

Combining Literature and Mathematics

Making Math Books and Finding Math Concepts in Books

Bernard R. Yvon and Jane Zaitz

Dr. Bernard Yvon is a professor of mathematics education and child development at the University of Maine. He was a speaker at the 1986 NCTM Canadian Conference in Edmonton. Dr. Yvon was a contributor to Mathematics in the Early Childhood Classroom. Jane Zaitz is preparing to return to teaching. She was a student in one of Dr. Yvon's classes.

There is more to teaching math than one textbook or many worksheets. Counting books, geometric shape books and many other math concept books can be made and shared by children. Hundreds of library and classroom books contain math concepts to be discussed, written and even acted out. Factual books can be used to make graphs and charts. Poetry books about numbers can be read, and similar ones can be written by children themselves. Numerous activities and projects, including the making of books can be undertaken to motivate math students and involve them in the everyday world of numbers and literature.

Making Math Books

Books come in all sizes; the "big book" is becoming popular for shared reading experiences in whole language programs. Large groups of children can read in unison from the pages of these books, which are printed with large type. Such reading is fun and noncompetitive. However, instead of buying expensive copies of such books, why not make them? Have each child make one page. The making of a book requires skills in language arts, creative writing, art and, if it is a counting book, math.

A Grade 2 class in one school enjoyed making a book that they entitled "The Colorful Counting Book" as a gift for the kindergarten and Grade 1

classes. The Grade 2 students cooperated and shared ideas while compiling the book. In the first lesson, each child selected a number and object(s) such as balls, trains, lollipops, gifts and balloons, which would attract young children. The students did their drawings on an 8" X 12" (20 cm X 30 cm) paper that had a ruled line across the bottom for the copy.

In big books, the lettering should be as large as possible— $\frac{1}{2}$ inch (1 cm) for lower case letters and 1 inch (2 cm) for upper case letters—so that a group of children can read the book from a distance. Some children may need to practise making big letters on separate sheets of paper. After practising lettering, their sentences should be checked for errors in spelling and punctuation.

After students have completed their sentences, they can begin their drawings. Drawings should initially be done on smaller paper, then transferred to the larger sheets that make up the big book. If the book is a counting book, numerals should be written in large squares on the top right corner of each page. Once the drawings and lettering are done, the students can assist the teacher in putting the book together.

Pages should be glued back-to-back, that is, page 1 is glued to page 2; page 3 is glued to page 4, and so on. Each page becomes sturdier and more durable when reinforced with another sheet of paper. If possible, the pages should be laminated to protect them from wear and tear. The front and back covers can be made by students who have finished their pages. Holes should be punched in the sheets, then two large rings inserted to hold the book together.

The fun continues when the children see their finished product and read it among themselves. If they've made the book for another class, they can

perform an oral presentation when giving the book. Each of the writers can read his or her own page. To do so will provide each with a sense of accomplishment. The students who receive the book will be very excited. To know the authors and even, at times, have played with them in the schoolyard is exciting.

Counting books are only one of the many different kinds of math books that a class can make. A colorful geometric shape book with two- and three-dimensional shapes was made by students in a Grade 8 class and left as a gift to their successors when they graduated into high school. The procedure described above was used. Students referred to their math text and their teacher while making the more difficult geometric shapes.

A simple sequence book like Maurice Sendak's *Seven Little Monsters*, which shows seven monsters doing different things, could be tried. Any child can create a favorite character and make several pictures of that character performing different, humorous acts. The potential for creativity with a simple math concept is great and can be used to turn young math geniuses loose.

A poetry book like the classic *Over in the Meadow* by Olive Wadsworth creates wonderful sets of 10 directions between mother animals and their offspring in an easily reproduced rhythm pattern. Creative students in Grades 4 through 8 could write similar books of directions from parents to children, or teachers to students. The potential for fantastic illustrations and humor are enormous. The finished product could remain in the classroom or be shared with or acted out for other classes. The whole school will be inspired to make other poetry or math-related books.

A dictionary of difficult mathematical terms could be made, illustrated and shared by upper class students. It would serve as a handy reference book and would help to develop students' math vocabulary. A small binder to which pages are easily added could be used to make this dictionary.

A book showing parts of favorite desserts, cut up into servings, could be helpful in

teaching students about fractions. A story about a growing family in which the parents keep dividing food into smaller and smaller portions could place fractions into a humorous account of family life. Metric units and decimals could be explained in a book in which each child selects a unit or term and draws a picture that illustrates the length or size of the unit. Graphing and charting activities can also be a part of this creative process of making math relevant to members of the class. After they start producing books, reading the books of others and making graphs on particular units of study, students will come up with more and more ideas in brainstorming sessions.

Nonfiction

Books of facts such as the *Guinness Book of World Records*, *The Book of Lists* (for the middle and upper grades) and *Do You Know? One Hundred Fascinating Facts* by Random House (for younger children) list intriguing data for children to study and make into graphs and charts. For example, a child who is interested in the speeds that animals can travel can make a graph that illustrates animals, from slowest to fastest moving. Older children can chart or graph information about buildings, sports, populations, speeds of vehicles or other subjects that interest them.

Logic, order and planning all go into making a graph or chart. Handsome finished products can be





displayed, shared and discussed by young mathematicians. Follow-up activities can include the construction of intriguing problems and questions that require the interpretation of data from the charts and graphs. Each student is an authority on his or her graph and can verify others' results with his or her expertise. Positive classroom dynamics are at work; each child is king of his own castle and knight at his neighbor's castle.

The variety of factual material is overwhelming. Teachers can search libraries for books related to science, social studies, history, geography and other areas of interest.

Acting Out Stories with Math Problems

Many stories and nursery rhymes have number and math concepts in them. "The Three Little Pigs," "The Three Bears" and "The Three Little Kittens" all have sets of three. Instead of just reading these stories to younger children, the teacher can organize a reading group to read them or find volunteers to act them out. Puppets are a good way for shy children to begin experiencing drama. In the book *The Teacher Who Could Not Count*, by Craig McKoe and Margaret Holland, students teach their teacher to count by acting out each number with their bodies. Games in which numbers are acted out and guessed

can be great rainy day activities for children. Remember, Roman numerals need extra cooperation and teamwork.

In many books, such as *It Could Always Be Worse* by Margot Zemach and *Mushroom in the Rain* by Mirra Ginsberg, people or animals are added to the original set. In the Yiddish folktale, *It Could Always Be Worse*, a poor family that lives in an overcrowded house keeps adding, on the advice of the rabbi, more inhabitants (animals) to the house. After the father can no longer stand the overcrowded conditions, the rabbi advises him to return the animals to the shed. Life seems peaceful and pleasant after the animals depart. The equation that corresponds to the story is 6 (children) + 2 (parents) + 1 (grandmother) + 3 (fowl) + 1 (cow) - 4 (animals) = 9 (the original number of family members).

Good listening and math skills are demanded of the children so that they can write an equation on the board after listening to a story. With practice, the children can reverse the process and tell a story from a simple addition or subtraction sentence. Their original stories can be acted out as well.

Math and books . . . books and math equal a fun learning experience. With a little imagination and a big desire to relate math to other areas of the curriculum, every teacher and class can make books that excite and motivate. Likewise, abstracting mathematical equations, activities and concepts from books may take some time and planning, but will make math the most exciting class of the day. The bibliography that follows will help you start an integrated math program that combines the world of numbers with the world of children's literature.

Procedure for Making a Big or Little Book with Your Class

1. Have a planning session in which children select a number or a math concept.
2. Have them draw a picture and write a sentence describing the picture, which illustrates the number or math concept. This should be done on draft paper.
3. Have the students practice large printing, if necessary.

4. On large sheets of paper (construction paper works well) draw a box in the top right hand corner, where a number will be written.
5. Check students' lettering and spelling, and make corrections or additions before allowing the students to start their final copy.
6. Make front and back covers. On the front cover, indicate the class, the year and the names of the authors.
7. Laminate or use clear contact paper.
8. Punch holes and place reinforcements around the holes for strength.
9. Use two 2-inch rings to hold the book together.
10. Read and share the book with other classes.
11. Hang the book on a coat hook to store it.
12. Take photographs of the book for the class bulletin board, class journal or newspaper.
13. Have fun!



Bibliography

Anno, Mitsumasa. *Anno's Counting Book*. New York: Crowell Junior Books, 1977.

A counting book that is beautifully illustrated with country scenes. On the first page, zero is indicated with an empty landscape; the next page has one piece of scenery. As the number increases, so does the number of objects filling the landscape. A fun, natural way to count. The last page talks about early number systems and one-to-one correspondence.

Charlip, Remy, and Terry Joyner. *Thirteen*. New York: Parents' Magazine Press, 1975.

A wordless concept book consisting of 13 picture sequences in which shapes evolve into new forms. Good for developing observation skills among children of all ages. Needs introduction.

Emberley, Ed. *Ed Emberley's Drawing Book of Animals*. Boston: Little Brown, 1970.

A wonderful book that teaches how to draw animals with simple lines, squares, triangles and angles. Has fun art lessons for all ages.

Hillman, Priscilla. *The Merry Mouse Counting and Colors Book*. New York: Doubleday, 1983.

A small, square cardboard book with colorful drawings of mice. Counting up to 10. Written in verse.

Hoban, Tana. *Circles, Triangles and Squares*. New York: Macmillan, 1974.

Beautiful black and white photographs of city scenes and everyday objects show the three most common geometric shapes for children to identify.

Other books by Hoban include *Shape and Things*, *Look Again*, *Push-Pull*, *Empty Full: A Book of Opposites*, *Count and See* and *Round and Round and Round*. Each could be used to promote discussion or provide follow-up activities for young children.

Hutchins, P. *One Hunter*. New York: Greenwillow, 1982.

One hunter meets up with 10 African animals hidden in the forest and walks by each camouflaged set. A humorous account that allows for guessing and counting. (Preschool to Grade 2)

Mathews, Louise. *The Great Take-Away*. New York: Dodd, Mead and Co., 1980.

One hog in a town of pigs steals. In rhyme, with five subtraction problems to solve. (Grades 1 to 3)

McKee, Craig, and Margaret Holland. *The Teacher Who Could Not Count*. School Book Fairs, Inc., 1981.

A story about a mixed-up teacher who makes mistakes in learning to count. Her students act out the numbers with their bodies to teach her properly. Great for rainy days or for number games in physical education.

Merriam, E. *Project 1.2.3*. New York: McGraw-Hill, 1971.

A fascinating book for urban or rural children to learn about life in a huge complex. Has eight pages at the end for observation and counting.

Oxenbury, Helen. *Helen Oxenbury's Numbers of Things*. New York: Heinemann, 1967.

A counting book about a lion. Simply but humorously illustrated. Depicts numbers 1 to 50.

Pienkowski, Jan. *Numbers*. New York: Harvey House, 1975.

Numbers is similar to Pienkowski's books *Colors*, *Sizes* and *Shapes*. The numbers one through 10 are illustrated with objects in a natural setting. On the opposite page, an abacus shows combinations of 10. (For two- to six-year-olds)

Random House. *Do You Know? One Hundred Fascinating Facts*. New York: Random House, 1979.

Lots of facts about things smallest to largest, from animals to vehicles. Ideal for graph and chart making.

Scarry, Richard. *Richard Scarry's Best Counting Book Ever*. New York: Random House, 1975.

A counting book in which Willy Bunny counts everything he sees. Goes to 100. Ideal for playing such games as "You Find It." Ask a child such questions as "How many firemen have green mops?"

Sendak, Maurice. *Seven Little Monsters*. New York: Harper and Row, 1975.

A simple, short account of seven monsters who get into trouble. The book could provide inspiration to children for making their own sequence books.

Shapiro, A. *Mr. Cuckoo's Clock Shop*, Los Angeles: Intervisual Communications, 1978.

A rhyming story about a clock shop with a large clock that has movable hands. The reader moves the time ahead one hour per page.

Silverstein, S. *The Missing Piece Meets the Big O*. New York: Harper and Row, 1981.

A triangle searches for his whole and meets many disappointments until the Big O tells him to wear off his edges and become a circle. A good introduction for young children to various shapes.

Wadsworth, Olive. *Over in the Meadow: A Counting Out Rhyme*. New York: Viking-Kestrel, 1985.

A counting book of the numbers one to 10. Ideal for ideas when asking a class to make their own books.

Warren, Cathy. *The Ten-Alarm Camp-Out*. New York: Lothrop, Lee and Shepard Books, 1983.

A story about a mother armadillo and her nine babies who like even numbers. They have a strange camping adventure. An enjoyable story with counting practice. (Preschool to Grade 2)