Annotated Bibliography of Resource Materials for Promoting Active Learning in Mathematics

D.B. Harrison
Associate Professor
Faculty of Education
University of Calgary

Association of Teachers of Mathematics, *Notes on Mathematics in Primary Schools.* London: Cambridge University Press, 1967.

An excellent source of practical suggestions for mathematical activities for elementary school children and spanning a wide range of basic concepts.

Bates, John, and Irwin, Donald, *Teachers' Guide for Developmental Math Cards* (Kits A to L). Don Mills, Ontario: Addison-Wesley (Canada), Limited, 1970.

A series of sets of colorfully illustrated activity cards and accompanying teacher's guides spanning Grades I to VI. The activity cards are organized around number, measurement, geometry, games, and notation concept strands. The teacher's guides give detailed suggestions as to how to use the cards and how to initiate an active learning program in elementary school mathematics. The cards are cross-referenced and immediate activities and enrichment activities are suggested for each card.

Biggs, Edith E., and MacLean, James R., *Freedom to Learn. An Active Learning Approach to Mathematics.* Don Mills, Ontario: Addison-Wesley (Canada) Limited, 1969.

A very practical source of materials for anyone planning to initiate an active learning approach to mathematics. Contains detailed descriptions of mathematics workshops for teachers, suggestions for countless student activities for learning a broad range of mathematical concepts and skills, and comments on administrative, teacher, and student roles as well as evaluation procedures. A distillation of workable procedures from years of classroom experience based on Piagetian ideas about how children learn.

Central Iowa Low Achiever Mathematics Project (CILAMP) Activity Booklets:

Gimmicks
Roman Numerals
Introduction to Flow Charting
Lost in Space
How it Might Have Been
Measurement
Area Measurement
The Protractor
Tangrams
LAMP
Enrichment Student Projects (ESP)
Graphing Pictures
The First Probability Programs
Math in Sports
Road Map Math

A well worked out series of activity booklets aimed at low achieving junior high school mathematics students but suitable for the lower grade levels as well. The complete set of mimeographed booklets can be obtained for $15.00 from: Jack R. Williams, Director, Central Iowa Low Achiever Mathematics Project, 1350 E. Washington, Des Moines, Iowa, 50316.

Copeland, Richard W., *How Children Learn Mathematics, Teaching Implications of Piaget's Research.* New York: The Macmillan Company, 1970.

Covers the usual topics in a course on methods of teaching elementary school mathematics, but places emphasis on how children learn mathematics rather than "techniques of teaching". The book is interwoven throughout with numerous practical illustrations of how to use laboratory and manipulative materials to help children learn mathematical concepts at the concrete operational level.

Davis, Robert B., *Discovery in Mathematics, A Text for Teachers.* Reading, Massachusetts: Addison-Wesley Publishing Company, 1964.

_____, *Explorations in Mathematics, A Text for Teachers.* Palo Alto: Addison-Wesley Publishing Company, 1967.

_____, *Matrices, Functions, and Other Topics, Teachers' Commentary,* The Madison Project, 1963. (918 Irving Avenue, Syracuse, N.Y., 13210).

These Madison Project publications provide detailed question sequences and descriptions of activities designed to promote "active learning" on the part of students. They contain many excellent examples of "advanced" topics that can successfully be handled by young children.

Dienes, Z. P., and Golding, E. W., *Exploration of Space and Practical Measurement.* New York: Herder and Herder, 1966.

Describes numerous games for children leading to an understanding of geometry, measurement, time, capacity, weight and area.

_____, *Learning Logic, Logical Games*. New York: Herder and Herder, 1966.

A teachers' handbook describing the kinds of experiences in logical thinking which children could be exposed to in the first two grades.

_____, *Modern Mathematics for Young Children*. New York: Herder and Herder, 1966.

Contains many suggestions based on Dienes' theory for presenting such topics as operations on sets, logical operations, number, numeration, place value, and number operations to young children.

_____, *Sets, Numbers, and Powers*. New York: Herder and Herder, 1966.

Contains lessons and games for elementary and junior high school students leading to an understanding of sets and numbers in terms of transformation "machines".

Elliott, H. A., MacLean, James R., and Jorden, J.M., *Geometry in the Classroom*. New Concepts and Methods. Holt, Rinehart Winston, 1968.

An integrated, thoroughly modern activity-oriented approach to geometry from beginning elementary to late secondary school levels - suggestive of many geometric concepts that can and should be introduced much earlier than has normally been the case.

Fisher, Dale, *A Feasibility Study on Active Learning with Real Numbers*. Unpublished Master's Thesis, The University of Calgary, Calgary, 1970.

The appendix of this thesis contains a detailed description of the teacher's guide for 46 student activities designed to provide a complete introduction to the system of real numbers, covering topics found in the real numbers unit in the Alberta Grade VIII mathematics curriculum but developing these topics entirely on the basis of student activities. Members are entitled to one copy free of charge, upon request. Non-members may obtain the appendix, entitled "An Active Learning Unit on Real Numbers", at a cost of $1 from Barnett House, 11010 - 142 Street, Edmonton 50.

Johnson *et al., Activities in Mathematics, First Course - "Patterns"*. Glenview, Illinois: Scott, Foresman and Company, 1971.

This is the first in a set of four consumable workbooks (the others deal with "Numbers", "Measurement", and "Probability") that make up the AIM First Course. The series is full of interesting and challenging activities, complete with punch-out materials, aimed at building positive attitudes with slow learners in mathematics. The first course was written for the Grade VII level but can be used at a variety of levels. The topics covered by the second course are: "Graphs", "Statistics", "Properties", and "Geometry". Teacher's editions and spirit duplicating masters and overhead visuals books are available for both sets.

Jones, H. R., Hancox, W. J., and Shephard, J. G., *Mathset*. W. J. Gage, 1967.

A series of student assignment cards on measurement and graphing.

Kieren, T. E., and Vance, J. H., "The Theory of Active Learning: Its Application in a Mathematics Workshop", in *The Manitoba Journal of Education*, Vol. IV, No. 1, pp. 33 - 40, November, 1968.

An article describing some features of the theories of learning developed by Bruner and Dienes and the creation of and student reactions to a mathematics laboratory based on these ideas.

MATHEX, *Basics of Mathematics Experiences*. Toronto: Encyclopedia Britannica of Canada, 1966.

A description of techniques and ideas from classroom practice for providing children with stimulating experiences in mathematics.

Nuffield Mathematics Teaching Project - Teachers' Guides. John Wiley and Sons, New York (In Canada: Longmans Canada Limited, Don Mills, Ontario).
I Do and I Understand, 1967.
Mathematics Begins, 1967.
Beginnings, 1967.
Pictorial Representation, 1967.
Shape and Size (2), 1967.
Shape and Size (3), 1968.
Computation and Structure (2), 1967.
Computation and Structure (3), 1968.
The Story So Far, 1969.
Environmental Geometry, 1969.
Problems, Green Set, 1969.
Desk Calculators, 1967.
Probability and Statistics, 1969.
Graphs Leading to Algebra, 1969.

Forthcoming Nuffield Titles (In Press):

Mathematics in Practice
Computers and Young Children
Logic
Logic and Computers
Purple Problems
Checking-up I
Checking-up II
Guide to the Guides
Into Secondary School
Red Problems
An excellent series of teacher's guides detailing activities suitable for elementary school children to learn actively a wide range of basic mathematical ideas (strongly influenced by Piagetian notions about the nature of children's learning processes).

Pethen, R. A. J., *The Workshop Approach to Mathematics.* Macmillan, Toronto, 1968.

_____, *Mathematics Workshop - Complete Set: Cards 1 - 224.* The Macmillan Company of Canada Limited, 70 Bond Street, Toronto 2, Ontario.

A thoroughly well-organized elementary school mathematics workshop program consisting of student "open-ended" activity cards and a teacher's guide.

Sawyer, W. W., and Nelson, L. D., (Editors). *MATHEX:* Mathematics Experience Materials for Canadian Schools. Levels 1 to 6 Teacher and Pupil Bulletins. Toronto: Encyclopedia Britannica of Canada, 1966.

A series of pupil activity sheets and teacher commentaries written by Canadian mathematics teachers to enable children to discover mathematical concepts for themselves. Mathematical games, puzzles, problems and experiments for kindergarten through junior high school.

Seymour, D. G., and Gidley, R., *Eureka* (Palo Alto, California: Creative Publications, 1968).

A unique publication filled with offbeat, interesting mathematical problems, puzzles, cartoons, jokes and similar material.

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