Mathematics Council NEWSLETTER

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From the Editor . . .

The following article by Marilyn N. Suydam should be of interest to all teachers of mathematics.

A general criticism of mathematics teaching is that it is often too abstract, particularly as the student advances through the grades. A good math lab, with manipulatives, can be as valuable and essential at the junior high school level as it is at the primary level.

Manipulative Materials

by Marilyn N. Suydam
Ohio State University, Columbus, Ohio 43212

In responses to questionnaires, most teachers indicate that they believe that manipulative materials (chips, blocks, fraction pieces, etc.) should be used for mathematics instruction. Children should be involved in the process of doing mathematics, and the use of concrete materials is integrally related to the development of meaning. As children work with objects and talk about what they're doing, they begin to see relationships--to learn mathematics.

Yet belief is not always translated into action. First-grade teachers report rather frequent use of manipulative materials. But teachers from grade 2 on indicate less and less use of materials.

As we are faced with widespread concern about achievement, it seems important to consider the evidence from research:

- Lessons using manipulative materials have a higher probability of producing greater mathematics achievement than do lessons in which such materials are not used. This finding presumes that using manipulatives is plausible in a lesson--they can't be used with all topics or for all purposes.

- Achievement is enhanced across a variety of topics, at every grade level K-8,at every achievement level, at every ability level.

- Children need not necessarily manipulate materials themselves for all lessons, however. Watching the teacher use the materials in a demonstration is sometimes at least as effective. This result may be because directing children's attention to important mathematical ideas is easier when the teacher is in control of the materials.

Only one caution is needed: not all children need to use manipulatives for the same amount of time. Prolonged use may keep some children using procedures too simple and inefficient for them. Concern for individual needs must govern the use of manipulative materials.

Bibliography

Suydam, Marilyn N. and Jon L. Higgins. Activity-Based Learning in Elementary School Mathematics: Recommendations from Research. Columbus, Ohio: ERIC/SMEAC, 1977.

Quotable Quotes

We all find ourselves in a world we never made. Though we get used to the kitchen sink, we do not understand the atoms which compose it. The kitchen sink, like all the objects surrounding us, is a convenient abstraction.

Mathematics, on the other hand, is completely the work of man. Each theorem, each proof, is the product of the human mind. In mathematics all the cards can be put on the table. In this sense, mathematics is concrete, whereas the world is abstract.

-- Sherman K. Stein

What's New?

EXTENDA-MATH. The Peel Board of Education in Mississauga, Ontario, is piloting a project called Extenda-Math during the 1983-84 school year. The purpose is to extend regular programs K - 8, particularly for students who are identified as superior. The material includes three sets of problem-solving activities that are specially designed to encourage divergent thinking and creativity. The activities, which are packaged for grades K-3, 4-6, and 7-8, also include teacher notes and a student record sheet. The material is to be finalized by September 1984.

For more information, contact: Alexander L. Norrie, Coordinator of Mathematics, Peel Board of Education, 73 King Street West, Mississauga, ON. L5B 1H5.

Puzzles, Problems

1. Mr. Gibb has three sons, Joe, John, and Mark, the sum of whose ages is equal to the age of their father. In one year, Mr. Gibb will be twice as old as Joe, in two years Mr. Gibb will be three times as old as John, and in three years Mr. Gibb will be four times as old as Mark. How old is each of the three sons now?

2. It takes 90 seconds to walk up an inoperative escalator. The trip takes 60 seconds when the escalator is working. How long would the trip take if the person walked up the moving escalator?

3. Here is a partial list of Pythagorean triples (solutions of $X^2 + Y^2 = Z^2$)

   Discover the pattern in the list and find the next five triples that follow the pattern.

5,	12,	13
6,	8,	10
7,	24,	25
8,	15,	17
9,	40,	41
10,	24,	26
11,	60,	61

4. Simple sequences -- What comes next? Can you find the next two numbers in these sequences?

   (a) 4, 8, 12, ...
   (b) 5, 9, 13, ...
   (c) 1 1/4, 2 1/2, 3 3/4, ...
   (d) 3, 6, 12, ...
   (e) 32, 16, 8, ...
   (f) 121, 12321, 1234321, ...
   (g) 3, 4, 6, 9,

-- SOLUTIONS ON PAGE 5

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Activities for Junior High School and Middle School Mathematics: Readings from the Arithmetic Teacher and the Mathematics Teacher, *edited by Kenneth E. Easterday, Loren L. Henry, and F. Morgan Simpson.* Selected activities conveniently organized by strands including counting and place value, decimals, fractions, and percents, probability and statistics, and problem solving. 1981. 218 pp. ISBN 0-87353-188-4. #126S4. $8.25.

Activities for the Maintenance of Computational Skills and the Discovery of Patterns, *by Bonnie Litwiller and David Duncan.* Practice for middle and junior high school students in nonroutine activities. Many number patterns can be discovered from the computation used. Answers are given, and pages can be easily removed for duplicating. 1980. 96 pp. ISBN 0-87353-169-8. #56S4. $4.50.

Bulletin Board Ideas for Elementary and Middle School Mathematics, *by Seaton E. Smith, Jr.* Your bulletin board tasks made easier: guidelines and 82 photos, 31 in full color. 1977. 56 pp. ISBN 0-87353-116-7. #82S4. $4.00.

Calculators: Readings from the Arithmetic Teacher and the Mathematics Teacher, *edited by Bruce C. Burt.* Calculators in the classroom, from rationale to activities. 1979. 231 pp. ISBN 0-87353-144-2. #294S4. $6.25.

Cumulative Index: The Arithmetic Teacher, 1954–1973. Indexed by author, title, and subject. 1974. 128 pp. ISBN 0-87353-027-6. #51S4. $8.40.

Elementary School Mathematics: What Parents Should Know about Estimation, *by Barbara Reys.* Emphasizes that estimating is as important for children as computing exact answers. Teaches parents how to give their children practice in this important skill. 1982. 12 pp. ISBN 0-87353-202-3. #314S4. $0.95, pkg. of 10, #325S4. $7.50.

Elementary School Mathematics: What Parents Should Know about Problem Solving, *by Barbara Reys.* This book will help parents engage in problem-solving activities with children, and the practice will give them teaching confidence. Also encourages the parent to seek out problems from other sources and design specific problems to fit the family situation. 1982. 16 pp. ISBN 0-87353-203-1. #313S4. $0.95, pkg. of 10, #326S4. $7.50.

How to Choose and Create Good Problems for Primary Children, *by Doyal Nelson and Joan Worth.* The material for this book first appeared in NCTM's 37th Yearbook, *Mathematics Learning in Early Childhood.* Problems derived from real-world situations and events that will make sense to young children. 1983. 40 pp. ISBN 0-87353-205-8. #324S4. $3.00.

I Can Count the Petals of a Flower, *by John and Stacey Wahl.* A fascinating, full-color picture book for teaching young children to count through beautiful photographs of flowers, plus such mathematical concepts as evens and odds, primes and composites, and factors. 1976. 32 pp. ISBN 0-87353-061-6. #77S4. $4.50.

IDEAS from the Arithmetic Teacher: Grades 1–4 Primary, *edited by George Immerzeel and Melvin L. Thomas.* Second in a series of "IDEAS" from the ARITHMETIC TEACHER, conveniently grouped by topic, such as problem solving, computation, numeration, measurement, and geometry. 1982. 120 pp. ISBN 0-87353-189-2. #279S4. $5.40.

IDEAS from the Arithmetic Teacher: Grades 6–8 Middle School, *edited by George Immerzeel and Melvin L. Thomas.* Third in the popular "IDEAS" series. Ideas are grouped according to computation, fractions and decimals, number patterns, flowcharts, problem solving, geometry, and metric measure. 1982. 140 pp. ISBN 0-87353-200-7. #310S4. $5.40.

The Mathematical Education of Exceptional Children and Youth: An Interdisciplinary Approach, *edited by Vincent J. Glennon.* Second of the Council's professional reference series. Ten essays, each directed to a particular exceptionality (the visually handicapped, the learning disabled, the gifted, etc.). 1981. 416 pp. ISBN 0-87353-171-X. #49S4. $19.50.

The Mathematics Laboratory: Readings from the Arithmetic Teacher, *edited by W. George Cathcart.* Forty articles on the what, why, when, and how of the mathematics laboratory in the elementary school; indexed. 1977. 232 pp. ISBN 0-87353-073-X. #86S4. $6.20.

Mathematics Library: Elementary and Junior High School, *by Marguerite Montague Wheeler and Clarence Ethel Hardgrove.* Lists children's books related to mathematics with annotation and grade level for each; a useful purchasing guide includes publishers and addresses. Fourth edition. 1978. 53 pp. ISBN 0-87353-126-4. #144S4. $4.00.

Multicultural Mathematics Materials, *by Marina C. Krause.* A collection of games and activities from around the world, many of them centuries old. Besides enhancing the mathematics lesson, these games can enhance individual students' ethnic identity and expose them to the ethnic heritage of others. Appropriate for grades 1–8, only simple, readily available materials are needed. Regions represented include Africa, Asia, Europe, and the Middle East. Large format (21.5 x 28 cm). 1983. 80 pp. ISBN 0-87353-206-6. #327S4. $5.00.

Organizing Data and Dealing with Uncertainty. A revised excerpt from *Experiences in Mathematical Ideas.* Vol. 2, designed to present probability and statistics to children in grades 5–8. Perforated sheets, 21.5 x 28 cm, can be duplicated for worksheets, overhead transparencies, and activity materials. 1979. 135 pp. ISBN 0-87353-141-8. #251S4. $6.25.

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Math Magic

Here are some tricks with numbers that you can try. After a little practice you can try them on your friends.

A Given Number

Take a number. Add 10. Multiply by 2. Divide by 4. Subtract 5. Multiply by 2. Your answer is the original number.

Obtaining Five

Take a number. Add 14. Multiply by 2. Subtract 8. Divide by 4. Subtract one-half the original number. Your answer will be 5.

Age and Birth Date

Add 5 to your age. Double it. Multiply by 25. Add your birthday day of the month. Double it. Subtract 500. The first two figures are your age; take half the last two figures to obtain your birthday date.

Answers to PUZZLES, PROBLEMS

1. Joe is 24 years old. John is 15 years old. Mark is 10 years old.

2. 36 seconds.

3. The pattern for odd n is $(n, (n^2-1)/2, (n^2+1)/2)$ and for even n $(n, (n^2-4)/4, (n^2+4)/4)$. The next five triples are: 12, 35, 37/ 13, 84, 85/ 14, 48, 50/ 15, 113, 113 / 16, 63, 65

4. Simple Sequences:

   (a) 16, 20. Multiples of 4. An A.P. with a=d=4.
   (b) 17, 21. An A.P. with a=5, d=4.
   (c) 5, 6 1/4. An A.P. with a=d=1 1/4.
   (d) 24, 48. A G.P. with a=3, r=2.
   (e) 4, 2. A G.P. with a=32, r= 1/2.
   (f) 123454321, 12345654321 (Palindromic numbers)
   (g) 18. 24. The differences between consecutive numbers form the sequence 1, 2, 3, 4, 5, 6.

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