MOTIVATING Math Students

Techniques Activities

HAVE YOU EVER BEEN ASKED, "Why do we have to do this?" Students often need a reason for doing a math assignment. This article will help you discover ways to motivate students. Most of the activities apply to the upper grades, although some can be used with younger children. Two important concepts for teachers to keep in mind are these: (1) The importance of firsthand experiences to assist students in learning math concepts cannot be overstated; and (2) the way you package material makes all the difference in whether it appeals to pupils or not. Students seem to have considerable difficulty with decimals, fractions, percentages, and metrics. Therefore, this article will concentrate on activities and methods for enhancing student learning in these areas.

File-Folder Activities for Decimals

When my students have difficulty with decimals and place value, I use a colored file-folder activity for each of the difficult areas. This folder has pockets for ones, tens, tenths, hundredths, et cetera. Using cards with decimals written in words (i.e., three hundred sixty-seven thousand*ths*), students choose matching numerals from a second pocket and try to place them in the correct pockets. The folder is self-checking, since students can turn the card over to find

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By Judy Zimmerman

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the correct answer. (See Illustration No. 1.)

In a similar activity, pupils place felt numerals on top of a felt-covered box. I call this "Decimal Delights." Students receive points for completing various activities using these materials.

"Freaky Fractions" is the theme we use when we study fractions. Each student gets to make a freaky character with a fraction such as ¾ or ¼ on it. We then combine these to create a giant bulletin board with headings such as "proper," "improper," and "unalike" fractions. This also includes a file folder activity in which students must place fractions on cards in the appropriate reduced fraction pocket. Students are encouraged to explore ways fractions are used in everyday life. They receive extra points each time they bring in such material.

Learning About Percentages

When our class works with percentages I ask the students to bring department store catalogs from home. They then create advertisements by cutting out pictures and writing story problems that offer percentage discounts just as they might be used in newspaper advertisements. The student has to decide on a percentage as well as figure the cost after the discount has been deducted. Students thoroughly enjoy seeing these colorful projects posted on the walls as well as working on one another's story problems.

Another percentage activity involves cutting out patterns of an ice cream cone with several different color scoops. The cone is the fraction written out while the scoops have the percentage, decimal, and fraction

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in numerals. If the teacher feels that this activity takes too much class time, he or she can make the parts and have the students put them together correctly. However, I have found that students remember the relationships much better if they make the cones themselves. (See Illustration No. 2.)

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Illustration No. 2.

Interesting Flash-card Activities

Have you ever wanted to get out of the boring flash-card mode and still drill children on mathematics facts? The following activity allows you to do this. Best of all, the students love it. Materials needed include a set of 3×5 cards, one for each statement from the list below.

WHO HAS???

(Addition-Subtraction-Multiplication-Division Drill)

Statements:

I have 6.	Who has this times 3?
I have 18.	Who has this divided by 2?
I have 9.	Who has this times 4?
I have 36.	Who has this less 6?
I have 20.	Who has this divided by 4?
I have 5.	Who has this times 6?
I have 30.	Who has this divided by 10?
I have 3.	Who has this times 4?
I have 12.	Who has this divided by 6?
I have 2.	Who has this times 2?
I have 4.	Who has this times 2?
I have 8.	Who has this times 3?
I have 24.	Who has this plus 4, divided by 4?
I have 7.	Who has this times 2?
I have 14.	Who has this less 3, times 2?
I have 22.	Who has this plus 3?
I have 25.	Who has this less 6?
I have 19.	Who has this less 9?
I have 10.	Who has this plus 5?
I have 15.	Who has this less 2?
I have 13.	Who has this plus 8?
I have 21.	Who has this divided by 3, plus 4?
I have 11.	Who has this times 3?
I have 33.	Who has this less 1, divided by 4, plus 9?
I have 17.	Who has this plus 6?
I have 23.	Who has this plus 1, divided by 3, plus 2?
I have 16.	Who has this plus 10?
I have 26.	Who has this plus 8, less 6?
I have 28.	Who has this and 4 more?
I have 32.	Who has this less 1?
I have 31.	Who has this less 2?
I have 29.	Who has this less 29?
I have 0.	Who has this and 6 more?
I have 6.	

Shuffle the cards and pass them out to the class. Have one child read his question. The person who answers is the one whose I HAVE statement is the correct response. Consequently, every child must do each calculation as the questions loop around the class. When the loop is complete, collect the cards, reshuffle, and play again.

Problem solving is another important aspect of math. In this area, choosing relevant work is crucial. One activity that our students enjoy is finding out how long a pencil lasts. Each student is given a new pencil and requested to record the date when he or she uses it up. After we collect the data, we make graphs to see whose pencil lasted the longest. This activity has an added side benefit—students tend to guard their pencils and use them sparingly.

Learning About Metrics

When we introduce METRIC MADNESS I wear a T-shirt that has "Think Metric" written all over it. The students then par-

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struction are no better than the materials they contain,"[35] classroom teachers, curriculum specialists, learning theorists, and computer programmers need to work together to develop software that makes the computer "an interactive, flexible, and powerful medium for teaching and learning."[36] Some believe that by utilizing the unique capabilities of computers, educators can individualize instruction "to achieve the goal of mastery learning, where everyone learns all material essentially perfectly."[37]

Studies indicate that drill-and-practice software generally produces small but statistically significant gains in student computational skills, possibly as a result of pupils spending more time on task when using the computer.

Quality courseware for teaching mathematics that reflects Seventh-day Adventist philosophy needs to be selected and/or developed for church schools. A few denominational educational institutions should be delegated the responsibility of evaluating software, including field testing, and then disseminating the results of these evaluations. Funds must be provided for this purpose. Careful coordination among the institutions involved can prevent duplication of costs and effort.

Because computers are so new in schools, in-depth research is needed to study their impact on the mathematics curriculum, the learner and the learning process, as well as on the role of the teacher. When educators consider the use of computers in the classroom, they should "not be thinking about computers" but "should be thinking about education."[38] □

RECOMMENDED READING

Viggo P. Hansen, ed., *Computers in Mathematics Education* (Reston, Va.: 1984 Yearbook of the National Council of Teachers of Mathematics)

Seymour Papert, *Mindstorms: Children, Computers, and Powerful Ideas* (New York: Basic Books, Inc., 1980)

FOOTNOTES

[1] Mike Lally and Iain Macleod, "Development of Skills Through Computers: Achieving an Effective, Enjoyable Learning Environment," *Impact of Science on Society*, 32:4 (October-December, 1982), p. 458.

[2] Beverly B. McConnell, *Evaluation of Computer Assisted Instruction in Math, Pasco School District, Final Report* (Pasco, Wash.: Pasco School District, September, 1983), pp. 1, 25. (This report is on microfiche, ERIC—Educational Resources Information Center, ED 235959, pp. 3, 27.)

[3] George W. Bright, "Understanding the 'CAI Phenomenon,'" *AEDS Proceedings: The Tomorrow in New Technology, Frontiers in Administrative Computing; Adventures in Instructional Computing* (Hereafter abbreviated *AEDS Proceedings*.) (Washington, D.C.: Association for Educational Data Systems, 1982), p. 220. (This report is from ERIC microfiche, ED 223239.)

[4] Kathleen J. Steele, Michael T. Battista, and Gerald H. Brockover, "Using Micro-assisted Math Instruction to Develop Computer Literacy," *School Science and Mathematics*, 84 (February, 1984), 123.

[5] Marilyn N. Suydam, "What Research Says: Microcomputers and Mathematics Instruction," *School Science and Mathematics*, 84 (May-June, 1984), 342.

[6] Lawrence P. Grayson, "An Overview of Computers in U.S. Education," *T.H.E. Journal*, 12 (August, 1984), 83.

[7] *An Agenda for Action*, (Reston, Virginia: National Council of Teachers of Mathematics, Inc., 1980), pp. 1-3.

[8] Donald T. Piele, "Computer Assisted Problem Solving in Mathematics," *The Computer: Extension of the Human Mind*, Proceedings, Annual Summer Conference, College of Education, University of Oregon, 3 (July 21-23, 1982), 132. (Hereafter abbreviated C:EHM.)

[9] Peter Kelman, et al., *Computers in Teaching Mathematics* (Reading, Mass.: Addison-Wesley Publishing Co., 1983), p. 65.

[10] Bob Underhill, *Teaching Elementary School Mathematics* (Columbus, Ohio: Charles E. Merrill Publishing Co., 1981), p. 4.

[11] James S. Cangelosi, "Increasing Student Engagement During Questioning Strategy Sessions," *The Mathematics Teacher*, 77:6 (September, 1984), 470.

[12] James H. Wiebe, "Needed: Good Mathematics Tutorial Software for Microcomputers," *School Science and Mathematics*, 83 (April, 1983), 285.

[13] *Ibid.*, p. 287.

[14] Harold Abelson and Andrea di Sessa, *Turtle Geometry* (Cambridge, Mass.: The MIT Press, 1981).

[15] Kelman, et al., pp. 95-137.

[16] Wiebe, p. 287.

[17] Henry F. Olds, Jr., "The Microcomputer—An Environment That Teaches: Exploring the Hidden Curriculum," C:EHM, 81. (ERIC 219859, p. 88.)

[18] McGraw-Hill.

[19] Olds, p. 81; Mari E. Endreweit, "Kids and Computers: A New Kind of Sociability," *Worcester (Mass.) Telegram* (August 19, 1984), 3E.

[20] Kelman, et al., p. 65.

[21] *Ibid.*, p. 66.

[22] Joanne B. Rudnytsky, "Beyond Drill and Practice," C:EHM, 216. (ERIC microfiche, ED 219879, p. 221.)

[23] Wiebe, pp. 283, 285.

[24] Charles E. Mitchell and Grace M. Burton, "Developing Spatial Ability in Young Children," *School Science and Mathematics*, 84 (May-June, 1984), 395.

[25] Wiebe, p. 291.

[26] Robert Sylvester, "Kids Are Learning More Than Their A, B, C's," *A+ Magazine*, 2 (September, 1984), 36.

[27] Judith A. Threadgill-Sowder and Patricia A. Juilfs, "Manipulative Versus Symbolic Approaches to Teaching Logical Connectives in Junior High School: An Aptitude x Treatment Interaction Study," *Journal for Research in Mathematics Education*, 11 (November, 1980), 373.

[28] Sunburst Communications.

[29] Learning Company.

[30] Sunburst Communications.

[31] Sally A. Sloan, "Instructional Uses of Computers: The Good, the Bad, and the Ugly," *AEDS Proceedings, op. cit.*, p. 24.

[32] Wiebe, p. 283.

[33] Kelman, et al., p. 16.

[34] Underhill, p. 5.

[35] Grayson, p. 81.

[36] Kelman, et al., p. 2.

[37] Alfred Bork, "The Fourth Revolution—Computers and Learning," C:EHM, 17.

[38] Sloan, p. 24.

Motivating Math Students

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ticipate in various hands-on experiences, such as taking bites out of a graham cracker until they think what is left is a gram mass. They then weigh it and the student who comes the closest to a gram wins. We also measure the room all over with a meter stick or try a ball-throwing contest in which students measure in meters the distance the ball has traveled.

Another invaluable aid that I use with students who have not yet learned their multiplication tables is math sticks. This activity involves ten craft sticks and some grosgrain ribbon. The numerals 1-10 are listed across the top and down the side of the first stick. The other sticks list vertically multiples of the number at the top of each stick. When the sticks are completed, they constitute a multiplication fact table. The student can use the sticks to assist him in mastering facts he has not yet learned. An added benefit of the sticks is

that by taking sticks like 3 and 4 and putting them side by side, the student gets all the multiples of ¾. (See Illustration No. 3.)

Rewards

Whenever I have students who work slowly or fail to turn in their assignments, I give them reduced assignments in a folder. Each day they complete the required problems I give them 10 points until they have accumulated 100 points. At that time they receive a previously agreed upon reward, such as a sticker, free day, or a pencil. I have found that stickers are an excellent source of motivation and cost little compared to the results they accomplish. Sometimes I enlist parental help in providing some of the rewards if there is a need for more tangible reinforcement. Often a student needs these added incentives for only a few months.

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I have found that file-folder activities are my best resource since they can easily be stored and pulled out for individual students who are having difficulty with a specific math concept. (See Illustration No. 4.)

Listed below are some sources for materials I have found to be practical and easy to use. You can develop similar resource materials yourself. It is not necessary to do this all at once. Choose one math concept with which your students are having difficulty and develop resources to enrich your instruction. Soon you will have a vast supply of materials from which to choose just the activity needed to motivate your students. □

Resources

Centers Galore
1411 Mill Street
Education Center
Greensboro, NC 27408

Good Apple, Inc.
Box 299
Carthage, IL 62321

Mathematics in Michigan
Volume XIX, No. 5
(June, 1980)

Solving Problems Kids Care About
(1981)
Goodyear Publishing Co. Inc.
1640 Fifth St.
Santa Monica, CA 90401

Math Disabilities

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before, after, between, up, and *down* are employed.

Numbers can be matched with their word equivalents (*1* with *one*).

Telling time can be taught by showing the actual times for class activities on a large clock with moveable hands. At noon the teacher tells the student that lunch time begins at 12:00 and ends at 12:30, showing where the hands of the clock will be at both times and