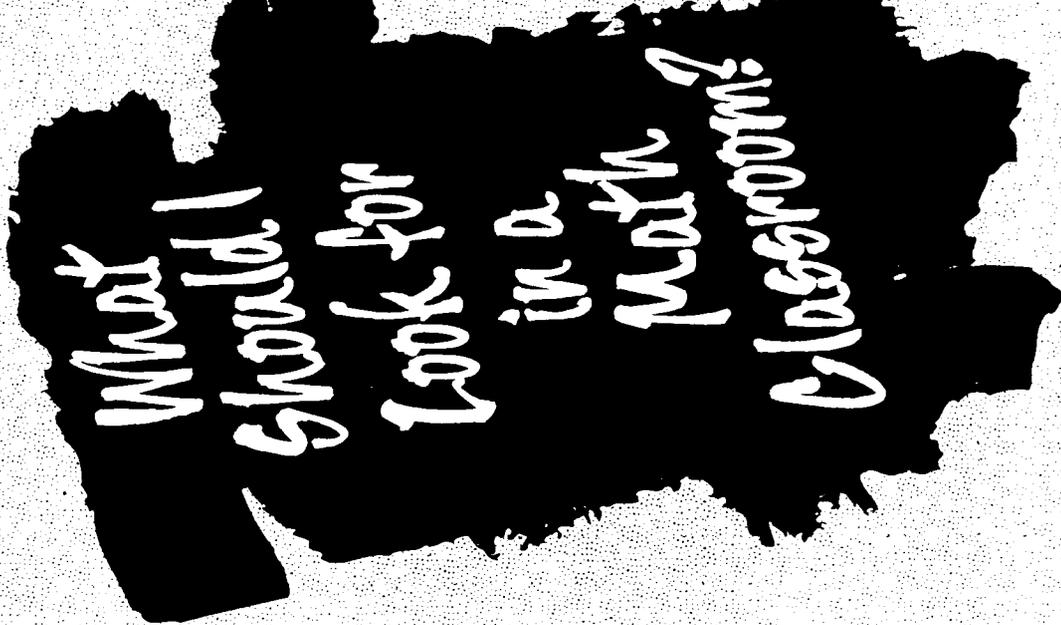
- American Association of Colleges for Teacher Education
- American Association of School Administrators
- Mathematical Association of America
- National Association of Elementary School Principals
- National Association of Secondary School Principals
- National Association of State Boards of Education
- National Council of Teachers of Mathematics
- National School Boards Association

The Annenberg/CPB Math and Science Project

The Annenberg/CPB Math and Science Project has funded more than 35 educational reform efforts. These projects educate and support groups of adults who have a hand in changing the way math and science are taught, including parents, teachers, teacher educators, administrators and policymakers. Projects funded place strong emphasis on building human coalitions and networks as well as electronic ones. The Project's mission is to engage as many adults as possible in the math and science education reform movement.

To order more copies of this brochure or find out about other materials available from the Annenberg/CPB Math and Science Project, call:

1-800-965-7373



Creating a Climate for Change...



Leads the Way



The Annenberg/CPB Math and Science Project

What Should I Look For in a Math Classroom?

A math classroom should provide practical experience in mathematical skills that are a bridge to the real world of jobs and adult responsibilities. This means going beyond memorization into a world of reasoning and problem solving.

Sounds good, but how will I recognize a good math classroom when I see it?

Look for the following actions by students and teachers. If you see them, you will be looking at a classroom that is preparing students for the world beyond school.

What Are Students Doing?

- Interacting with each other, as well as working independently, just as adults do.
- Using textbooks as one of *many* resources. Students should know *how* and *when* to use manipulatives (such as blocks and scales) and technology (such as calculators and computers) as problem-solving tools.



Applying math to real-life problems and not just practicing a collection of isolated skills. Lots of time is allowed for solving complex problems.

Seeking a best solution among several solutions to a problem. Students can explain the different ways they reach these solutions, and defend the choice of one over another.

Working in groups to test solutions to problems with each group member highly involved.

Communicating mathematical ideas to one another through examples, demonstrations, models, drawings, and logical arguments.

Working in teams to challenge and defend possible solutions. Students help each other to learn.

What Are Teachers Doing?

- Guiding students in exploring multiple solutions to any problem; challenging students to think deeply.
- Moving around the room to keep everyone engaged in productive work.



Encouraging students to raise and discuss questions about math for which there are no textbook answers. Rather than simply answering these questions, teachers are helping students to gain mathematical competence and confidence by finding their own solutions.

Guiding students in making appropriate use of manipulatives and technology.

Promoting student use of inquiry and creativity. Students are moved to higher levels of learning by pursuing alternative approaches to solving a problem or by proposing new problems that are variations on, or extensions of, a given problem.

Bringing a variety of learning resources, including guest presenters, into the classroom in order to increase learning options for all students.

Working with other teachers to make connections between disciplines to show how math is a part of other major subjects that students are studying.

Using assessment that focuses on problem solving and understanding rather than on memory and speed.

Helping all students to explore career opportunities that use the mathematics that they are learning.

