



THE LABORATORY APPROACH IN MATHEMATICS - CALGARY JUNIOR HIGH SCHOOLS

Mrs. Bernice Andersen, mathematics consultant with the Calgary Public School Board, assembled the following reports from several Calgary schools. Our thanks to Mrs. Andersen and each of the contributors. The photographs were taken by Sharat C. Sharma of the Calgary School Board Instructional Aids Department.

What is happening at *your* school? Please take time to send in a report to the *Newsletter*.

THE "DISCOVERY METHOD" AT COLONEL IRVINE JUNIOR HIGH SCHOOL

by Rose Makway

Mrs. Makway teaches Junior High Mathematics at Colonel Irvine Junior High School, Calgary, Alberta.

At Colonel Irvine Junior High in Calgary, some of the students were introduced to the "discovery method" of studying mathematics for the first time this year. Although we have no actual lab facilities, the regular classroom has been adapted to serve the purpose. Students work in groups at tables with complete freedom to discuss their discoveries and display their results in any way they wish, within the limits of our facilities. Usually no previous instruction has been given, and students discover new concepts with the guidance of activity cards and their own imagination. Although questions are always answered by the teacher, the students are encouraged to discover as much as possible on their own. In a follow-up lesson, each group presents its discoveries leading to the formation of general standard rules such as $V = lwh$.

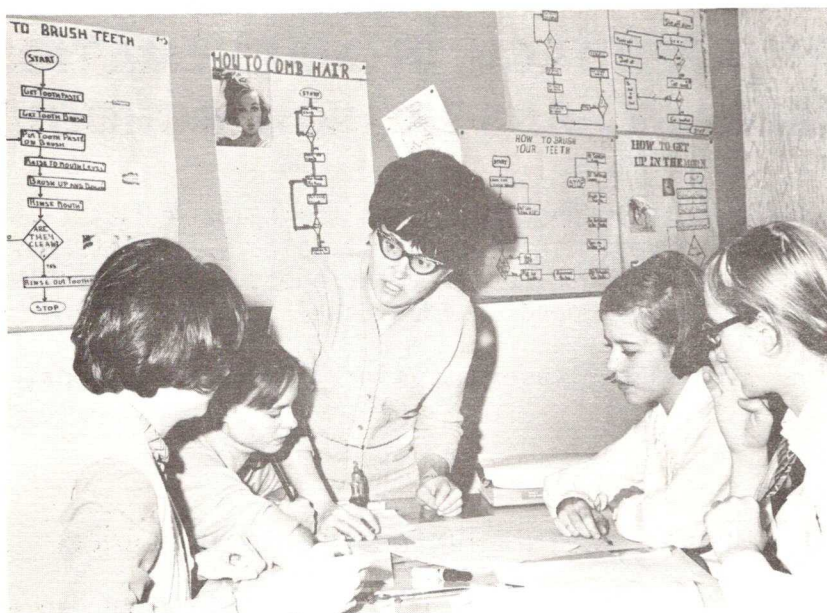
In the following pictures a Grade IX class is being introduced to algebra for the first time. No previous instruction has been given. With the guidance of activity cards

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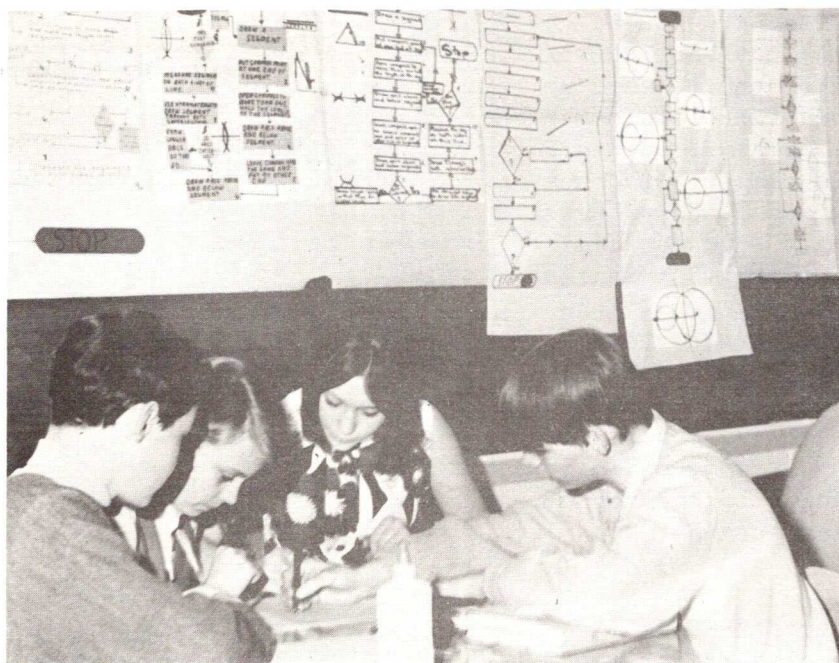
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Newsletter Editor: Mary Beaton
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and some help from the teacher, the class is discovering the rules for operations with powers and exponents. In a follow-up lesson the groups present their results. The class, together with the teacher's guidance, forms general rules such as $x^m \cdot x^n = x^{m+n}$, using the results of the groups' discoveries.



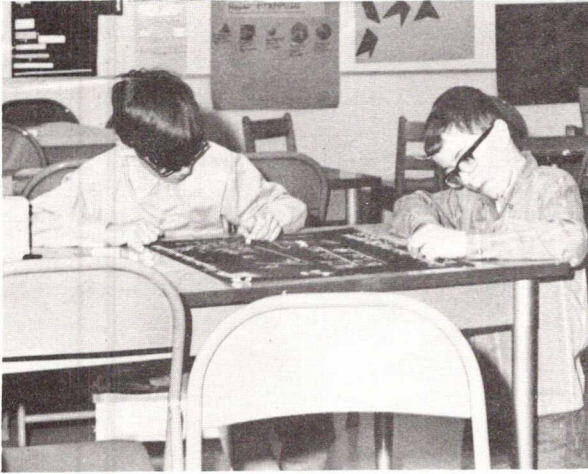
In the background of this picture are charts made by a Grade VIII class studying geometric construction. Flow charts were introduced for the first time by using everyday situations such as "How to Comb Your Hair".



In the next lesson, flow charts for geometric constructions were developed, using patterns discovered in the previous lesson. These were followed by working out problems that involved using the constructions in new situations.

THE WORKSHOP APPROACH AT F.E. OSBORNE JUNIOR HIGH SCHOOL

by Chuck Swaney and Wes Larson
Messrs. Swaney and Larson, working cooperatively in F.E. Osborne Junior High School, Calgary, have developed a workshop approach in mathematics.



Grade VII students are completing displays for percentage. They took a sampling of student opinions on their choice of an important question and represented the results in percentages. Some questions sampled were: "Do you think you want to smoke?", "Should the Americans Leave Viet Nam?", "Should girls be allowed to wear blue jeans in school?" and "Do you like our principal?"

The displays on the walls resulted from a workshop approach to mathematics. Some of the problems represented are: Keeping the area of a rectangle constant while varying the perimeter (Grade VIII); prisms and pyramids; finding solutions to matching pairs of congruent sides of 30-60-90 triangles (Grade IX) by Grade VIII students from nets.



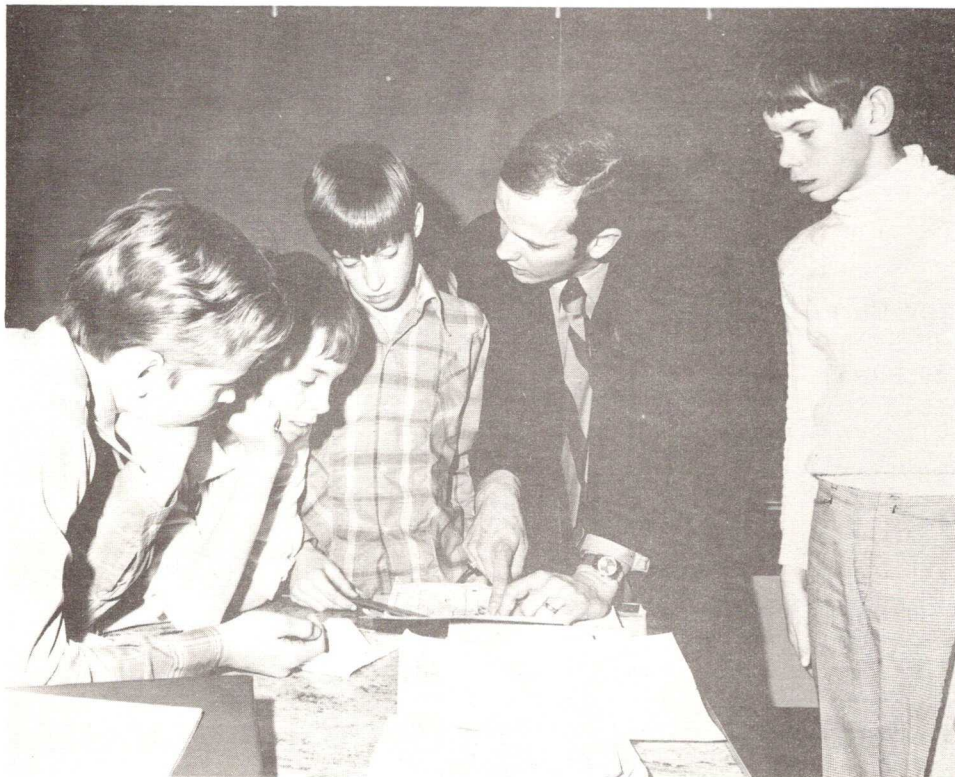
STUDYING RATIO BY THE LAB APPROACH AT SUNALTA JUNIOR HIGH SCHOOL

by Ron Cammaert
Mr. Cammaert is a mathematics teacher at Sunalta Junior High School, Calgary.

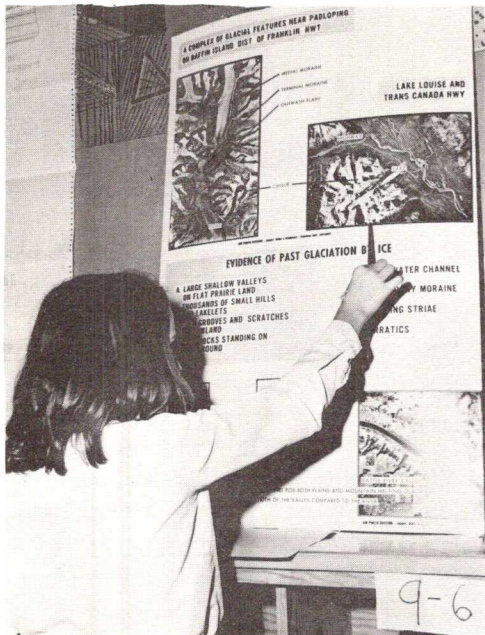
The pictures refer to a Grade VII laboratory mathematics class, dealing with ratio. Each student group was given a different problem. The problem usually required the students to gather some information from a situation and then to find a ratio or use a ratio to find a distance.



The two boys with the globe decided to make a question on their own which involved finding a distance in miles between two particular points. They then gave the problem to someone else to solve.



The four boys receiving help were attempting to change a particular ratio on a city map to another map that did not have a scale.



The girl with the aerial photograph was finding the ratio to which the photograph was made after being told the actual length of Lake Louise.

The girls and boy were working to find to what scale the area map of Calgary had been made. They had been told the elevation was exaggerated in a ratio of 3.1 and a particular elevation was pointed out to them.



NOW AVAILABLE

Mathematics for Elementary School Teachers

A series of 10 thirty-minute films and supplementary texts (1.50) which show a modern approach to teaching numeration and the four basic arithmetic operations are now available.

If you plan to show the films (two per week for five weeks), we strongly recommend that you invite the parents. They find the series informative and reassuring.

The viewing fee is \$100.

For further information contact Lynn S. Fossum, Provincial Film Coordinator, MCATA, 16325 - 83 Avenue, Edmonton, Alberta.

MATH OPTION TOPIC - GRADE VIII

THE STOCK MARKET

by D.W. Annesley

Dennis Annesley is mathematics coordinator at Avalon Junior High School, Edmonton

This particular topic proved to be one in which most students were interested, as many of their parents had invested in the market at one time or another and some of the students had stocks of their own.

The study was begun by first constructing a list of objectives, bringing to light *what* exactly the students wanted to learn about the stock market. This took about 40 minutes and was done by first allowing 15 minutes or so for students to discuss their ideas with each other. The final 25 minutes were spent pooling all ideas and consolidating them into a list. Here is the list which we prepared:

1. What is a *stock*, and how are they put on the market?
2. To learn about procedures for trading shares.
3. To discuss how one's financial position influences the way in which one invests.
4. To learn how one becomes a stockbroker.
5. To be exposed to a broker's point of view on investments.
6. To learn how to read the financial page.
7. To learn how to decide between good and bad investments.

After constructing the list of objectives, we spent some time discussing which objectives were possible to achieve and what we might do to achieve them. This set the stage for our study. The following outline shows how the remainder of the study was handled.

ACTIVITIES DURING THE FIRST SIX CLASSES

1. Discussions (both group and class) were held regarding objectives 1 and 2. About half of each period was used for this purpose.

2. The other half of each period was spent by students on their graphs, both constructing them and keeping them up-to-date. The graphs were records of daily prices on stocks which students had selected to watch. The graphs were constructed on large sheets of brown wrapping paper and displayed on tack boards around the classroom.

3. A stockbroker came to the school to talk to my option group about the market. He and I had met previously to decide on topics for his talk.

Classes 7 and 8

Students invested \$1,000 each in the market.

Classes 9 and 10

Charts were constructed to keep track of all transactions including brokerage fees.

Classes 11 -

Kept graphs started at the beginning of the study up-to-date.

Bought and sold shares if desirable.

Spent 10 to 15 minutes of each class discussing some aspect of the stock market.

Spent the last class selling everything in order to determine each student's financial status. A one dollar prize was awarded to the student who made the most money (\$462).

The final class was held at Richardson Securities. We were given a brief talk by one of the brokers and then allowed to watch the board. Each student was given a piece of ticker-tape and a pamphlet about stocks and bonds to take home.

Time for the unit, in all, was about six weeks on the basis of 45-minutes per class, three classes per week.

Have you read?

COLLEGE PREPARATORY MATHEMATICS - PREPARATION FOR WHAT?

by Charles R. Eilber
published in *The Mathematics Teacher*,
61:1, January, 1968

Reviewed by Murray R. Falk, Past President, MCATA

The author begins by questioning the relevance of present high school mathematics curricula to the future historian, musician, English teacher, or articulate layman. The major purpose of any current mathematics course is to prepare the student for the next course. But what of the student whose interests and motivation favor the arts and humanities?

The author suggests that a partial solution is found in the recent increase in the number and variety of reference material *about* mathematics - materials which emphasize the historic, cultural, biographic, philosophic, artistic, and social aspects of mathematics. About 600 such references are listed in the NCTM pamphlet *The High School Mathematics Library* (1963).

The author proceeds to list 11 areas that are highly relevant to an educated person in any field.

- The historical growth of major mathematical concepts.
- The growth of Greek mathematics as a model for systems of thought.
- The philosophic and religious controversies raised by mathematical and related scientific discoveries.
- The influence in many fields of Euclid, Kepler, Descartes, Newton, Einstein and others.
- The mathematical basis of music.
- Mathematical influence in art and architecture.
- Mathematical forms in nature.
- Probability, statistics and inference in the social and biological sciences.
- Computers and their social significance.
- Physical and philosophic implications of non-Euclidean geometrics.
- Generalizing from a set of data.

The author gives an example of how some of these topics might be raised in a course in Analytic Geometry and suggests several sources for ideas in other areas.

Eilber concludes by suggesting that we are selling mathematics short by not including the effects of its cultural impact.

We should strive for mathematics courses which are meaningful, relevant, and of lasting significance, not only in their own right, but for the broadened insights they provide into almost every corner of human thought.

I heartily recommend this article as a stimulus for your next staff room discussion.

BOOK REVIEW



The *Houghton Mifflin Mathematics Enrichment Series* is a set of seven books (from 30 to 90 pages each) dealing with the following topics:

1. *Legislative Apportionment* - Albert E. Meder, Jr.
2. *Stereograms* - Donald W. Stover
3. *Mosaics* - Donald W. Stover
4. *Sequences* - Katherine E. O'Brien
5. *Topics from Inverse Geometry* - Albert E. Meder, Jr.
6. *Induction in Mathematics* - Louise Johnson Rosenbaum
7. *Fibonacci Numbers and Lucas Numbers* - Verner E. Hoggett, Jr.

In general, the set of seven books seems appropriate for high school matriculation students, especially those with a keen interest in formal proofs. All books extensively rely on geometric and algebraic proofs and theorems.

Three of the books provide a non-mathematical incentive to the learning of their contents. These are:

Stereograms
Mosaics
Legislative Apportionment

The books on stereograms and mosaics would probably lend themselves to an activity approach, because both provide for drawing and cutting activities to supplement the mathematical ideas behind the concepts. The book of stereograms stresses coordinate systems, chart reading, graphing, and algebraic manipulation. All of these culminate in a three-dimensional picture which "pops out" of the paper. A special set of glasses is provided in the back of the book to help achieve the three-dimensional effect.

The book on mosaics also provides meaningful mathematics activities for a student, which lead on to formal mathematics concepts. The book utilizes such mathematical ideas as one-to-one correspondence, the sum of the exterior angles of a polygon, the measure of the interior angles of a polygon, and mosaic symbol notation. The last is adequately explained, and is the basis for most of the exercises in the book. The number of possible mosaics is extensively covered, both formally (using algebraic and geometrical proofs) and informally (by attempting to build mosaics with different shapes of colored papers).

Legislative Apportionment is based on the American political system, but could easily be adapted to the Alberta and Canadian systems. The book is excellent for showing a practical side of mathematics to skeptical social science students (and teachers). Algebraic manipulation, inequalities, and the four arithmetic operations are the necessary mathematical tools required. This book would be best used by a teacher to set up a series of lessons related to the local scene.

I will review the other four books in the next *Newsletter*.

Gerald Worger

Mr. Worger is on leave of absence from the Calgary Public School Board, where he has taught in elementary, junior and senior high schools. At present he is working on an M.Ed. at The University of Calgary in the field of Math Education.

A GAME YOU PLAY TO LOSE

Hexapawn: A Game You Play to Lose has been produced by International Business Machines Corporation. This game, devised by Martin Gardner and first published in *Scientific American* in 1962, demonstrates how a machine can be instructed to "make decisions" and avoid repeating past mistakes. It is based on a simple version of checkers and is intended to increase interest in computers and computer programming among high school students. Teachers, or those who work with teachers, can secure copies of *Hexapawn* by writing to:

Manager, Editorial Promotions,
International Business Machines,
Armonk, New York 10504