DOCUMENT RESUME

ED 069 499 SE 015 150

TITLE	Mathematics Methods Program Newsletter, Number 2.
PUB DATE	Nov 72
NOTE	10p.
EDRS PRICE	MF-$0.65; HC-$3.29
DESCRIPTORS	Curriculum; *Elementary School Mathematics; Evaluation; Instruction; *Mathematics Education; Methods Courses; Newsletters; *Preservice Educaticn; *Teacher Education

ABSTRACT

Indiana University's Mathematics-Methods Program, which integrates mathematics content and methods courses for elementary school education majors, is described in this newsletter. The organization of pilot classes is detailed, the mathematics topics for the first semester are listed, and activities of the education students at a participating elementary school are described. The elementary school's mathematics laboratory, a unit on mathematical relations covered in the methods course, and the writing sessions involving development of project materials are all briefly discussed. Included is an outline of a program for evaluation of the project. (DT)

NEWSLETTER

Mathematics Methods Program

Number 2 *November 1972*

PILOT CLASSES

The first fifteen months of the Project came to focus with the beginning of the fall semester. Two pilot classes of about 25 students each started the Mathematics-Methods Program.

Each of the classes is being team-taught by a Mathematics Department teaching assistant and a Mathematics Education Department faculty member. The teams of Mr. Tom Hudson and Professor Paul Trafton and Mr. Al LaTendresse and Professor John LeBlanc coordinate their efforts so that the faculty member is with the class during an average of one of their three double periods (1 hour and 45 minutes) at the University each week. The class also travels to Smithville Elementary School for one double period each week.

It is anticipated that the students will study six to eight units of the Mathematics-Methods Program during the first semester:

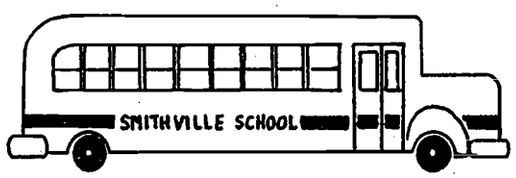
1. Sets and Logic
2. Graphs
3. Introduction to Mathematical Relations
4. Numeration
5. Addition of Whole Numbers
6. Geometry I (Awareness)
7. Subtraction of Whole Numbers
8. Multiplication-Division of Whole Numbers

To provide a change of pace several "mini-units" will also be studied such as Pascal's Triangle, Number Patterns, and Slicing a Potato. The schedule is still flexible and will probably be adjusted.

During the first day of classes, the students were introduced to the rationale and goals of the Mathematics-Methods Program and were presented a series of slides concerning pedagogical problems in mathematics teaching. In the next two class periods, a

A Project of the Mathematics Education Development Center sponsored jointly by the Mathematics Department and the School of Education of Indiana University and funded through the UPSTEP program of the National Science Foundation

content knowledge pre-test was administered, and the first unit, Sets and Logic, was begun.



On Friday of the first week of classes both pilot sections were bused out to Smithville Elementary School, where they were greeted by Wendell Brinson, principal, and by Miss Marilyn Hall, the mathematics resource teacher. After a tour of the school, each pre-service teacher observed the activities in the classroom to which he had been assigned for the first eight weeks.

On their second visit to Smithville the pre-service teachers began to work with the children assigned to them. Each was assigned four children for the first eight weeks and was instructed to get to know the children while working with them and to observe how they think, act, and learn. Much of the work done with the children has been in preparation for the Smithville Mathematics Fair which is discussed below. This aspect of the Program has gone very well. One prospective teacher said that he enjoyed the children so much that we were going to need an "armed guard" to get him away from the school.

In future visits to the school, the emphasis on the fair preparation will be replaced with a focus on working with children using activities associated with the units which the prospective teachers are studying at the University. The prospective teacher will be asked to continue to record in his log his observation of the behavior of individual children in mathematics learning situations.

NOTES TO THE INSTRUCTOR

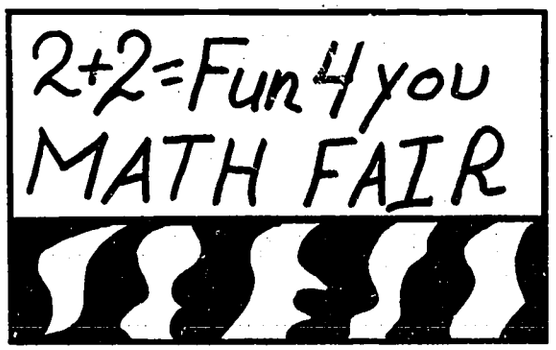
Susan Sanders

In addition to an activities booklet and a set of worksheets, each unit in the Mathematics-Methods Program includes a manual of notes to the instructor, written especially for that unit. Among the topics covered in the instructor's notes are a suggested day-by-day timetable for the unit; a list of materials required for each activity, with special notation if materials such as films must be ordered in advance; answers to all but the most obvious worksheet problems; suggestions for ways of discussing open-ended questions; and pedagogical notes (for example, how the instructor can provide feedback when group activities are in progress).

It is important that these notes be written with the mathematics teaching associate in mind, since in all likelihood, this is the person who will be conducting a large part of the course. Recently in working on the notes for the multiplication-division unit, I found my experience in presenting the same material to my T101 class to be invaluable, and have tried to include in these notes comments on activities which may require special clarification by the instructor, points which must be emphasized in the unit, different interpretations of problems which might be useful if the student does not entirely understand a concept, and suggestions for enrichment activities to challenge the more advanced students.

SMITHVILLE ELEMENTARY SCHOOL

A mathematics fair took place at Smithville Elementary School on October 19. The fair provided a focus for the activities of the pre-service teachers in the Mathematics-Methods Program on their first eight weekly visits to Smithville. An enthusiastic atmosphere for mathematics was generated among the teachers, prospective teachers, and pupils as they worked together on the fair.

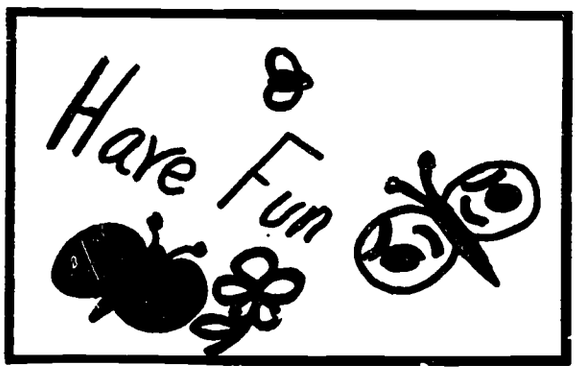


After a school-wide contest to name the fair, the pupils selected "2 + 2 = Fun 4 You." And they did succeed in showing their parents and other visitors to the fair that mathematics is fun, with an array of displays and booths in which the pupils themselves challenged visitors with mathematical puzzles and involved them in the construction of graphs, taking of measurements, estimation of large numbers, and other mathematical activities.

At the beginning of the fair, welcoming remarks were given by the Smithville School principal, Wendell Brinson. Professor John LeBlanc then briefly discussed the goals of the Mathematics-Methods Program. Professor Paul Trafton and Miss Marilyn Hall spoke to the parents describing their roles in the Smithville School. The parents were shown slides of the children engaged in mathematical learning activities.

Then the visitors went to the various classrooms where they saw colorful displays depicting the mathematical topics which the students had been studying. These varied from counting sets of objects and studying geometric shapes in grades 1 and 2, and the study of graphs and of ancient numeration systems in grades 3 and 4, to the study of man's use of large numbers and measurement in the metric system in grades 4 and 5. The parents watched pre-service teachers and three or four pupils engaged in mathematical activities. These included forming patterns with beads, activities with Cuisenaire rods and Dienes blocks, and constructing graphs of data gathered on the spot from parents.

The fair was given a substantial amount of coverage in the local papers. The parents and community left the school that night feeling that mathematics was exciting and, particularly for their children, very much related to the real world.

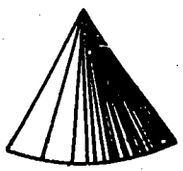


All illustrations on this page were drawn by Smithville Elementary School students.

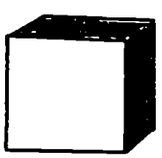
SMITHVILLE SCHOOL'S MATHEMATICS LABORATORY

Marilyn Hall

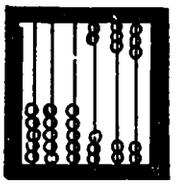
"Welcome to the World of Mathematics," says the sign at the Smithville Mathematics Laboratory, which greets the elementary students, their teachers, and fifty pre-service teachers from Indiana University.



Prior to the beginning of the school year, mathematics laboratory materials were ordered from over twenty different companies. A materials catalog was set up and is comprised of a description list by major mathematical strands. For example, all of those materials designed to increase a child's understanding of whole numbers are listed together. The lists have been cross-referenced, enabling easy accessibility to materials. This catalog will be used by the teachers, students, and pre-service teachers to find the needed materials located in the mathematics laboratory.



The major objective of the laboratory is to provide the opportunity for teachers and students to relate the world of mathematics to the real world and to develop their confidence and skill in mathematics. The materials are being used in activities which range from relating a single concept to its embodiment to interweaving several concepts and relating them to real world situations.



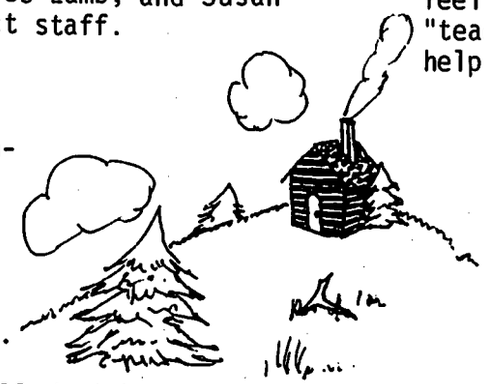
The materials include multi-base blocks, logic blocks, various abaci, unifix cubes, geometric shapes, balances, and Cuisenaire rods, as well as other mathematical aids and games. The materials are stored by topic so that teachers may more easily find what they need.

During the academic year, in my capacity as mathematics resource teacher, I assist the Smithville staff in incorporating the mathematics laboratory materials into their teaching. Their involvement in this program will enable the teachers to gain in-service training and hopefully will equip them to provide an improved mathematics program for Smithville pupils in future years.

SMITHVILLE-PROJECT RETREAT

On July 12th and 13th, a retreat was held at the Abe Martin Lodge in Brown County, Indiana for the teachers and principal of Smithville Elementary School and the Project staff to discuss plans for the school year '72-'73. It was also hoped that two days of close cooperation and exchange of ideas would cement the good working relationship which had been developing between the Smithville teachers and the Project staff during the previous year. Those in attendance included Wendell Brinson, Smithville School principal; Gloria Bier, Glodene Chambers, Mark Cline, Jane Nute, Diedra Riggs, Norieta Sichting, and

Wilma Weimer, Smithville teachers; Professors John LeBlanc, Donald Kerr, Paul Trafton, Billy Rhoades, and Maynard Thompson, Project faculty; and Marilyn Hall, Charles Lamb, and Susan Cote, of the Project staff.



At the retreat, the agenda included two days of morning and afternoon meetings. Meals were eaten as a group, which allowed informal discussion of the Project. What little free time existed was filled with a volleyball game that was enjoyed by all.

Miss Marilyn Hall was introduced to the Smithville staff as the mathematics resource teacher. Miss Hall discussed her role at Smithville School and the function of the mathematics laboratory.

Professor Paul Trafton discussed the textbook series, Harbrace Mathematics, which has been provided by the publishers for use in the Smithville School classrooms this year.

An important issue in the minds of the Smithville teachers was the utilization of the elementary education majors enrolled in the Project's Mathematics-Methods Program during their visits to Smithville. It was decided that the role of the pre-service teachers would evolve with full input from the classroom teachers. In order that there be maximum benefit for both the pre-service teachers and the pupils, it was decided that each pre-service teacher would be assigned a specific group of pupils to work with (3 to 4 pupils). In this way the pre-service teacher could more clearly focus on the learning patterns and difficulties of young children. Conversely the pupils could feel that they had their own special "teacher" who might provide extra help.

An important outcome of the retreat was that a mathematics fair would be held at Smithville School on October 19. It was felt that such a fair would have two values: 1) to enable the parents of the pupils at Smithville School to become acquainted with the new mathematics program; and 2) to provide a focus for the pre-service teachers' activities with the children during the first eight weeks of school.

The retreat proved a great success. The Smithville School principal and teachers and the Project members left with renewed enthusiasm for the implementation of the program in the fall.

NEW PROJECT MEMBERS

In looking at the list of Project members you will see some new names and you will miss some old ores. Gone are Nancy Capozzolo, Wally Goya, Geraldine Nardi, Bob Olin, Lynnette Olson, and Carter Warfield.

Arrived from the University of Northern Iowa is Calvin Irons, who is a doctoral student in mathematics education.

The Project evaluator, Charles Lamb, is a doctoral student "on loan" from the University of Georgia.

Deane Hutton is now the Project audio-visual consultant. He is a doctoral student on leave from Adelaide Teachers' College in Australia.

Four new mathematics T.A.'s have been employed. Karen Scott, Susan Sanders, and Glenn Carver all teach part-time in the Mathematics Department and work part-time on unit development in the Project. Tom Hudson is team-teaching one of the pilot classes with Professor Paul Trafton.

Two doctoral students at Northwestern University, Roger Chilewski and Howard Johnson, worked on the Project this summer. Their work involved structuring a unit dealing with elementary number theory.

Susan Coté is now our administrative assistant. Susan came to us from the graduate department of French and Italian at Indiana University.

We have also been joined by Susan Bennett, who is typing unit manuscripts.

CAROLE GREENES VISITS M-M-P

Professor Carole Greenes from Boston University consulted at the Project in September. Professor Greenes looked carefully at all aspects of the Project and made a number of very helpful suggestions.

In particular, Professor Greenes gave us ideas to help develop more open-ended activities in the units. Her experience in the schools, with teachers, and with elementary pupils made her advice especially valuable.

Professor Greenes will be using some Project materials in her classes at Boston University. We are looking forward to future cooperation with her as well as with other teacher-trainers involved in programs whose conceptual bases are similar.

LE BLANC AND SPRINGER TO ENGLAND

During the first week of September, Professors LeBlanc and Springer attended the International Congress on Mathematics Education in Exeter, England. Professor LeBlanc made an opening presentation in the Working Group on the Initial Training of Primary Teachers and found considerable interest in the Mathematics-Methods Project.

The final report of the Working Group emphasizes the importance of combining mathematics content and methods, using manipulative materials in teacher training, and providing experience with children prior to practice teaching.

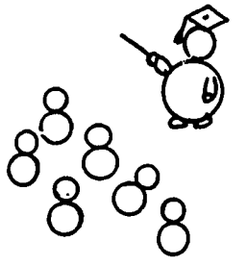
Professor Springer also made a presentation concerning the Project to a forum on the role of the mathematician in mathematics education.

Both Professors LeBlanc and Springer returned with heightened enthusiasm and with the feeling that the Project and its goals reflect the current thinking of many mathematics educators from throughout the world. In particular, correspondence has been established between a group of Dutch mathematics educators and us through the exchange of some units.

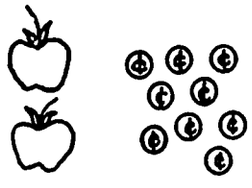
RELATIONS

Billy E. Rhoades

Relations permeate the study of mathematics at all levels. In an attempt to have the pre-service teacher become aware of this fact, relations are first presented early in the sequence, immediately following the unit on graphs.



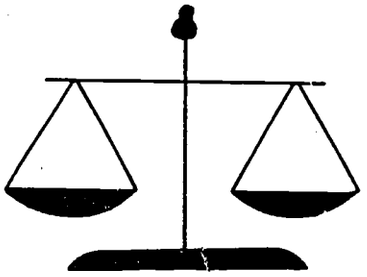
many-to-one



many-to-many

The initial unit on relations is an informal one, consisting of the presentation of a variety of examples of relations from elementary school texts, including those that are many-to-one, one-to-one, one-to-many, and many-to-many. The pre-service teacher also examines relations for symmetry and transitivity. Many of these activities are presented in a problem solving situation.

A second and more formal treatment of relations occurs in the second semester. At this point the pre-service teacher considers examples of equivalence relations that have been developed in various units and looks at the corresponding equivalence classes. During the unit the student prepares a "mini-lesson" on relations, suitable for elementary pupils.



EVALUATION

Paralleling the development and trial of the Project instructional materials is that of the Project evaluation program. Two important phases of this program have been initiated. The first phase is geared toward measuring the gain in mathematics content knowledge evidenced by students enrolled in the Mathematics-Methods Program as compared with students enrolled in the traditional sequence of three mathematics courses and one mathematics methods course. The second evaluation phase initiated this fall is focused on the Project's impact on the mathematics learning achieved by the pupils in the Smithville Elementary School.

During September all first through fifth graders at the Smithville Elementary School were given the Metropolitan Achievement Test (1970) and the Otis-Lennon Mental Ability Test. Only the Metropolitan Achievement Test will be administered again in the spring.

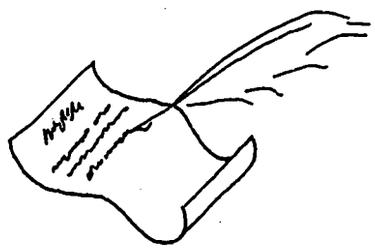
For the purpose of measuring mathematics content learning by Indiana University elementary education majors, a Content Knowledge Test was devised. In addition to the students in the Mathematics-Methods Program, a control group of 200 elementary education majors was tested. In this way the Mathematics-Methods Program students may be compared with students at various stages in the regular course sequence. Comparisons will also be made within each content area to pinpoint any particular strengths or weaknesses in the Program.

The test will be administered again in December 1972 and in April 1973. In the summer of 1973, the data from this preliminary evaluation will be analyzed; and all evaluative instruments will be revised for use in the formal evaluation of the Mathematics-Methods Program.

In addition to the cognitive measure which the Content Knowledge Test should provide, an attitudinal measure is being developed which will indicate the changes in attitude on the part of the students in the Mathematics-Methods Program toward mathematics and toward mathematics teaching. It is anticipated that an evaluation of this sort will be carried out through observation of the pre-service teachers by Project staff during classroom activities as well as while working with elementary school pupils at Smithville School. Plans for this very difficult aspect of evaluation have not yet been fully developed.

Several educational research specialists have been consulted in the development of the overall evaluation design, and they will continue to advise periodically as the evaluation proceeds. These consultants are Professor Golam Mannan of Indiana University Northwest, and Professor James Sanders and Dean Turner, both of Indiana University.

SUMMER WRITING SESSION



For three weeks in May and June, seven professors of mathematics and mathematics education participated in an intensive writing and evaluation session at the Mathematics Education Development Center. These professors were:

Larry L. Hatfield
University of Georgia

Richard A. Lesh
Northwestern University

Michael Mahaffey
University of Georgia

Bernadette Perham
Chicago State University

James E. Schultz
Ohio State University

Larry E. Wheeler
Wisconsin State University
at River Falls

Lauren G. Woodby
Michigan State University

The purpose of their visit was, first, to evaluate the writing efforts of the Project staff and to avail the staff of the fresh insights and observations of mathematics educators not yet involved in the development of the Project materials. Second, the visiting faculty members were responsible for the drafting of new units following the Project philosophy of integrating the content of certain mathematical topics with the pedagogical considerations relevant to the teaching of that topic to the elementary school child.

Prior to their arrival at Indiana University, the visiting faculty members received certain materials to acquaint them with the immediate and long-range goals of the Project and to enable them to begin thinking about their own substantive contribution during the writing session.

The daily schedule during the three-week writing session began with a one and a half-hour meeting at 8:00 a.m. to discuss the efforts of one writing team, and to provide the team with the reactions and suggestions of the entire group. The rest of the morning was spent working at the Project office in teams with the Project faculty. In the afternoons the writers were free to work independently either at the Project office or elsewhere. Occasional informal gatherings and volleyball games provided the necessary relief during this intensive work schedule.

The written products which emerged from the three-week writing session varied from nearly completed units to detailed outlines of units. For instance, the unit Sets and Logic is an edited version of that unit written by Professor Larry E. Wheeler.

In every case, the visitors expressed interest in future involvement with the Project. Project materials are being used or will be used this year by Professors Lesh, Perham, Wheeler, and Hatfield.

While such writing sessions are exhausting and time-consuming, they seem to be an important phase in the validation of the Project's goals and products.

The illustrations in this newsletter were done by Susan Bennett.

MATHEMATICS-METHODS PROGRAM

The Mathematics-Methods Program completely integrates mathematics content and methods courses for undergraduate elementary education majors. Each instructional unit in the Program consists of activity-lessons in which the mathematical content, the related elementary school learnings, and appropriate pedagogical techniques are developed using a laboratory strategy. In conjunction with the two-semester twelve-credit-hour Program, the students visit Smithville Elementary School each week to learn how children think and reason about mathematical ideas.

John F. LeBlanc, Director

Donald R. Kerr, Jr., Assistant Director

Mathematics Faculty

Billy E. Rhoades (on leave)
George Springer, Co-principal investigator
Maynard D. Thompson

Mathematics Education Faculty

Paul R. Trafton
Ronald C. Welch

Graduate Students-Mathematics

Glenn M. Carver
Tom S. Hudson
Alfred L. LaTendresse
Susan M. Sanders
Karen S. Scott

Graduate Students-Mathematics Education

Carol A. Dodd
Fadia F. Harik
Calvin J. Irons
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