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ABSTRACT

This report summarizes the first two years of study at the Elk Grove Training and Development Center. The initial program was designed to improve mathematics instruction through the use of a non-graded multi-media approach utilizing laboratory team teaching. Achievement test summaries indicate that K-5 students instructed in mathematics through this program have achieved at or above grade level on standardized tests. The author concluded that the students became truly involved with this approach to learning mathematics, but the teacher had to have assistance in the lab, time for planning and inservice training, and a sincere commitment with the program. This work was prepared under an ESEA Title III contract. (RS)

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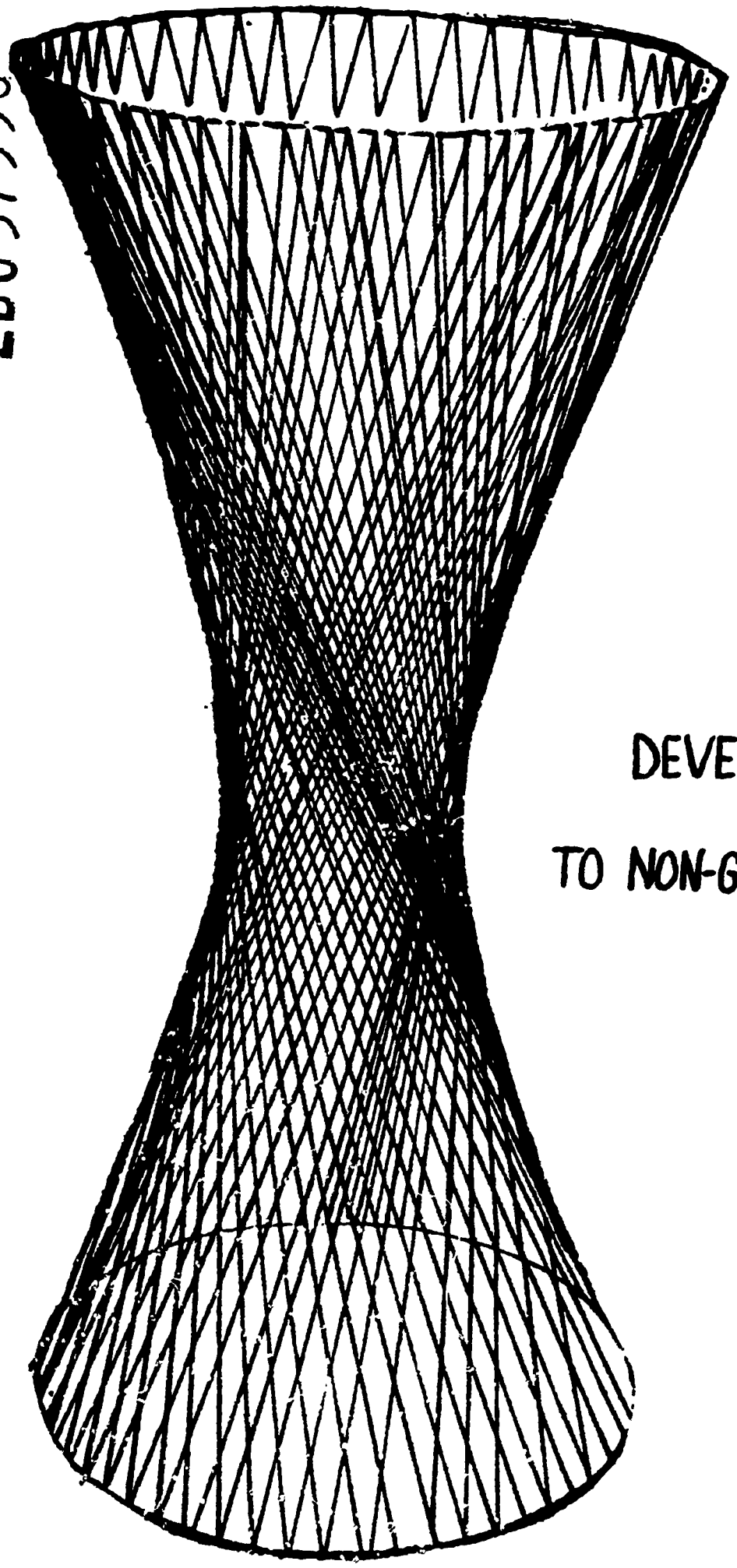
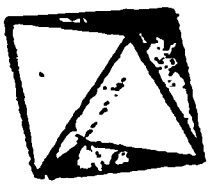
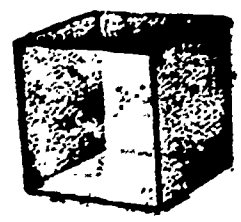




A DEVELOPMENTAL PROGRAM TO NON-GRADE MATHEMATICS K-12



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June, 1969

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OVERVIEW OF THE PROGRAM

The Developmental Program to Non-Grade Mathematics

Components

1. Activities

a. Demonstration

Initial demonstrations for this program took place three months after the program started (December, 1967). The program was implemented in an elementary school (Juliette Low) in school district #59 (Dr. Donald Thomas, Supt.). For the first year demonstrations were scheduled for Tuesdays and Thursdays, but every effort was made to hold demonstrations at other times if requested.

In the second year of operation, the program involved three hundred K - 5 students. The mathematics laboratory became the center of demonstrations.

b. Training Service

The teacher training service most emphasized was a four-week summer institute in which teachers experienced (1) team-teaching; (2) small group instruction; (3) a multi-media approach; and (4) a mathematics laboratory where children worked with materials. Other training sessions were 2, 4, or 8 session workshops.

c. Consultant Services

The coordinator was available for consultant services to all schools who requested help to implement all or parts of the program.

d. Seminar Services

During the second year of operations, monthly follow-up seminars were held for summer institute participants.

e. Released Time

Released time monies were used to release the teachers who were in the summer institute for monthly seminars during the school year. Released time money was also used to pay for substitutes for teachers implementing the developmental mathematics program. The teachers met weekly for purposes of planning and at other times to participate in professional activities which would help them in their work.

f. Developmental Activities

Aside from coordinating the above activities, the coordinator was responsible for the development of an organizational pattern to facilitate the non-grading of mathematics. Much time was spent in developing laboratory activities to help children explore basic concepts of mathematics.

2. Personnel

a. Producers

(1) Coordinator - Mrs. Phyllis C. Ferrell

Teaching Assistant - Mrs. Betty Johnson

(2) Secretary - Mrs. Maria Mokas

(3) Others involved in producing the model program

(a) Principals of Juliette Low School

Mrs. Jean Griffith - 1967

Mr. Ethan Janove - 1968

Mr. Earl Woodley - 1968-69

(b) Teachers in the developmental program

Miss Susan Reeves

Mrs. Gail Goodman

Miss Patricia Riggs

Miss Royce Parks

Mr. Andrew Turausky

Miss Maura McMullen

Miss Joanne Derencin

Mrs. Margaret Butler

(c) Visitors:

Teachers (200)

Administrators (30)

Teachers involved in one workshop (270)

Teachers involved in 4 8-session workshops (251)

Teachers involved in Summer Institute, 4 weeks (32)

Students directly affected by the program
(approximately 1500)

3. Location

The coordinator, her teaching assistant, and secretary were housed at the Juliette Low Elementary School, School District 59, Arlington Heights, Illinois. Office space was available as well as room to hold orientation sessions for visitors. A project area large enough for 60 students was designated as the mathematics laboratory. Seminar sessions and training sessions were held at the school. A summer institute was held at Winer Junior High in Arlington Heights School District #25 (Dr. Donald Strong, Supt.).

II RATIONALE

Background and History

Educational leaders of today agree on the need for change in the teaching of mathematics. As Carl Breiter [2] points out, nearly everyone fails in mathematics. To be sure, not all fail at the same time or in the same content area, but at some point in grade school, high school, or college. He further explains that they may survive an official flunk but they decide not to go on with mathematics because they fail to understand it. Using the concepts of fractions as an example, he says surprisingly few people understand fractions and yet manage to get through algebra, which, in his words:

> is rather like struggling through a course in carpentry without having learned how to drive a nail. [2]

There has been extensive educational development in the field of mathematics in the past sixteen years with considerable attention given to revision of curriculum and to methodology for exploration and discovery. However, very little has been done to develop plans to operationalize these programs in the schools and render them responsive to individual differences among children. There is the need to give teachers the kinds of experiences that will help them implement such programs.

A mathematics program should be developed which will "non-grade" [1] mathematics for students. Inherent in such a program is the need to develop appropriate strategies for non-grading and appropriate attitudes on the part of teachers and administrators who will implement the program. It is not possible to separate these two aspects of an effective mathematics program.

The field of mathematics has had its share of attention-getting since the early fifties. It was in 1952 that Dr. Max Beberman [3]

University of Illinois, began working with colleagues and skilled teachers on ways to develop materials and teacher training programs so that the end result would be student-generated enthusiasm about mathematics. This group did develop many materials which were used in high schools throughout the state. Later, the materials were used in the Illinois Gifted Program for outstanding students at the seventh and eighth grade levels. These materials were developed to emphasize the discovery approach for the student.

How much the idea really touched the student population studying high school mathematics in the last fifteen years is another question, and a serious one. Actually, the overall impact of this kind of serious attention from outstanding mathematicians has been of small consequence. In looking back over the past fifteen years at the emphasis on the new mathematics, those involved in the business of teaching realize the smallness of such an impact. Dr. Robert B. Davis [4], Professor of Mathematics and Education, Syracuse University and Webster College, sums it up:

> What effect has all of this effort in writing and publishing had on school mathematics in the United States? From all presently available evidence, its effect is relatively slight. Most of the high school mathematics curricula seem--once one looks beneath the shiny new surface--to be about the same as they were before the alleged 'revolution' began.

Dr. Davis further emphasizes evidence that shows societal change has accelerated in the past three decades, but curriculum change has slowed. This jeopardizes our total educational program.

Because much emphasis has been put on mathematics in the last fifteen years, and because we still have a large percentage of our teaching population at the elementary (and even the secondary levels) teaching traditional mathematics with a so-called "new discovery approach, we need to take a look at other aspects of our mathematics program.

We've attempted to revolutionize the mathematics curriculum in the past eighteen years but have not realized these goals because of the lack of teacher training.

The need for skilled mathematics personnel has become increasingly critical. The whole approach to the educational aspect of teacher training needs critical revision. There is a need to effect change in implementation of a math program and this can only come about by dealing with personnel organization and methodology, as well as content. The developmental program does this. That is why, in discussing needs for the program, attention is directed to all aspects of the program. In this developmental program this includes the mathematics laboratory, team teaching, the multi-media approach, and small group work. This combination combines to allow children to move at their own pace through the mathematics program (non-grading).

Non-grading is desirable but very difficult to achieve because it requires a change in philosophy and behavior for the traditional pattern. Here traditional pattern refers to: (1) lock step curriculum; (2) group size ratio of 30/1 (students to teacher); (3) grading systems in which grades are determined for groups and where goals are for the group rather than the individual; (4) out-dated achievement tests where goals are a direct contradiction to a program that pays attention to individual differences. Mathematically, all little third graders are expected to start and stop at exactly the same place on the test. It's very difficult to develop a program which pays attention to individuals as long as this is the case; (5) teacher training: teachers are traditionally so steeped in the above mentioned deterrents to individualization, that try as they may, these pressures rule their behavior. Some very fine teachers use these traditional patterns of behavior as their model--even knowing children fail because of them.

Even though concepts of a mathematics laboratory have been around for some time, it is fairly new and untried at the elementary level and particularly at the primary level. To watch six and seven year olds manipulate cuisennaire rods, to see the children find relationships without verbalizing, to watch them instinctively reach for a colored rod just enough smaller to round out a pattern, gives one an "it must be right" kind of feeling. In watching students in a mathematics laboratory, there is a sureness that this is right.

It is known that (1) not all children are ready for written materials at the same time, (2) children vary in rate of learning, (3) small children find it difficult to deal with abstractions, and (4) small children go through various stages before internalizing mathematical concepts. It is also recognized that children need to experience success in learning situations. Programs must be developed that pay attention to these beliefs and the math lab does this.

The need for team teaching is an important ingredient for the developmental program in mathematics. We find many views as to what team teaching really is. A good description, as the writer sees it in the developmental math program, emerges in Harper & Row's "Team Teaching". [5]

> Team teaching is a type of instructional organization, involving teaching personnel and the students assigned to them, in which two or more teachers are given responsibility, working together, for all or a significant part of the instruction of the same group of students.

By teaming talent is used more wisely and as a main result, children benefit. John Holt, author of "How Children Fail" says:[6]

> There should be more situations in which two experienced teachers share the same class, teaching, and observing the same group of kids, thinking, and talking to each other, about

> what they see and hear. . . . . .
> When I think what this year's experience has revealed about children's work, behavior, and thought, what avenues of exploration and speculation it has opened up, I can only wonder what extraordinary discoveries about learning might be made if other teachers in other places could work in this way.

Teaming, though it requires time and effort, does alleviate pressures for a lone teacher, at least the kinds of pressures that are on her when she is trying to pay attention to the differences in twenty-five to thirty children.

Implementation of the developmental mathematics program requires that teachers change their behavior, and teaming does facilitate this change in that it provides opportunity for team members to observe and help each other.

Some non-graded mathematics programs may be found throughout the United States: Nova at Fort Lauderdale, Florida, for the brighter students only and from seventh grade on up; individualized programs in the Middle School at Barrington, Illinois; and at Greve Junior High in Elk Crove Village, Illinois.

One program that has made an impact throughout the nation is called I. P. I. (Individually Prescribed Instruction) and has been developed at the University of Pittsburgh, Pittsburgh, Pennsylvania. Joseph L. Lipsom describes the basic program as follows:

> The purpose of the program is to allow each child to progress through the curriculum at his own rate and to reach objectives by means of tasks assigned on the basis of his unique abilities (Bolvin 1955). The basic components of the system are (1) a sequential curriculum stated in terms of what the student is expected to do at each stage, (2) placement and diagnostic tests to determine what instruction shall take place, and (3) lessons, i.e., work page assignments of teacher directed activities. [7]

The developmental program to non-grade mathematics has utilized the philosophy of all of these programs but the greatest influence has

come from England and particularly from the work done by Edith Biggs [8] who is one of Her Majesty's Inspectors for the Schools of England. She has directed three hundred mathematics laboratory workshops in England for elementary and secondary teachers. In these schools, children learn mathematics through the laboratory approach. She also urged directors of the Nuffield Project [9] to sponsor a mathematics teaching project (to cover age range five to thirteen years) which would require local authorities to provide a teachers center (a lab set-up). Edith Biggs [7] writes:

> A scheme was drawn up; in-service courses for leader teachers from each of the thirteen pilot areas were provided and the Nuffield Foundation Mathematics Teaching Project (organizer, Dr. Geoffrey Mathews) was launched in 1965. . . . . By 1966, nearly a hundred centres had been set up in mathematics, in science, or in both. . .

In this country we are inclined to consider a mathematics laboratory as supplementary to the program but in England and in the developmental math program, the mathematics laboratory is an integral part of the mathematics program. This aspect of the program and its implementation at K and 1st grades is a truly unique feature of the developmental program to non-grade mathematics.

III. PURPOSE

The development of a program to non-grade mathematics grew from commitment to an idea. Inherent in the development were certain beliefs, values, and assumptions. What beliefs were held that became the basis for development of the program? One was that in spite of all the hullabaloo of the discovery approach and the "so-called revolution" in mathematics, hardly a dent has been made in changing what has been going on mathematically for the past one hundred years. This is partly due to the fact that bringing about changes in education has always been very slow. But in spite of this, it is a belief that perhaps one very important item needed to insure success for change in mathematics (namely, teacher training) has been omitted. Whereas, curriculum changes have moved to upgrading content and to introducing the "discovery approach", the kind of teacher training to bring about implementation of the desired program has been almost totally disregarded. Development of a non-graded mathematics program must deal with personnel and methodology as strongly as content perhaps even to the exclusion of emphasis on content.

It is further believed that there is no one way to non-grade mathematics, but instead many ways to approach the concept. There is no one text for all children, no one set of lesson plans for all teachers, no one specific set of concrete materials (such as cuisenaires), no one set of visuals, and no one organizational plan. The situation must be assessed in each school where a desire to non-grade really exists, and components for implementation should be determined by all involved. This developmental program attempted to take the very best from all known programs and ways to non-grade mathematics, and integrate all into a new program.

Beliefs affecting the organization of the program are based upon knowledge that all children do not learn in the same way. It is important to know how a child learns, at what point he is ready to learn, when he can explore, understand and internalize certain concepts. Above all it must be realized that this varies for each child.

It is further believed that curriculum must change with the changing times. Computational skills are important, but not the most important goal for a mathematics program (though they have been for many years). In this day and age this writer would recommend a pocket computer for all students beyond the sixth grade. This would result in a program much improved over one geared to high scores on the skills area of an achievement test. There is too much stress on computational skill, to the exclusion of learning, discovery, and the intrinsic beauty of mathematics. A good mathematics program should stress the search for relationships, processes involved in attacking problems; processes that encourage looking at problems from any angle.

A developmental program to non-grade mathematics values the individual child, the individual teacher, and the individual administrator. To value a child is to take him as he comes to you, respect him, and accept that which he brings with him. One should assess where he is and build his program on that data. In a better program, the child and his teacher work together on these goals. These goals must provide success for the child.

Just as a child is valued, so is a teacher. This means acceptance of where that teacher is. For our purposes this involves all the hang-ups of traditional behavior, the insecurity many teachers feel with mathematics, the stress on computational skills

to the exclusion of all else. Then, through teacher training that involves teachers in the kinds of activities that will help them in implementation of a non-graded mathematics program, progress will be made.

Along with these beliefs and values there are certain assumptions that must be stated:

1. That concern for improvement in education is a continuous process;
2. That districts who are a part of the consortium supporting (or formed by) the T & D do desire improvement in the educational program and would be supportive of the training programs offered by the Center.

The program to non-grade mathematics holds promise both socially and psychologically in that it provides a program which allows children to move at their own pace, the learning pace, the comfortable pace. It provides success experiences and it is these success experiences that give children a good self-image. This, in turn, affects their behavior and attitudes generally as they live their lives.

Furthermore, the program holds promise because it is for all children. It is not only for better students, or for under-achievers, or for average students. It is for all children. It pays attention to all individuals. Also, it is not dependent on a specific set of published materials. Materials available in the district may be used in the program.

The model program is unique in two aspects. First, it defines the laboratory as an integral part of the program. In other words, a student doesn't open his book to do mathematics, close it, and go to the lab for supplementary exercises. What is done in the lab is

a major part of the mathematics program. At the primary level, the mathematics lab is the mathematics program. The second aspect in which the developmental program is unique is that it is implemented at kindergarten and first grade. There are no instances of non-graded mathematics programs with emphasis on the mathematics lab at the K - 1 level in the area.

It should also be stressed that much that is learned by the teachers as it relates to the organization of the program is applicable to academic areas other than mathematics. For example, concepts of (1) team teaching, (2) small group instruction, (3) multimedia approach, (4) and a lab approach can be used in any academic area.

Objectives of the Model Program

In the fall of 1967, the objectives were stated as: (1) that children be placed in a continum according to what they know; (2) children will experience lab work (exploration with concrete objects) 2-3 times weekly; (3) within the framework set forth by the teacher, the children will proceed with the textbook at their own pace; (4) teachers will team, but within their reference of teaming; (5) lists of activities to strengthen mathematical concepts will be developed; (6) in-service with the team will be on-going; (7) records will be kept for each child.

For teachers the objectives were: (1) to get teachers to look at their behavior ; (2) to become aware of and proficient in use of instruments for measuring what a teacher does; (3) to change the role of teacher from purveyor of knowledge to diagnostician, clinician.

In the summer of 1968, goals were restated as: (1) give teacher experiences with components of the program; a. team teaching,

b. small group work, c. multi-media approach, d. mathematics lab; (2) to influence teachers to change traditional behavior from lecturer to learner; (3) to help teachers become sensitive to learning at all levels; (4) to help teachers implement the program in their school.

In the fall of 1968, objectives again were restated as follows: (1) to continue the development of an organizational plan to non-grade mathematics; (2) to insure that this development can be used for all levels of children, regardless of ability, interest, achievements, etc; (3) to insure that the program is exportable to any school and is independent of a specific text series or set of materials; (4) to continue to identify mathematical concepts and to present the mathematical concepts to elementary and secondary students through effective teaching strategies; (5) to insure mathematical continuity in the program through the use of consultant help from the college; (6) to refine the basic components of the plan, using the resources of the college in the summer institute and academic year--in dealing with: (a) teams of teachers; (b) small groups of children; (c) broadening the multi-media approach; (d) continuing development of the mathematics laboratory as an integral part of the program AND as the training laboratory for teachers; (7) to further develop a training program for teachers that utilizes that which has been developed in the program (methods, materials, and clinical experience) and give teachers the kinds of experiences that they, in turn can give to their students; (8) use the program as a teaching laboratory for pre-service college students.

Projected goals for the program provide that the T & D will

cooperate with colleges to provide other members of their staff (regular and extension) for teaching and mainly for consultant work to (1) insure program continuity of mathematical concepts; (2) explore involvement in this kind of program as a means of imparting mathematical content and teaching methods to the undergraduate preservice students in elementary education; (3) provide consultant help in program development from an interdisciplinary team which includes mathematicians, behavioral scientists; (4) strengthen the evaluation of this program as a vehicle for continuing teacher education and improving mathematics programs for children; (5) train elementary mathematics specialists to function in the role of the coordinator; (6) develop and coordinate a non-graded program of mathematics education for beginning college students.

Relation of the Model Program to the Basic Questions of T & D

In selecting model program coordinators, administration personnel of T & D Center needed to consider potential coordinators as they related to the basic questions of the T & D. It was natural and expected that they would hope to select Model Program Coordinators who had some background relative to these basic questions.

In the summer of 1965 the coordinator of the Developmental Program to Non-Grade Math became involved in an eight-week workshop at the University of Illinois that stressed an in-service for teachers that required them to look at their teaching behavior via the Flanders Interaction Analysis, a style of teaching inventory, examination of questions asked by teachers through Guilford's model of intellect, creativity tests from Torrence, and teaching classes on video tape. Since 1965 the coordinator has been working to get

other teachers involved through:

a. self assessment in-service, District #59

b. self assessment in-service for Madison Project workshop participants -- 1965 and 1966

c. follow-up activities with CERLI (Cooperative Educational Research Laboratory, Inc.) at Appleton, Wisconsin, Rockford, Illinois, and McCormich Creek State Park

d. leadership training activities at Elk Grove Training and Development Center

e. learning to use the video tape machine and using it at the Juliette Low School where the program was developed

f. some full staff in-service at Juliette Low School as well as the team of teachers involved

As a result of their involvement in the developmental program to non-grade mathematics participants might be willing to expose and study their behavior openly and objectively because (1) involvement means teaming, and teaming indirectly forces one to consider his behavior with students and with other teachers; (2) involvement in the program gives them the physical apparatus such as audio tapes, video tapes, tape slides and a coordinator who not only teaches them how to use the equipment but encourages them to use it; (3) involvement through the coordinator of the Training and Development Center gives them released time to do these things. They have time to tape, study, analyze, and think. This is the greatest facilitator for bringing about willingness to expose behavior; (4) involvement gives them further experiences (small group work, a lab approach, new materials) that usually inspire them to want to be a better teacher. Then they are apt to be more willing to expose and study their behavior.

During the first year in the developmental program, the following activities took place:

a. Of the team of four teachers involved, one did a video tape with eight first graders. The topics discussed involved children's ideas about talking to others without permission, and about working at their own rate in various subjects. The teacher's goals were:

   1) to have each child make a contribution
   2) for the children to come to the conclusion that they can work at different rates
   3) to determine level of progress children are at for decision-making and critical evaluation

The coordinator critiqued the teacher on audio tape for a building institute meeting. The principal of the building then critiqued the coordinator on her goals. This whole session was discussed by the staff. As a result, eight staff members asked to be video taped in their classes.

b. Two other team members used audio tape for similar topics, and asked the coordinator to analyze these tapes using the CERLI matrix and other instruments that would give objective feedback in regard to their goals.

   The objectives of the second teacher were as follows:

   1) to have all children feel comfortable in the discussion and to allow each one the opportunity to respond;
   2) to be "non-directive", i.e., allow the group to interact among themselves more than with the teacher;
   3) to be accepting of all the children's ideas;

4) to ask "good" questions; not imply an answer in the process of asking a question.

Her topic was "Should children be allowed to pick their own teachers and choose what they want to learn in school?" This teacher evaluated her tape simply by studying it and by using data from the tape to check out reaching of goals listed. This evidence gives credence to a Yes answer on question #1. Teachers, who had never before exposed their behavior as teachers now became involved in doing so.

The second question deals with change in role perception. Subtle influences are at work and change of role perception comes about indirectly. Involvement in the program meant that there would be regular planning sessions with teachers. Concentrated effort was devoted to:

a. grouping and re-grouping practices into groups of 6 to 8;

b. team planning, where teachers shared in planning for groups and for individuals, shared responsibilities for teaching, and evaluated total activities in regard to success and appropriateness to children;

c. using audio tapes, video film strips, movies;

d. evaluating students progress;

e. evaluating teachers progress in relation to their goals.

The environment was set for change of perception. It started with bringing the teacher from behind closed doors, exposing her to self assessment, teaming, and working with others. These experiences affect self perception but combined with activities of the first basic question the affect is even greater. In other words, after experiencing exposure to one's teaching behavior, perception of self and others changes.

The anticipated learning outcomes for teachers should affect learning outcomes for students because the teacher, through her actions, sets a climate for learning. Traditionally she has closed the door, assigned the same problems and facts to be memorized to thirty students each day of the year. The better students are bored, the slower students cannot keep up, and the average ones find memorizing facts to be meaningless.

Involvement of teachers in this program gives them necessary experiences to provide that students are working in small groups on needed concepts. Students have activities in the mathematics lab which help them understand mathematics. As they continue to work at their own pace, in small groups, with many materials they find success in this mathematics program and anticipated learning outcomes are realized.

Activities for Program Development:

The developmental aspect of the program put special emphasis on an organizational plan to non-grade mathematics. Activities consisted of:

(1) Regular planning sessions for teams of teachers with the program coordinator.

(2) Small group learning situations for students.

(3) Multi-media resource material.

(4) A mathematics laboratory

(5) Additional activities

Each component of this program is discussed briefly below.

(1) Teachers in team situations

In this part of the program, teachers are asked to determine the learning outcomes desired for each group of children. The rationale for this procedure is that a teacher will implement most effectively a program he understands through his involvement in creating it.

In the planning sessions teachers are asked by the coordinator to consider such questions as: "What kinds of experiences should a group of six year olds have in mathematics? Should these experiences be the same for all? If not, how should they differ? How can a child's level of understanding a particular concept be ascertained? What are acceptable performance standards? What are the kinds of activities which will help children learn these concepts in mathematics? What can be done to give children a feeling of success?"

Teachers consider these questions and determine learning goals. Once decisions are made, the coordinator helps the teacher design the kind of experience that is desired for each child. These regular planning sessions provide clinical learning experiences for the teachers.

In the second year of operation, teachers at the third, fourth, and fifth grade level met with the coordinator for 1/2 day each week, and planned for small groups by:

1) Identifying concepts to be taught.

2) Placing students into small groups according to concept to be learned.

3) Prescribing material (text and other) and lab activities for developing and strengthening of concepts.

(2) Students in small group learning situations:

Children are placed in small groups for initial instruction in a math concept according to their diagnosed needs. The small grouping pattern is also used for follow-up work, reinforcement, and independent study. Each teacher of the team may work with two or three groups of students during the daily scheduled periods of instruction.

Small group instruction also provides a vehicle for teacher change in that it facilitates a break with the traditional pattern of instructing a classroom or groups of students from the same page of the book at the same time.

(3) Multi-media approach

A wide range of books, film strips, tape slides, programmed material and visual and audio aids are available for use by both teachers and students. Some of these materials have been locally developed, others have been produced by commercial sources or curriculum project groups.

(4) Mathematics Laboratory

The fourth component of the program is a mathematics laboratory which is housed in a regular classroom. Shelves and cabinets are filled with manipulative learning materials (e.g., cuisenaire rods, geo-boards, tiles, counters, etc.) and are freely accessible to the children. Instead of individual desks, tables are provided to encourage children to work together in small groups. The activities which take place in the laboratory are an integral part of the mathematics program.

The laboratory activities are an integral part of the mathematics program and some concepts of development (e.g., measurement topics and informal geometry) are dependent almost exclusively upon the laboratory activity.

In the lab four small groups of students worked with various kinds of materials, thereby freeing the teacher to develop a concept with one group, or to circulate among the groups as a resource person.

(5) Additional activities:

In addition to the basic program components outlined above, there are several other activities which have been undertaken to support the development of the Program to Non-Grade Mathematics:

a) An evaluation plan which provides feedback for decision-making involving further development of the program.

b) A catalog of materials suitable for use in the mathematics laboratory.

c) An outline of mathematical concepts which is correlated with a ser of teaching activities.

d) A four week summer institute program for training teachers through their interaction with students in grades K - 8. Cross-age grouping of students and exchange of teachers from various grade-level teams are features of the institute.

e) A dissemination plan which includes the opportunity to visit the on-going program, to talk with teachers, students, and the program coordinator, and to receive follow-up consultant help if program implementation is undertaken.

f) Experimentation by coordinator, assistant, and teachers with all kinds of materials to create new ways to approach math.

g) A daily log was kept much of the first year and during the summer institutes. Much has been edited.

h) New tests have been developed by the coordinator. These tests are given in lab situations and are not pencil and paper tests.

The following pages show the student schedule and the teacher planning schedule for the mathematics program.

PLANNING SCHEDULE

	9:00	10:00	11:00	2:30
MONDAY			Andy Turausky Royce Parks 2nd grade	Gail Goodman Maura McMullen 1st grade
TUESDAY	←			→
WEDNESDAY	Margaret Butler and Joanne Derencin - teach all mathematics at the 3rd, 4th, and 5th grade levels. They have released time, one morning weekly to plan with the coordinator.			
	Also planning on Wednesdays		Andy Turausky Royce Parks	Gail Goodman Maura McMullen

The coordinator plans with the teachers, but if she is not available, her assistant plans with them.

It is notable that one idea that has worked well is to plan four activities for the laboratory. Divide the groups into four sub groups. These groups then move from activity to activity each day. This gives the teacher time to work with a small group. To facilitate this idea at the 1st and 2nd grade levels, 5th graders are being scheduled into the laboratory daily to help with the small groups. They can easily do this because they have had experience with all the materials in the lab.

Schedule of Mathematics laboratory and classroom activities for the

322 students at Juliette Low Elementary School, Elk Grove School District 59

	9:10	9:10	10:00	10:00	10:50	10:50	10:50	1:00	1:00	1:30	1:30
MONDAY	4A Kab	4B Room	5A Lab	5B Room	3A* Lab	3B Lab	3C Room	1A-Lab 2A-Lab	1B-Room 2B-Room	1A-Room 2A-Room	1B-Lab 2B-Lab
TUESDAY	4A Room	4B Lab	5A Room	5B Lab	3A Lab	3B Room	3C Lab				
WEDNESDAY	Same as Monday →					Same as Monday		SAME	SAME	SAME	SAME
THURSDAY	Same as Tuesday →					ame as Tuesday					
FRIDAY	Teachers make decisions with students - clean-up, testing, free choices of materials →										

* 3A was identified as needing continuous lab work, because the students were not able to use text material at the 3rd grade level. Teachers asked that they have daily laboratory activities.

A, B, and C merely designate groups -- which are formed strictly on teacher judgment. Some ability grouping occurs then within each group.

Groups are about 30 each -- third grades are 20. Betty Johnson, assistant coordinator, teaches the third grade.

IV. ACTIVITIES

Analysis of techniques used for program development

In analyzing these techniques for program development and in considering the activities from the point of view of a principal or other administrator desiring to implement the program, it must be stated that one must be aware of problems to be faced.

In retrospect the coordinator asks: Was implementation of these activities asking too much of teacher in the way of behavioral change?

Change to.	From. . . . .
small group	large group
multi-media	one book
team teaching	self contained classroom
mathematics laboratory	very few (if any) manipulative materials

To make any one of these changes often represents a traumatic experience for a teacher. Even if she truly believes this is what is wanted and needed, traditional pressures of grades, outdated achievement tests, and fear of not meeting goals of peer groups all combine to cause rejection of the new programs.

The use of released time to plan helped, but did not represent enough time for a teacher to internalize all aspects of the program.

Four weeks in a summer institute accomplished much more towards implementation of the program than two years of daily work with individual teachers.

The techniques are sound but one must not underestimate the amount of time and training a teacher needs for program implementation.

Activities for Demonstration

Permission from school district #59, the principal of Juliette Low, and the teachers was obtained. Plans were organized for the coordinator and her back-up teaching assistant to orient visitors through a colored slide presentation and verbal explanation.

In the first year of operation the demonstration was scheduled from 1:00 - 2:00 p.m. when first and second graders were in the mathematics laboratory for one half of their math program. In the second year of operation, the demonstrations were at any hour from 9:00 a.m. to 2:00 p.m. (Monday through Thursday).

When visitors went into the laboratory, they were encouraged to look for certain behaviors of the children, to sit at the tables with the children, and to ask questions. They were asked to use discretion in talking with the teacher--that is, not to bother her when she was working with the children. Either the coordinator or her teaching assistant were always present. After a demonstration with children, the coordinator would spend an hour or more in a part of the laboratory not being used by children to demonstrate laboratory materials to the visitors.

A typical morning for visitors at Juliette Low would include the following activities:

9:00	Arrive at Juliette Low
9:00 - 9:30	Coffee and rolls Name cards Questionnaire sheets (T & D)
9:30 - 10:00	Formal presentation by coordinator (including orientation to the school and introduction of the principal and learning center director)
10:00 - 11:00	Watching children in laboratory
11:00 - 11:40	Working with materials used in lab

When demonstrations occurred in the afternoon, visitors were asked to arrive at Juliette Low between 12:30 and 12:45 to have some time for orientation with the coordinator.

1:00 - 2:00 Observation of first and second grades

2:00 - 3:00 Work with materials in the lab
Follow-up question and answer period

A "handout" for the visitors included a list of materials used in the laboratory, where purchased, cost, grade level used, and training needed.

Analysis of techniques used in demonstration program

The formal techniques used in the demonstration program (i.e., orientation, and viewing children participating in the program) have been used in other programs throughout the state (Illinois Gifted Program) for the past six or seven years. These techniques have proved to be highly acceptable in demonstration.

The idea of involving the visitors with children and materials is not unique to this program, perhaps, but it has proved to be a worthwhile addition to formal demonstration. A visitor feels he has gained much more when he actually manipulates materials in a laboratory situation than if he just sat and watched.

Very often visitors to the school just "dropped in" (or may have been brought in by the principal or another person). This usually proved to be a highly frustrating experience for the visitors and for the coordinator. They may or may not have liked what they say, but regardless, they did not understand what was going on and were not able to place the activities they viewed in proper perspective. The need for orientation will always be a vital part of activities in demonstrating.

Activities in the area of dissemination

In 1967, a detailed program description was prepared. Guidelines followed were prepared by administrative personnel of the Training and Development Center.

A one page description of the program was prepared to be handed out to visitors and sent to those who inquired.

In 1968, a more complete description of five pages was prepared for "handouts".

The dissemination services of the center were utilized through their newsletter and visitation scheduling. The developmental program did not have an individual brochure for 1968. In 1967, it was a part of a joint brochure with Madison Project Mathematics.

Since Juliette Low was a Kettering I/D/E/A School, the developmental program was publicized in their magazine. Inquiries came from all parts of the United States as a result of an article in that publication.

Juliette Low was also selected as one of the outstanding schools in Nation's Schools. Hence, the mathematics program received publicity from this.

The coordinator traveled throughout the area and to Michigan, Wisconsin, Mississippi, and New York to work with teachers in the development of a non-graded mathematics program.

Above all, the program operated on the theory that a good program, well implemented, and effectively demonstrated, disseminates most effectively through the visitors and trainees that come in contact with it.

Good dissemination resulted through working closely with mathematics consultants from surrounding districts.

Analysis of techniques used in dissemination

In any developmental program, dissemination gets a slow start. It is difficult to judge techniques used, but all proved important in reaching educators. It should be noted, however, that "non-grading" is the "in" thing, and not difficult to disseminate at this time.

Training

There were several types of training activities. These are best categorized from the standpoint of time involved.

A. Short sessions of one to three hours (one session only)

B. Two or three three-hour sessions (teachers from outside came to Juliette Low School)

C. An in-service program(voluntary) for math teachers spread out over a year in St. Charles Public Schools. Six one-hour sessions; two three-hour sessions

D. Summer Institute
Four weeks; six hours per day

E. Monthly follow-up seminars for summer school participants

F. The unique kinds of experiences for the teachers in the program.

There was one activity that was common to all training programs whether the coordinator was to meet with a group for an hour or sixty hours. This was the involvement of the group through manipulating lab materials. It became common practice to take several sets of materials and instruction sheets and divide a group into small groups with instructions to explore on their own. After a certain time the groups would move to another area with different materials. The coordinator would move from group to group and act as resource.

In Jackson, Missippi a two hour meeting was held in a gymnasium. The coordinator met with the math resource people on the previous evening and explained something about the materials to be used for the group.

There were four groups of twenty people each. They were provided with four kinds of materials:

A. Cuisenaires

B. Geo-boards

C. Tuf

D. Games (Tower of Hanoi, peg jumping, High I Q)

In two hours, eighty teachers had experience in manipulative materials, and they expressed enjoyment and frustration both. In this particular instance, the group came back a second day. At that time they chose the activity or activities they wished to pursue further. The coordinator and math team acted as resource personnel.

In workshops of more than two three-hour sessions, participants had an opportunity to work with children in small groups in a lab situation. Furthermore, they had experience with other media--films, film strips, overhead projectiles. The bases for these kinds of activities always has been to provide the teacher with the kinds of experiences it was hoped he in turn would provide for the children.

Analysis

The coordinator would, if given the opportunity again, insist upon a staff having an amount of training equivalent to four weeks of institute before implementing the developmental program. Verbal administrative and verbal staff commitment are needed, but are not enough.

Future training sessions would give more time to small group instruction and diagnosing problems.

V. EVALUATION

A. Formative Evaluation:

The feedback from the Developmental Program to Non-Grade Mathematics was drawn from a variety of sources, namely:

1. Teachers in the experimental program at Juliette Low
2. Teachers in the summer institute--1968
3. Teachers in seminar groups--but not in summer programs
4. Teachers not in institute involved in implementing programs with teachers who were in institute
5. Teachers and supervisors throughout the country with an interest in this developmental approach - mathematics laboratory seminars
6. Students in the pilot program at Juliette Low
7. Students in pilot programs at other schools
8. Mathematics consultants in consortium area
9. Visitors to the program
10. Workshop participants other than institute and seminar
11. Two outside evaluation teams

This information was obtained in various ways. The teachers in the program had feedback sheets. These varied somewhat as to whether the teacher was in the on-going program at Juliette Low or in an experimental program at another school.

How Feedback was Obtained:

Although there is some question as to the significance of feedback which we refer to as brickbats, bouquets, and suggestions - it provides feedback for decision making and in that sense it is significant.

It works this way. Participants in a program are asked to describe (or list) activities best liked, activities least liked, and suggested changes. They do not sign their names. The comments are gathered together, put on ditto, run off, and returned to all who contributed. The items listed as "best liked" are of some value to the coordinator in that if for e.g., 50-70% of the group are inspired or find learning in a specific activity, that activity should be kept as a part of the program. The real help for decision making comes from the "least liked" items. Some items admittedly are difficult for the coordinator to cope with especially if the interpretation or the participant is far afield from what was intended by the coordinator. But this very situation makes this feedback all the more important, and the coordinator must decide how to use this information in bringing about desired change.

Feedback obtained in this manner compares to listing activities to be rated on a three to five point scale favorably. It seems better because the participant has to come up with the activities rather than have them listed for him. This coordinator has found favorite activities by participants that may not have been listed at all. It should be emphasized that participants react to feelings as well as specific activities. For example one participant said "The room is too cold." Room temperature is not apt to be listed to be rated on a five point scale, yet, the information provides feedback that affects a learning situation.

Another kind of feedback used was in terms of the goals of the participants. In one instance, six teachers from Madison Heights, Michigan, spent three days at Juliette Low. At the beginning session they listed their goals. The activities were built around these goals, and at the end of the three days they rated each goal as to whether it was reached - partially reached - etc.

B. Summative Evaluation

Data necessary for a summative evaluation was gathered through surveys for teacher trainees, and tests for students. The survey was given to the 30 participants in last summers' institute and following monthly seminars, and also to teachers at Juliette Low school where the experimental program took place. These results are compared with survey results from the group of teachers (a select group) who participated in the summer institute for 1969. Another survey was given to these 1969 participants at the close of this summers' institute. The results are reported in the appendix.

Other data pertaining to the effect of the program on students was gathered through special tests using laboratory materials. Then these tests were developed by the coordinator of the program. There is a report of results of the Iowa Basic Skills tests administered by School District 59 to Juliette Low students.

Other data came from anecdotal records of primary students at Juliette Low. Each year, teachers interview students. One question asks students to name their favorite subjects. These answers are recorded, and one can see differences of answers by second graders (1968-1969) given when they were first graders and in the mathematics program, and present third graders who were second graders at that time and were not in the program.

Other evaluation reports come from mathematics consultants in other districts. They are in the form of reports on how summer institute participants in the developmental mathematics program used their training.

Finally, the appendix contains copies of reports from outside evaluation team members in the spring of 1968, and again in 1969. Also, there are letters of support from superintendents of the consortium for continuance of the program through NSF funding.

Evaluation activities have focused mainly in teacher training in summer institutes. A four week Summer Institute was held at Miner Junior High School in Arlington Heights, Illinois, (District 25, Dr. Donald Strong, Superintendent) in the summer of 1968. A similar institute was held at Dryden Elementary School in school District 25 in the summer of 1969. A brief summary of these activities follows:

1) Content: Teachers were asked <u>not</u> to use textbooks.

   a. They identified math concepts to be explored.

   b. They identified and studied math materials to explore the concepts.

2) Teams: Two teams at each level -- five per team.

   a. They planned daily: as to which group to work with, as to material.

   b. They set up several activities in each lab period.

   c. They planned two or three different activities for the students in the hour they were present.

3) Organization: For the morning sessions.

   a. One hour of team planning.

   b. One hour in lab situations with students.

   c. One hour of study, evaluation, and observation.

4) Evaluation: Done by the teachers.

   a. A daily log was kept by each team including <u>goal</u>, <u>activity</u>, and <u>evaluation</u>.

   b. These are being edited for sharing by all.

5) Participant Data:

Teachers	Level of Students	Number of Students	Time	Place
10	Primary	40	9:00-10:00	Miner Jr. Math Labs
12	Intermediate	30	10:00-11:00	Math Labs
10	Junior High	30	11:00-12:00	Math Labs

GOALS AND TRANSACTIONS FOR SUMMER INSTITUTES

GOALS	TRANSACTIONS	
A. Give teacher experiences with components of the program:		
1) Team Teaching	Teams formed at each level Planned one hour daily	
2) Small Group Work	Planned for six per table Planned for 2 or 3 groups per hour	
3) Multi Media Approach	Used overhead Used filmstrips Shared many commercial sheets	
4) Math Lab	Rooms 31 and 32 at Miner were set up as labs.	
B. To influence teachers to change traditional behavior from lecturer to learner	No texts Small groups only Teaming and planning Video taping to view themselves Opportunity to micro-teach	
C. To help teacher become sensitive to learning at all levels	For one week, teachers cross-teamed and taught at other levels. For example, a Kindergarten team cross-teamed with junior high to teach intermediate students.	
D. To help teachers implement the program in their school	Transactions offered follow-up help on a regular basis District 25 will have 3 schools implementing parts of the program District 21, 59, and parochial schools will have parts of the program	District 15 will have it in one school at the primary level - in total

SURVEY RESULTS

Given to: Summer Institute Participants who also participated in seminars the following year and to teachers in the experimental program at Juliette Low.

Time spent: Summer Institute participants spent about 90 hours working in the various aspects of the program. Teachers in the experimental program worked with the coordinator weekly over a period of two years.

Purpose: The survey was given to ascertain whether goals for the program were reached.

RESULTS TO QUESTIONS ON SURVEY

QUESTIONS	RESULTS OF THOSE WITH TRAINING	RESULTS OF THOSE WITHOUT TRAINING
1. Have you attended Summer Institute for Developmental Math?		
2. How many hours of workshop in Developmental Math?		
3. Do you have a math lab in your school?		
In a special room?	51%	12%
In your own classroom?	49%	24%
Or combinations of both?	25%	3%
4. Do you have math lab materials?	91% yes 9% no	57% yes 35% no
5. What percent of time is used with concrete material?	40%	20%
6. What percent of time is spent in lab?	25%	20%
7. Multi-media:		
Do you have film strips?	90%	75%
Do you have an overhead?	90%	85%
Other texts?	64%	14%
8. Do you have small group instruction?	65% yes	33% yes
Is the lab arranged to facilitate small groups?	90% yes	
Is the classroom arranged to facilitate small groups?	90% yes	35% yes
If you have small groups, how many sub groups?	1 - 6	11-30
What is the average group size?	4 - 8	1-28

(continued) RESULTS TO QUESTIONS ON SURVEY

QUESTIONS	RESULTS OF THOSE WITH TRAINING	RESULTS OF THOSE WITHOUT TRAINING
9. Rank from 1 to 5 the order of operation you use.		
Math needs of the child	1	2
List of math concepts to be taught	3	3
Identification of book materials used	5	4
Math needs of the group	2	1
Identification of lab activities to be used	4	5
10. How do you get to each group?		
Team with another teacher	3	3
Independently	1	1
Children assist	2	2
Adults assist	4	4
11. Lab time:		
How much time is spent with book?	1/3 time	
How much time is spent on written exercise?	1/3 time	
How much time is spent on manipulation of concrete materials?		
12. (check appropriate space)		
Children work at their own pace		
in all cases		25%
in most cases	81%	36%
not at all	15%	39%
13. Do math teachers meet for professional discussions?		
Regularly	34%	9%
Irregularly	21%	19%
Seldom	34%	19%
Not at all	11%	52%
14. Do you keep notes on lab activities?		
Regularly	16%	7%
Irregularly	30%	21%
Seldom,	10%	7%
Not at all	44%	63%
15. Do you have regular meetings in your school in regard to math lab?	34% yes 66% no	only 1 said yes
16. Answer yes or no.		
Do you have video taping?	43%	
Demonstrations?	90%	
Discussions?	90%	
Distribution of written material?	90%	
Give presentations?	83%	
Formal self-assesment by use of instruments?	30%	
Visitation to other schools, same school, demonstration centers?	45%	

RESULTS TO QUESTIONS ON SURVEY (continued)

QUESTIONS	RESULTS OF THOSE WITH TRAINING	RESULTS OF THOSE WITHOUT TRAINING
17. What records are kept in lab?		
Tests relating specifically to lab?	27%	
Worksheets relating to material observations?	25%	
Assignments sheets?	30%	
Other records (list)?	10%	
Log?	10%	
18. Do you have a "free time" slot for students?		
Regularly?	50%	
Occasionally?	12%	
Seldom?	0	
Not at all?	4%	

FAVORITE SUBJECTS
SECOND GRADERS

FIRST GRADE

Ahr, Leslie	music, reading
Ahr, Lynda	reading, math lab, music
Bellis, Holly	
Bochenski, Jim	reading, math lab
Boston, Julie	industrial arts, math
Brainard, Donna	gym, art
Brown, Nancy	gym, music
Bulman, Neal	math lab, art
Calderone, Judy	reading
Cerami, Ricky	reading
Chatten, Andrew	
Dalgleish, Mitchell	
DiCara, Mark	reading, math lab, gym
Dolan, Susan	math lab, reading, music
Drury, Sally	
Fish, Ruth	
Garza, Rey	science
Gentile, Anthony	reading
Guzy, Meg	math lab
Hines, John	gym
Kahn, Ellen	art
Kebel, Julie	reading, social studies, math lab
Kornacker, Janet	writing, art
Line, Gregg	math lab
Logan, Steve	gym, industrial arts, music
Lowe, Lisa	
Mathias, Constance	gym, music
Mokas, Mark	gym, math lab, music, learning center
Munn, Patsy	music, gym
Nelson, Leslie	music, math, reading
Nelson, Lynn	
Nelson, Robert	art, reading, math lab
Olezewski, Gregg	
Patke, John	gym, math
Pettinato, Richard	reading, writing
Pfaff, Bob	math, art, science
Pleotis, Elaine	writing, gym
Prince, Julie,	gym, music, math
Reiman, Astrid	gym, music, math lab
Sanchez, roy	art
Schmidt, Cindy	math lab

The next four pages are copied directly from anecdotal records of second and third graders of Juliette Low. The second graders were involved in the program as first graders, and the listings show their favorite subjects at the end of first grade.

Twenty out of forty-seven reported mathematics lab as a favorite subject.

Those who were third graders in the fall of 1968 reported P.E., art, reading, writing, music, gym, projects, etc. as favorite subjects None reported mathematics. As first graders, only four reported mathematics among their favorite subjects. These students were not involved in the developmental program as second graders.

Favorite subjects - second graders (cont.)

Sicoli, Robert	
Siwik, Tom	math
Stafford, Henry	social studies, gym, math
Tabisz, Steven	language arts, math, gym
Travis, Cheryl	
Verdi, Joe	art, gym, reading, math
Zickzer, W. Scott	

FAVORITE SUBJECTS
THIRD GRADERS

	FIRST GRADE	SECOND GRADE
Ahr, Tracy	gym	P. E., independent work
Baumgardner, Kathy		
Bell, Kathy		
Blegan, Leanne	art	art
Boston, Thomas		reading, writing
Brabeck, Richard		
Buddecke, Michael		
Cramer, Nannette		
Dolan, David	art, gym	
Egan, Mary		art, music
Elson, Timothy		
Farinella, Cathy	math, music, reading	
Fiorenza, Graclyn		reading, writing
Foster, Diana		
Galletto, Susan		
Guzy, Brian	art	
Haeger, Michael	art	art
Hamann, Julie		P.E.
Hanat, Lorraine	art, music	reading
Hanson, Michael	games	art, music
Hines, James	sports, math, gym	gym
Hocter, William	social studies	
Huber, Martin		projects, writing, stories
Jacobs, John	P.E.	
Jennings, Scott	independent study, math	
Johnson, Brian		
Johnson, Lynn Anne		
Johnson, Robert C.	reading, math	
Keener, Kerri		social studies
Koelliker, James		all areas
Lamick, Rovert		
Lindner, Sharon	art	
Liu, Faan Hoan	science, reading, P.E., math	art
Marich, Joseph	writing, gym, soc. sci., science	all
Martin, Denise	music, gym	projects
Menas, Lisa		all
Merz, LuAnn		
Miller, Jeffrey		all
Moritz, Todd		
Nelson, Luanne	gym, music	
Nielsen, Jack	all	gym, music
Niemcheck, Lori		
Nieto, Robert		all

Favorite subjects - third graders (cont.)

Nugent, Mary	art	
O'Connor, Martin		
O'Mara, Melanie		social studies, reading
Overland, John		
Palmisano, Angela	art, gym	music, art
Peterson, Stephen		reading
Phillips, Gregory		
Poklacki, Ellen		science
Prince, William		
Pritchard, Jeffrey		
Purzycki, Jacqueline		
Quint, Brian		
Roche, Marianne		reading
Ryan, Bruce		
Scearce, Kenneth	writing reports	
See, Michele		
Shaver, Judi		
Sicoli, Aldo		
Smith, Lorraine	social studies, art	art
Snell, Brad		art
Strebel, Danny	reading	
Swetman, Randy	P.E.	P.E.
Thomas, Joseph		
Thornton, Cynthia		

Following is a description of tests developed for primary children that are unique in that the children are tested using lab materials, and they do not use pencil and paper. This description and samples of the test was submitted for publication to the Arithmetic Teacher in June of 1969.

TESTING FIRST GRADERS WITHOUT PENCIL AND PAPER

BY PHYLLIS FERRELL

In the summer of 1968, the Elk Grove Training and Development Center (Title III, E. S. E. A.) sponsored a four week institute in a Developmental Program to Non-Grade Mathematics. The institute was held at Miner Junior High in Arlington Heights, Illinois, School District #25 (Donald Strong, Superintendent). Approximately 100 students (K-8) attended for one hour daily. There were no books for students, and teachers sat at tables with students as they all manipulated materials. Thirty-two teachers participated and attention was focused on the mathematics laboratory as an integral part of a mathematics program.

In referring to the mathematics laboratory, there is a distinction to be made between the idea of using the concept of a mathematics lab as an integral part of a mathematics program and implementation of what is usually meant by "exploration with concrete materials". From several colleagues I have heard the expression, "Well, really, there's nothing new about the use of concrete materials. It's been going on for years." I would like to stress some differences, and make some comparisons between the mathematics laboratory approach in this developmental program as compared to use of manipulative materials with modern texts.

Comparisons between

THE DEVELOPMENTAL PROGRAM	MODERN TEXTS AND CONCRETE MATERIALS
A. The use of concrete materials in a lab approach IS THE ESSENCE OF THE MATH PROGRAM K-2 and an INTEGRAL part beyond that.	A. Generally, the use of manipulatives is at best-- SUPPLEMENTAL to the mathematics program.

B. Children do not have regular texts--especially through the K-2 level. Teachers do have a guide.	B. The childrens' math program is based on a text, which they must cover whether ready for the material or not.
C. There are a variety of materials for every child to use, and these materials are readily available.	C. There may be enough manipulative materials, but usually they are neatly catalogued and out of sight, or gathering dust in a storeroom.
D. There is emphasis for teacher involvement in the lab experiences desired for the child.	D. The emphasis for the teacher is on WRITTEN CONTENT rather than involvement with lab manipulative materials.

The concept of using concrete materials and/or a laboratory approach in the teaching of mathematics is not new, but how it is used and where emphasis is placed is new to mathematics curriculum in the United States. The ideas expressed under "The Developmental Program" are those which were emphasized in our summer institute.

Four of the teachers who participated in the institute were from an elementary school in Palatine, School District #15 (Mr. Castor, Superintendent) and worked with their principal and district mathematics consultant to implement the program at the first and second grade level. Emphasis was on the laboratory approach, and in the spring of 1969 when the question of evaluation came up, it was decided to devise a way of testing the students using lab materials and in a different way than the traditional pencil and paper tests.

At the first grade level, the teacher divided thirty students into four groups, and gave each student a name tag which designated his group (I, II, III, IV) and which also identified him within that group by a capital letter A through G.

The classroom was rearranged into four groups of 7 or 8 desks each. The desks were put together to form table surface arrangements (even if you don't have a mathematics laboratory in your school, you can turn your room into one! In one area were the familiar colorful

cuisenaire rods, at another were geo-boards; another area displayed homemade tag board number lines and dime store racing cars, and the fourth area had a bucket of plastic counters. Two mathematics specialists and a teaching assistant joined the first grade teacher, and this completed final arrangements for testing.

The teacher explained to the students that this was to be a test, and through it didn't look like the usual set up for a test, it looked like fun to the students for they enjoyed these materials. Each group went to a testing area. After about ten minutes, the groups moved to the next testing area, etc. Each person testing had each group for about ten minutes with rating sheets like the following:

Teacher _____

ACTIVITY_____

GROUP: _____

A._____

B._____

C._____

D._____

E._____

F._____

G._____

It was decided to use the symbols =, -, ? to indicate that the student performed the task succussfully, did not perform the task, and some question remains about performance. As time went on the teachers had variations such as (-, +) which meant that the student was lost at first and then successfully performed the task.

At the conclusion of the testing which took about 50 minutes for 30 children, the four testors got together, put the results on a

master sheet*, and discussed the activities. Many questions were raised. Were there any surprising results? Did things happen as expected? Would this kind of test be really helpful to the teacher? How? Was it more helpful for diagnosis than for testing achievement? Were attitude ratings from those who didn't know the children helpful to the teacher (who did)?

One interesting observation was that first graders, when given a set of objects different in number from others in the groups, and confronted with such questions as "Does anyone at the table have more in his set than you have?" could simply not tell by just looking, he had to count each set. (A week later we tested second graders in this way--using most of the same materials but going into more depth and found them to have no difficulty in making these comparisons and expressing the relationships immediately.) This supports Piaget's findings that children do have a very difficult time making one-to-one correspondences and defining order relationships at this age. However, it should be mentioned that the first graders had no difficulty in making comparisons and seeing order relationships when given a set of FIVE objects? Do you know why?

In looking at the tests used, you will note that we were checking the children's understanding for (1) how many; (2) meaning of 'more than' and 'less than'; (3) addition (or combining); (4) separating a set in different ways; (5) terminology including more, less, same as, fewest, most, largest, smallest; (6) geometric models for triangle, circle, square, rectangle, diamond, etc.

*	CUISENAIRES	GEO-GOARD	NUMBER-LINE	COUNTERS	COMMENTS
BILLY	+ + - ?				
PEG	- + - +				
HAROLD	- - - ?				
JIMMY	+ + - +				

THE TEST

(Actual copy of test sheet given to the testor)
(A through G identifies the students)

For example, student A had five tasks (if time). Read across the top. First he was to show 2 sets. One contained 1 counter, and the other contained 4 counters. Next he was to combine them and tell "how many". Then he was to show two sets other than 1 and 4 (for example 2 and 3). Finally he was to verbally express certain relationships. Then, if time, he was to make a model of a triangle using 10 counters.

SUGGESTED ACTIVITIES FOR FIRST GRADERS AT THE TESTING STATION USING COUNTERS

	SHOW ME 2 sets of	Combine (for checking)	Break into 2 different sets	Recombine and answer questions
A.	1 and 4	5		How many at the table have more than you?
B.	2 and 7	9		How many have the same as you?
C.	3 and 5	8		How many have less than you?
D.	5 and 2	7		How many more do you need to have 10?
E.	8 and 2	10		Who has the most at this table?
F.	3 and 3	6		Who has the smallest number of counters?
G.	4 and 4	8		How many more do you need to have as many as E?

Make a picture of the following figures using only the stated number of counters.*

A. triangle--10

B. square--4

C. rectangle--8

D. diamond--9

E. 2 triangles--6 counters

F. square--8

G. circles--the smallest and the largest--10 counters

*We used small plastic lids 1 1/2" in diameter.

THE TEST

COPY OF TEST SHEET FOR TESTOR

SUGGESTED ACTIVITIES FOR FIRST GRADERS AT THE TESTING STATION USING CUISENAIRES

CHILD	FIND ONE ROD THE SAME LENGTH AS:	FIND THE ROD THAT REPRESENTS 1 MORE	2 LESS
A	8 whites	(blue)	(dk.g.) Who has the shortest rod?
B	3 lt. green	(orange)	(blk) Who has the longest rod?
C	4 red	(blue)	(dk.g.) How many have longer rods than you?
D	2 purple	(blue)	(same) How many have shorter rods than you?
E	4 whites	(yellow)	(red) How many have the same length as you?
F	1 purple and 1 red	(black)	(prpl) What rod would you have if you added a red?
G	1 white and 1 light green	(yellow)	(red) What do you need to make a train as long as orange?

Review train building and then give each child a different task. Build a train of 2 cars as long as the following:

A dark green

B black

C brown

D blue

E orange

F yellow

G purple

THE TEST

COPY OF TEST FOR TESTORS

SUGGESTED ACTIVITIES FOR FIRST GRADERS AT THE TESTING STATION USING NUMBER-LINES AND RACING CARS

REVIEW: The children were used to playing games by parking their cars in the garage (represented on the number line by 0) and taking trips--a term who usage has become questionable at this time, but hopefully not for first graders. 3 plus 5 on the number line represents a trip which moves us to 3 and then five more. We report where we stopped (hopefully, 8). The next task asks the child to skip backwards towards the garage--skipping 1 at a time--and reporting how many landings. Comments vary from very good to poor.

CHILD	MOVE TO 1st THEN ___MORE	RETURN BY SKIPPING 1	COMMENTS
A	3 and 5	4 (moves)	
B	3 and 7	5 (moves)	
C	5 and 1	3 (moves)	
D	2 and 2	2	
E	5 and 5	5	
F	6 and 3	4 and 1/2	
G	1 and 3	2	

The second task asks the child to place the car on the numeral that is:

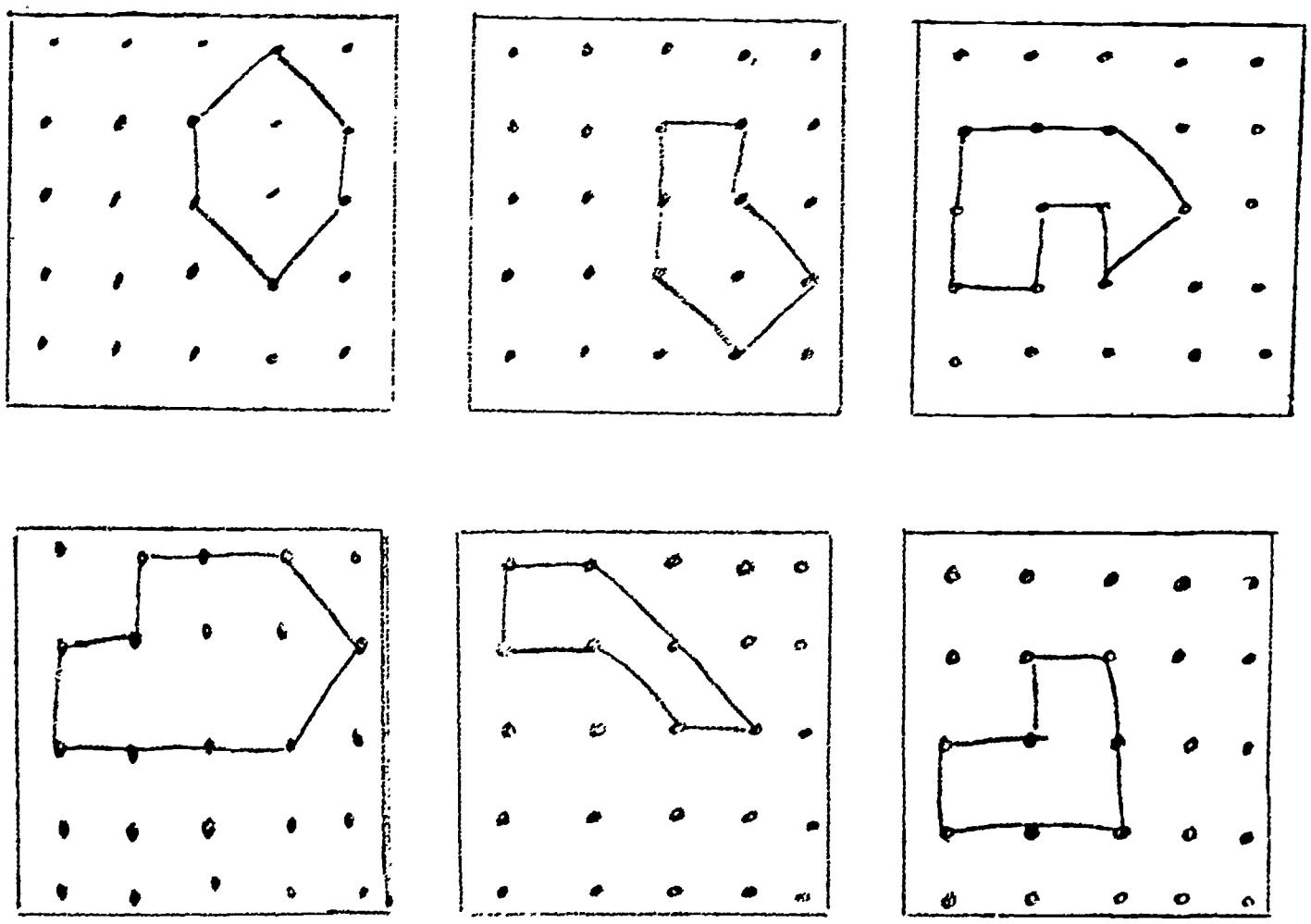
	1 SPACE. . .	2 SPACES. . .
A	before 10	after 7
B	before 5	after 5
C	before 7	after 6
D	before 4	after 2
E	before 1	after 3
F	before 8	after 2
G	before 6	after 1

SUGGESTED ACTIVITIES FOR TESTING FIRST AND SECOND GRADERS USING GEO-BOARDS.

GIVE EACH CHILD A DIFFERENT TASK.

CHILD	SHOW ME A PICTURE OF A. .	2nd TASK
A	Triangle	largest triangle
B	square	largest square
C	rectangle	largest rectangle
D	diamond	largest diamond
E	5 sided figure	largest 5 sided figure
F	many sided	largest
G	more than 5 sides	largest

Give each child a card to copy. (The geo-board consists of a board with escutcheon nails arranged in an array as shown--evenly spaced. Rubber bands are used to make the models)



Group I	CUISENAIRES add	subt.	attitude	ATTRIBUTES naming attributes	satisfying 2 cards	comparison	COUNTERS (grouping-division sub-sets)	
a. Mike F	+	(-)+	+	+	too difficult	+	+	+
b. Mike G.	+	-	?	+	-	+	+	+
c. Judy	+	+	+	+	-	+	+	+
d. Leslie	+	+	+	+	-	+	+	+
e. Sherri	+	(-)+	+	+	-	+	+	+
f. Brent	+	+	+	+	-	+	+	+
g. Mike H.	+	+	+	+	-	+	+	+
Group II								
a. Tracey	+	+	+	+	-	+	+	+
b. Danny	+	+	+	+	-	(+ -)	+	+
c. Chick	+	+	+	+	-	+	+	+
d. Susan	+	+	+	+	-	+	+	+
e. Deborah	+	+	+	?	-	+	+	+
f. Donna	(-)+	+	?	?	-	+	+	+
g. Jimmy Arnold	+	+	?	?	-	+	+	+
Group III								
a. Steven	+	+	+	+	?	+	+	+
b. Susan	+	+	+	+	?	+	+	+
c. James S.	+	-	+	+	?	+	+	+
d. Julie P.	+	-	+	+	-	+	+	+
e. Paul S.	+	+	+	+	+	+	+	+
f. Brad	+	+	+	+	+	+	+	+
g. Dan	+	-	+	+	+	+	+	+
Group IV								
a. Janice	+	+	+	+	-	+	+	+
b. Ellen	+	+	+	+	-	+	+	+
c. Janet	+	+	+	+	-	+	+	+
d. Bob	+	+	+	+	-	+	+	+
e. Carol	+	+	+	?	-	+	+	+
f. Tom	+	+	?	?	-	+	+	+
g. Ryan	+	+	+	?	-	+	+	+

These pages show results of the tests given using lab materials rather than pencil and paper. Interpretation was left to the classroom teacher. She has found them most helpful for diagnosing and for planning.

	COUNTERS	GEO-BOARDS			COMMENTS
Group I	geometric some copied	patterns	perceptual	units (area)	
a. Mike F.	+	+	+	+	
b. Mike G.	-	+	+(-1)	+	
c. Judy	+	+	+(-1)	+	
d. Leslie	+(-)	+	+(-2)	+	
e. Sherri	+	+	+	+	
f. Brent	(+ -)	+	+(-1)	+(-1)	
g. Mike H.	(+ -)	+	+(-1)	+	
Group II					
a. Tracey	+	+	+(-1)	+	
b. Danny	+	+	+	+(-1)	
c. Chick	+	+	+	+	
d. Susan	+	+	+(-2)	+	
e. Deborah	+	+	+(-1)	+	
f. Donna	+	+	+	+	
g. Jimmy Arnold	+	+	+	+	
Group III					
a. Steven	+	+	+	+	
b. Susan	(+-)	+	+(-1)+	+	
c. James S.	+	+	+	+	
d. Julie P.	(+-)	+	+(-2)	+	
e. Paul Stevens	+	+	+(-2)	+	
f. Brad	+	+	+	+	
g. Dan	+	+	+	+	
Group IV					
a. Janice	+	+	+	+	
b. Ellen	+	+	+	+	
c. Janet	+	+	+	+	
d. Bob	+	+	+	+	works quickly-easily distracted
e. Carol	+	+	+	+	needs directions & explanations
f. Tom	+	+	+	+	fools around
g. Ryan	+	+	+	+	

	NUMBER LINE				CUISENAIRES	ATTITUDE
Group I	add and skip	before	after	game		Comments
a. Rich	-	-	-	-	-	fooled around
b. Tom	+	+	+	+	+	
c. Stan	+	+	-	-	+	
d. David	+	+	+	+	-	
e. Cindy	+	+	+	-	-	really listened
f. Carol	+	+	+	+	+	
g. Kathie	+	+	+	+	+	
Group II						
a. Tim	+	+	+	-	+	seemed interested
b. Steve	+	-	?	-	+	gave up easily/serious
c. Billy	+	?	+	?	+	
d. Susie	?	?	+	?	-	
e. Carrie	+	+	?	?	+	
f. Kim	+	?	?	?	+	persevered
Group III						
a. Jim	+	-	+	-	+	proficient
b. Van	+	+	+	-	+	
c. Jean	+	+	-	-	+	works quickly and effectively
d. Becky	+	+	+	-	+	easily discouraged
e. Tina	+	+	-	-	+	tried very hard
f. Karen	-	+	+	-	+	had some difficulty
Group IV						
a. Brian	+	+	-	-	+	silly
b. Greg	?	+	+	-	+	enthusiastic
c. Mike	?	+	+	+	+	
d. Jennie	+	+	-	+	-	fools around
e. Emi	?	+	-	+	+	tried hard
f. Robin	+	+	+	+	+	had difficulty
g. Cathy	+	+	+	+	+	

	GEO-BOARDS				COUNTERS			
Group I	shapes	largest	copy	attitude	2 sets of 5	combine	combine	question
a. Rich	?	+	-+	?	-	+	-	++
b. Tom	+	+	+	⊕	-	+	+	+
c. Stan	+	+	+	⊕	-	+	+	++
d. David	+	+	+	?	-	+	-	++
e. Cindy	+	+	-	+	+	+	-	++
f. Carol	+	+	+	⊕	-	-	-	+-
g. Kathie	+	+	+	⊕	-	-	+	+-
Group II								
a. Tim	+	+	+	⊕	+	+	+	+
b. Steve	+	+	+	?	+	+	+	-
c. Billy	+	+	+	⊕	+	+	+	+
d. Susie	+	+	+	+	+	+	+	+
e. Carrie	+	+	+	+	+	+	+	+
f. Kim	+	+	?	+	+	+	+	+
Group III								
a. Jim	+	+	+	⊕	+	+	+	-
b. Van	+	+	+	+	+	+	+	+
c. Jean	+	+	-	?	+	+	+	+
d. Becky	+	+	+	⊕	+	+	+	+
e. Tina	+	+	+	⊕	+	+	+	+
f. Karen	+	?	+	+	+	+	+	+
Group IV								
a. Brian	+	+	-+	+	+	+	+	-
b. Greg	+	+	+	+	+	+	+	-
c. Mike	+	+	+	⊕	+	-	+	-
d. Jennie	+	+	?	?	+	+	+	-
e. Emi	+	+	+	+	+	+	+	+
f. Robin	+	?	+	+	+	+	+	-
g. Cathy	+	+	+	+	+	+	-	-

⊕ excellent
\+ good
? attention intermittent

In any program that is considered new or innovative, an evaluation must be planned which will check out effects on the students in the program. In order to set up a testing program the following people met: the assistant superintendent in charge of curriculum in District 59, the District 59 math consultant, the District 59 testing consultant, a T & D evaluation team member, the principal of Juliette Low, and the coordinator of the math program. It was agreed that the program coordinator could test Juliette Low students using any contemporary tests. Since Iowa Basic Skills test would be given to all students in the district, these results could be used.

It is necessary to say that Iowa Basic Skills were developed to test students in traditional programs based on drill and memory work. The test requires that, for example, all little third graders are at the same place at the same time in math achievement. It is hardly a suitable test for a program that pays attention to individual needs of students. Yet traditionalists keep insisting that skills must not slip in any program. They're right, but in the program all students do not perfect the same skill at the same time.

Since a member of the T & D evaluation team suggested that it would be a real plus for the innovative program if it could be shown that Juliette Low students did not show a significant drop in Iowa Basic Skills scores. Two tenths point per grade level plus drop could be expected in all instances (with all schools) because tests were given two months earlier in 1969 than in 1968.

The following page gives you Juliette Low's place in the rank order listing for fifteen schools, and also compares grade level scores for 1968-1969.

COMPARING 15 ELEMENTARY SCHOOLS--SCHOOL DISTRICT 59

Composite Scores Rank Order List

	IQ ranks 1968-69		3rd grade 1968-69		4th grade 1968-69		5th grade 1968-69		Average Rank 1968-69	
Juliette Low	9	7.5	3	3	3	8	6	2	4	4,33

1968 ARITHMETIC SKILLS - 1969
(Grade Level)

	CONC.	PROB.	TOTAL	CONC.	PROB.	TOTAL
Third	3.9	4.2	4.1	4.1	4.0	4.0
Fourth	5.0	4.9	4.9	4.9	4.8	4.9
Fifth	6.0	5.7	5.8	6.1	5.8	5.9
First				2.0	2.0	2.0 (Dist. means 2.0)
Second				3.1	2.6	(Dist. means 2.9)

In the overall picture Juliette Low ranked higher in 1969 than in 1968 (15 elementary schools, .2 drop expected).

Third grade level in arithmetic total difference of .1 (.2 drop expected).

Fourth grade level in arithmetic stayed at 4.9 (.2 drop expected).

Fifth grade level in arithmetic raised 5.8 to 5.9 (.2 drop expected).

So in consideration of the fact that the Developmental Math Program pays attention to individual differences and does not stress teaching for Iowa Basic Skills, these scores indicate that the student achievement in mathematics was actually higher at Juliette Low in 1969 than in 1968. K, 1, 2 were in the program both years.

A R L I N G T O N H E I G H T S P U B L I C S C H O O L D I S T R I C T 25

301 West South Street
Arlington Heights, Illinois 60005
Phone: 312, 253-6100

June 1, 1969

MEMO

TO: Phyllis Ferrell, M.P.C.
Developmental Program to Non-Grade Math

FROM: Bernice Gleige, Math Consultant
School District #25

SUBJECT: Evaluation Notes

1. Dee Kamins 6,7,8
Diane Calvello K, 1, 2 - - - - - presented resume of summer in-service before the Board of Education in
Joe Bartel 3,4,5

One board member asked if we planned to have these materials (Attribute Games, Cuisenaire Rods, Geoboards) in every building. Dr. Strong requested Creature Cards (to teach set theory, etc.) in every building. A transparency set is in all 17 buildings.

2. Each teacher participant has a lab in her room and has held workshops in her building.

3. Resultant innovations:

   a. Micro-teaching
   b. Non-graded approach
   c. Activity - centered classroom

4. Specific activities revolved about these areas of mathematics:

   a. Area - geoboards, tiles, many different units
   b. Geometry - Attribute Games, D-Stix, straws and pipecleaners, etc.
   c. Mapping and graphing
   d. Mathematical relationships - Cuisenaire Rods

5. Three P.T.A. evening meetings were devoted to Developmental Mathematics and three more are scheduled for next year!

6. Summer School Program 1969 - Developmental Math Lab. Thomas & South note: (Believe you have on hand number of participants, etc.)

Evaluation: Summary of data:

The Developmental Program for Mathematics was organized to provide constant feedback. Teachers in the experimental program were given released time weekly. This proved to be of great value to the teachers and to the coordinator. In these sessions, time was spent talking about the plans that were working well, about those that were not, and about needs to be considered.

The monthly seminary following the summer institute of 1968 provided informal feedback at all levels, K - 8.

Specifically, the goals for teacher trainees were checked through the surveys. A study of the survey shows considerable difference of activities between teachers who had had training in the program and teachers who had not had training. The effect of the program on the children was checked out formally through testing, and informally through interviews.

Though the feedback provided data for decision-making, it is too early to completely assess the effectiveness of the program. This developmental program was in operation less than two years, for it was not started until the second year of funding of the Training and Development Center. It is unfortunate that the program had to cease for it was just getting a good start.

The mathematics laboratory was operating on a regular basis at Juliette Low school. Two hundred children worked daily in the lab. When a fire destroyed the school in February of 1969, the program was abruptly halted. The coordinator moved to the Training and Development Center to begin phase-out activities for the program. However, after a short while, teachers began asking for a way to have laboratory activities, and stated that the children were losing interest in mathematics taught the old way. Teachers voted unanimously for a laboratory in the rebuilt school this fall, and this indicates a belief in the philosophy of the program and an awareness that it is a good program for students.

C. Recommendations

a) Organization needs

If I were doing the program in an elementary school, it would be organized in much the same way, that is, children grades 1 through 5 would spend half of their mathematics time (one hour daily) in a lab approach. The team of teachers would function in the same way-cooperatively planning the mathematics program needed for small groups of kids. The stress on weekly planning and on laboratory plans calling for varieties of activities would continue, even though teachers felt too pressed to have to work with lab materials daily. When the coordinator and teaching assistant were available, all went well. But if the teacher was left alone, she tended to return to the book and leave the materials set on the shelves. Some of the reasons could relate to a feeling of inadequacy with materials and the need for planning time.

Organizationally, it must be stressed that if the program is to succeed the teacher involved needs time to plan; assistance in the lab; and time for in-service. These things cannot be stressed enough and this coordinator would not attempt to set up a similar program without this understanding.

At Juliette Low School in School District 59, the coordinator spent 80% of the time at the school, actually developing ideas for use of materials, planning with teachers, and working with groups in the lab. The organization set up had the support of all three who were principals during that time.

The district math consultant gave verbal support to the program but kept putting up stumbling blocks by interfering with use of books, materials, and schedules. This often put the teacher in an awkward situation. The district testing consultant took a giant step backwards (personal opinion) in using only Iowa Basic Skills tests in mathematics. In our modern programs we should use tests that test what we are doing, and the district up until this past year emphasized this need.

Hence, one criticism of the program organizationally is that it takes more than verbal commitment, and in the future, plans should call for less lab activity at first. The program must be looked at without the coordinator and assistant being available (after training in a summer institute) for the teachers.

Budgetary needs were ample for the developmental aspect of the program. In implementation in a school, it has been shown that there must be released time for planning and a substitute teacher, or paraprofessional, or aide in the lab. To compare this to another concept, the learning center concepts cannot function effectively without aides. The mathematics lab approach to teaching math cannot function effectively without aides.

Personnel needs. This coordinator could not have asked for finer personnel involved in the program than Betty Johnson, teaching assistant, and Maria Mokas, secretary. Administrative personnel at the Training and Development Center gave strong support to the program. Juliette Low School had three principals while the program was there and all three (Jean Griffith, Ethan Janove, and Earl Woodley) gave strong support to the program. They were most cooperative in working out scheduling, released time, etc. because they really believed in the program.

Unfortunately the teachers (with one or two exceptions) were not committed to the program. They generally took the view that the coordinator was there to do the work and they would go along with it as long as it didn't cost them time or extra effort.

Juliette Low School burned in February of 1969, and staff and students had to do double shifts at another school without a lab. Their immediate needs seemed to be books. However, after two months they reported that the children truly missed the lab, and generally lost interest in mathematics. They further unanimously expressed the desire to set up a lab and use it in their mathematics

program in the rebuilt school in the fall. This coordinator wishes them well, but questions success unless considerable more commitment is made by the teachers. Since neither the coordinator or teaching assistant will be present all depends on the staff (maybe that will be the impetus needed).

The coordinator has taken a hard look at this situation questioning reasons why and considering the question "If I had it to do over". It is in contrasting this attitude with the attitude of summer institute participants (1968) that partially answers the questions. Over half of summer institute participants went back to their schools and became strong leaders in improvement of all or parts of the program (see report from Bernice Gliege and Jo Nesmith). They have interested others and formed teams. This year's summer institute finds many colleagues of last summer participants present.

It is the conclusion of the coordinator that a four week institute would be a must before again setting up an experimental program. With this institute as a background, the coordinator would only be needed in planning. The program would belong to the teachers from the beginning. This was not the case at Juliette Low, and in retrospect the coordinator realizes it was a mistake for these teachers not to have had institute training first, so the program would belong to them. (They were invited to attend in 1968.) Next year it will, and since there are some outstanding teachers on the staff, it should succeed.

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ABSTRACT

The need to upgrade mathematics programs has become crucial. Though considerable emphasis has been placed on mathematics programs since the "Revolution" in math which has its beginnings in 1952, little improvement, if any, has been noted in mathematical achievement. Improvement refers to achievement of students in skill, concept understanding, problem solving, areas and further improvement in turning out needed mathematicians. For in this electronic space age, the demand for skilled mathematicians increases, yet we are graduating fewer degree mathematicians yearly. Emphasis for upgrading must be at all levels, from Kindergarten through college. This program began at the primary level and worked through eighth.

Considering the general attitudes of dislike for math on the part of teachers and students this program seeks ways to improve methods, thereby, improving attitudes. The program was developed by paying more attention to individual needs through small group instruction in a laboratory approach. Then a further step involves teachers in these same techniques of small group instruction and a lab approach as an integral part of the program.

The general plan calls for follow up seminars to help teachers in meeting problems of implementation, and an evaluation design to check out effect on students involved.

APPENDIX A

Chronological Development of the Program

APPENDIX A

Chronological development of the program

A. Fall of 1967: Arranged through Jean Griffith, Principal of Juliette Low School, School District #59 to begin experimental Developmental Mathematics program there.

Met with Juliette Low staff--Planned a mathematics program using a mathematics laboratory approach with emphasis at the K-2 level. Third, fourth, and fifth grade teachers were invited to participate and utilize the laboratory as they desired.

Plans for team teaching were implemented. Released time was arranged for teachers so they could plan.

Demonstrations began twice weekly in November, 1967.

B. January of 1968: One first grade teacher became totally involved with bringing all first graders to the lab daily. The other team teacher was involved in book work in the class room.

Activities were: 1) Daily lab work
2) Team teaching

T & D Center provided: 1) Some of the facilities
2) Released time

Teachers decided their mode of operation.

Also in January of 1968, there occurred a change in administration. The new principal was supportive of the program, and insisted on a vote of confidence from the teachers.

The T & D Center hired a secretary to be at Juliette Low rather than having the Coordinator used one at the center.

Two 3-day training sessions for teams of teachers from other schools began.

C. In February of 1968: Consultant and travel money was spent to bring outstanding mathematics consultants in the use of mathematics laboratories from all parts of the U. S. Edith Biggs and Leonard Seeley from England were invited, but could not attend.

D. June of 1968: Implementation involved 120 students at the K-1 level where the mathematics laboratory was an integral part of the mathematics program.

Teachers at the school voted unanimously to continue the program in the fall.

E. Summer of 1968: 4-week institute
32 teachers of the consortium
100 students daily
Plans were formulated for follow-up seminars during the school year

F. Fall of 1968: Change of administration at Juliette Low. In the pre-workshop days, schedules were set up to involve all teachers teaching mathematics--and all students at Juliette Low in the program. All spent at least half of their math time in the lab.

Demonstrations were arranged for Monday through Thursdays of each week.

Coordinator traveled throughout the area working with groups of teachers in institutes, in-service training, and in general after school meetings.

Evaluation plan was set up--involving surveys for the teachers and testing for students involved.

G. January of 1969: The coordinator began weekly visits to Jane Addams school in Palatine, School District #15, where three teachers worked with their mathematics consultant to implement the program.

Developmentally, the program at Juliette Low was in full swing. All students (over 300) were involved regularly in the program. Fourth and fifth graders used their knowledge of math lab to help with the first and second grade students.

H. On February 7, Juliette Low School burned. Children were moved to another school on a double-shift basis. The program as developed could not continue.

I. Coordinator, secretary, and assistant to the coordinator moved to the T & D Center.

Monthly follow-up seminars continued at the Center.

Phase-out plans and writing occurred a month earlier than originally planned.

Follow-up consultant work continued in districts #15, 25, and #4.

J. April of 1969: A video tape showing aspects of the program such as planning with administrators, working with children in a lab, and working with teachers in seminars was made.

K. May of 1969: The coordinator, assistant, and secretary tested students in the program (K-5). Juliette Low staff included a mathematics laboratory in their plans for Sept., 1969, and asked the model program coordinator to help plan one.

L. A summer institute in the developmental program to non-grade mathematics was sponsored the the T & D Center and was held in Arlington Heights, District #25, from June 23 through July 18, 1969

APPENDIX B

Syllabi of the Program Activities

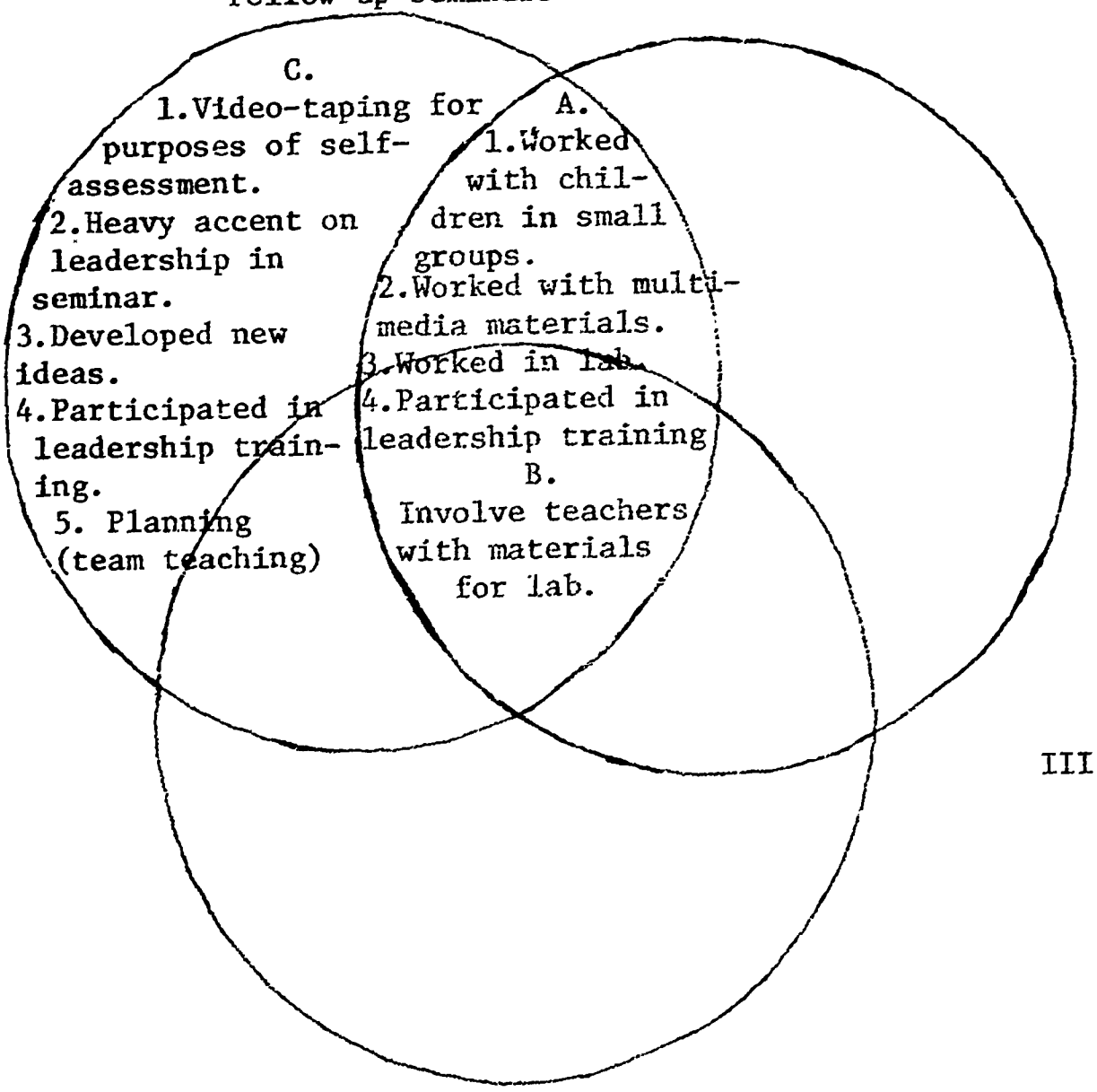
APPENDIX B

Syllabi followed in each of the program activities

Training activities for the Developmental program to non-grade mathematics fall into the following categories:

A. Short sessions of 1-3 hours, 1 session only.
B. Two or three, three-hour sessions (at Juliette Low where teachers from other school districts spent time in a training program.
C. Yearly program in St. Charles public schools; 6 one-hour sessions; 2 three-hour sessions.
D. Summer Institutes: 6 hrs/day, 20 days.
E. Monthly follow up seminars for summer institute participants.
F. The 5-7 teachers in the program at Juliette Low--4 days a week--on going.

The venn diagram below shows the kinds of activities--
(1) that were common to two kinds of workshops (A)
(2) common to all (B)
(3) unique to some (C)



APPENDIX C

Evaluation Instruments

a. Survey questionnaire

b. Feedback sheet - regular sessions

c. Feedback sheet - three day sessions

d. Summer institute survey questionnaire

e. Tests given to students
(refer to pages 48 to 52)

f. Other tests, etc.

APPENDIX C

a. Survey Questionnaire
(refer to pages 37 - 38)

July 11, 1969

SUMMER INSTITUTE IN DEVELOPMENTAL MATH

ACTIVITIES LIKED BEST (Past Two Weeks)

ACTIVITIES LIKED LEAST (Past Two Weeks)

SUGGESTIONS: (Plans, Teams, Activities, etc.)

ELK GROVE TRAINING & DEVELOPMENT CENTER

July 18, 1969

Developmental Math - Evaluation from participants no name needed. Please be as objective as possible. Comments may be brief. The purpose of this feedback is to improve any future workshops.

Place an X over the word that best expresses your feeling.

1) During the Institute I have been mainly at

primary	intermediate	upper

2) The teaming experiences were (generally) of

great value	some value	small value	no value

3) Working with small groups was of

great value	some value	small value	no value

4) If you answered that 2 and/or 3 were of great or some value, then will next year find you

A. Teaming

yes	no	if possible	part time

B. Working with small groups in math

yes	no	if possible	part time

If part time estimate how much

20%	40%	70%

5) With which materials do you feel most comfortable? Fairly comfortable? Least comfortable? (Use M, F, and C and star those you'd like more experience with *).

Cuisenaire _____

Geo-Board _____

Dienes _____

TUF _____

Think Stix _____

Attribute _____

Blocks_____

People Pieces_____

Cubes_____

Creature Cards_____

Sand Pile_____

Store_____

Tile_____

Tin Foil_____

Pentominoes_____

△ Rotational Geometry (Carl's _____

Curve Stitchery_____

Games (Name specifically

_____

_____

_____

_____

6) All of you were involved with video taping with small groups in a lab experience. Check the most appropriate words as they apply. The video taping experience for m e was

happy_____	unhappy_____
Meaningful_____	not meaningful_____
helpful_____	not helpful _____
Worthwhile_____	A waste of time_____
Inspiring_____	Uninspiring_____

Please react to your schedule - if you were planning a workshop in the future.

The schedule

A. 1 hour in lab

_____ would change _____ would not change

Comment:

B. 1 hour with team

would change _____ would not change _____

Comments:

C. 1 hour free

Study, observe

would change _____ would not change _____

Comments:

D After lunch

	Would change	Would not change	Comment:
Movies	_____	_____	_____
Group discussion	_____	_____	_____
Independent	_____	_____	_____
Other	_____	_____	_____

Other comments

7. Please react to your feelings about no books for students in the institute. Do these experiences effect your future plans in any way?

8. Any other reactions?

March 15, 1968

MEMO:

To: Training Teams
From: Phyllis Ferrell
Topic: Feedback

Will you check scale for your reaction to goals. I will appreciate and need comments to help build the program and to follow up our activities?

My goals are listed (based on your goals). Will you please help assess?

	YES	ABOUT ¼ as MUCH AS DESIRED	NO	COMMENTS
1. To assess the needs of the trainee				
2. To provide experience for you in:				
A. Concrete mat.				
B. Work with kids				
C. Aspects of teacher tr.				
D. Planning for teams				
E. Planning for grouping				
F. Planning for non-gradedness				
3. To provide cons. service during the session.				

PLEASE MAKE ANY OTHER SUGGESTIONS.

APPENDIX C

e. Other tests given to students are:

(1) Arlington Area Articulation Committee on Math Contemporary Tests

(2) Iowa Basic Skills

APPENDIX D

Directory of Consultants

CONSULTANTS TO THE DEVELOPMENTAL MATHEMATICS PROGRAM

Mrs. Beryl Cochran
Box 1176
Weston, Connecticut 06880

Mr. Don Cohen, Coordinator
Madison Project for New York City
1309 Q Street
Elmont, New York 11003

Mrs. Bernice Gliege, Math Consultant
School District 25
Arlington Heights, Illinois

Mrs. Alice Hart
Madison Project - Chicago Consultant
7312 N. Ridge Avenue
Chicago, Illinois 60645

Mr. Bernard Kessler
Curriculum Consultant
Educational Service
Olivette Underwood Corp.
1 Park Avenue
New York, New York 10016

Mrs. Ann Nard
CEMRL, Inc.
CSMP
103 S. Washington Street
Carbondale, Illinois 62901

Peter Kasmussen
UICSM Math Project
Urbana, Illinois 61801

Carl Selzer, Math Consultant
School District 54
Schaumburg, Illinois

Mr. Frank Van Atta, Consultant
Rochester Public Schools
Rochester, New York

Dr. William Rogge, Professor
Department of Education
University of Illinois
Champaign, Illinois

Mrs. Jean Griffith, Coordinator
Leadership Training
Elk Grove Training and Development
Elk Grove, Ill.

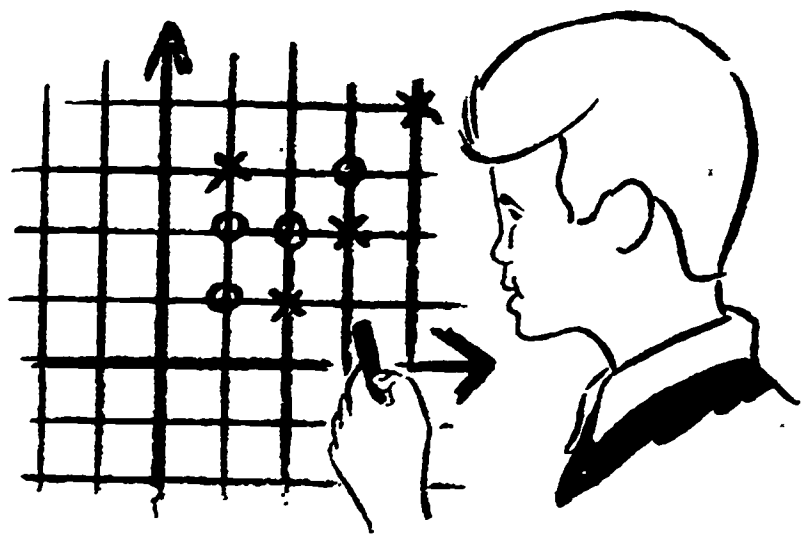
APPENDIX E

Dissemination Materials

a. Brochure

b. One page description hand-out

For the school year 1967-1968, the two mathematics programs, Developmental Mathematics and the Madison Project, combined efforts in <u>one</u> brochure. Below is a copy of that part of the brochure which referred to the Developmental Mathematics Program.



DEVELOPMENTAL PROGRAM FOR MATHEMATICS

Non-graded Mathematics is recognized as a powerful boost to help children scale, at their own pace, mathematics' lofty heights.

Through team teaching, the multi-media approach, and the mathematics laboratory, this developmental program in mathematics expands the students' creative learning experiences.

This developmental program, designed for elementary and secondary students, has begun at the 1st and 2nd grade levels at the Juliette Low School. (Mrs. Jean Griffith, Principal)

You're invited to contact the program's coordinator, Phyllis C. Ferrell, at the Training and Development Center for further information.

The Elk Grove Training and Development Center has been organized to help meet the demand that Education keep pace with mushrooming mass of new information, scientific discovery, and innovation in methods and techniques. Members of the Center consotorium include public, private, and parochial schools, colleges and universities, and the cooperative Educational Research Laboratory, Inc.

Phone AREA CODE 312/259-8050

FOR INFORMATION OR AN APPOINTMENT

Funded under Title III of the Elementary and Secondary Education Act.

DEVELOPMENTAL MATHEMATICS

Educationally, much we hear these days has to do with the idea of paying attention to individual differences in children. Sounds great, doesn't it? What conscientious teacher or administrator could vote against any program that paid attention to individual differences among children? But then ones heart sinks. Why? Because the teacher or administrator involved is too apt to say to himself, "Sure, that's fine for others who may have extra money, teachers aids, etc. -- but we can't do it in our case." And there are many teachers who really believe in letting kids proceed at their own rate, but who cannot cope with the feeling of being needed in fifty places at once.

The coordinator of this developmental math program has experienced these frustrations, has experimented with different ideas, and has acquainted herself with almost all available programs attempting to ungrade mathematics. We can find some isolated examples of non-grading of mathematics at the junior high and high school levels. At the elementary level, the best example of non-graded math is IPI (Individually Prescribed Instruction).

But let's go further. This developmental program for mathematics is an aim to ungrade mathematics K-14. At this time, emphasis for the program is at first and second grade. The coordinator is working with a team of teachers (four in all) at the first and second grade level; eighty-six students are involved. A block of time is set aside for mathematics for all students. The teachers are grouping, teaming, planning together with the coordinator; getting involved in a kind of "on the spot" daily in-service, and participating in the development of a mathematics laboratory. Put them all together, and you see non-grading of mathematics beginning to evolve. The program is being demonstrated now at Juliette Low School in Arlington Heights.

When you visit us, you may see a large group, small groups, or individuals pursuing concepts at a table in the lab. We have introduced cuisennaire rods in large group settings so that kids can then explore ideas individually. You may see one group working with counters, another in tinfoil geometry. These are the kinds of activities that point up a philosophy of ungrading.

For further information, please call me mornings at 437-1000, Extension 65, or afternoons at 259-8050. I'd be happy to talk with you.

Phyllis Ferrell, Coordinator

PF/ce 10/17/67

APPENDIX F

Relevant Materials

a. Sample daily logs written by teachers (to be compiled)

b. Outside evaluation team reports (1968 and 1969)

c. Letters of support from superintendents of consortium

SAMPLE DAILY LOG

Written by Teachers in the Program

(to be compiled into a laboratory manual)

July 3, 1969

UPPER LEVEL

Teachers: Peggy Aiman, Doug Williams, Mary Allen, Ruth Halsted, Carol Catardi, Therese Butzen, Bud Williams, Marie White, *Joyce Cramer, *Bob Woods *observers and recorder

Goals: To allow students to enjoy themselves playing mathematical games.

Activities:
- Tanagrams
- Tuf (with and without framtions
- Tower of Hanoi
- Sum Times
- Kalah
- Mem
- Percection game
- Quibic
- Tic Tac Toe with color cubes
- Frustration Ball
- Peg game
- Testilations

EVALUATION:

General— The pupils seemed to enjoy choosing what they were to do. Many played games they had been introduced to earlier in the institute. Special comments on reaction to several activities follows:

Testilations: Students were asked to cut a shape from graph paper that would cover 5, 6, or 7 units. Even bigger shapes can be used. Use this as a pattern to cut additional shapes from two colors of construction paper at a time. These colored shapes are then arranged alternately on a separate sheet of paper. The students learn that some shapes can be used to cover the whole area, others not. If they have one that cannot be used as an over-all pattern, have them devise a new one. Forms are glued to the paper in an over-all patterns. Comment: Students liked this activity. One girl started in two opposite corners when pasting -- found her pattern did not match accurately when she got to the middle or center. This activity takes a whole hour.

Tic-tac-toe with color cubes. Students played for the whole hour = did not want to quit.

Tuf -- several variations were used today. In one case, the teacher threw the dice. all students then had to copy her dice and use these to make their equations. All then were working with the same numerals etc. In another group where 8th graders were competing with younger students, it was decided to remove the fraction pieces.

Factoring game = was played as teams. This gave all students a chance to participate.

Tower of Hanoi and peg game -- students kept track of the number of moves required

Some students messed in the sandbox with no direction.

Sum Times, Perception game and Kalah were all at one table where all were enthusiastically received.

H June 27, 1969
Arlene Matten

PROGRAM

Goals: To introduce children to sandtable. To gain experience in estimating measurement.

Materials: Sandtable, cups, bowls and scoops.

Procedure: We will go over to the sandbox and talk about estimating how many scoops will fill the cups and bowls. After each child has estimated the amount of scoops needed to fill a cup or bowl one child will determine who has the correct estimate. This is an activity the group has asked to try.

Results: The children became more accurate at estimating as the time went on. At first each child guessed and then one child tried out their estimates. At first they were not very accurate. Later each child was given a shovel and a bowl. They made their guess and I wrote it on the board. The children then went back to the sandtable and tried. They reported back on their results. Each child had several opportunities to s and see if they were correct using different spoons, scoops, bowls, and measuring cups. By the end of the session two of the children could estimate almost perfectly how many scoops or spoonfuls they would need. All of the children enjoyed this activity. The one immature child in the group wanted to try another activity after a very short time.

Goals: To let the children continue with an activity they had enjoyed this week.

Materials: Geo boards - Rubber Bands - Asco Blocks - Think Stix

Procedure: Each child was allowed to choose the activity they would like. Three chose Geo Boards, one chose Asco Blocks and one chose Think Stix. This activity is for enjoyment.

Results: Four of the children stuck to thr activity they chose. With the Geo Boards the children made harder pictures and talked about what shapes were in their pictures. The girl with the Asco Blocks made a robot and a house. They boy with the Think Stix is the immature child of the group. He quickly tired of this activity and asked for blocks. After a brief time he asked for something else.

My goals with the group were mainly enjoyment and this was accomplished with most of the group.

GROUP B

PRIMARY & INTERMEDIATE July 8 and 9, 1969

GOALS: 1. Complete work with sewing cards. Carry the sewing work into third dimension with some of the faster children.

2. Pentominos. Working with five units, guide the children to discover that twelve different shapes are possible. Using the idea of an open-end cube, guide the children to discover the eight different shapes that can be folded into an "open-end cube."

ACTIVITIES: 1. Sewing. All children were able to complete their flat designs by the end of the second day. Some finished the flat-angle design in one day and b egan working with circles and three-dimensional designs. Some brought in s hoe boxes. Others made their own "corner" starting from tagboard, cutting out t he three-unit shape, and folding and taping it into the desired shape. These children paper ·l with inside of the "corner" with colored construction paper.

2. Pentominos. Each group worked with five units. The teachers asked the children to discover the twelve possible shapes using all five units, and then asked them to find the eight possible shapes that would make an open-end cube when folded. Various media were used for assembling the units, however. One g roup used the unit cube of the Diene's blocks; another started with "tin-foil geometry" and transferred to tile after the children had grasped the idea o f how a cube made six units, and an open-end cube five units. All groups transferred their designs to paper and cut out the shapes. One group used the overhead projector to show new shapes, as they were discovered, to the entire group.

EVALUATION: 1. The sewing work went well, and some of the designs were quite attractive. All the children seemed to enjoy this activity.

2. There was a marked difference in ability among the children who w o r ked with the sewing cards. As a rule, the girls worked faster and did better work than the boys.

3. We had trouble making a design working with circles. In order to measure the units, a protractor must be used and the two circles divided by degrees. The big circle should be marked off every ten degrees and t he smaller circle marked off every five degrees in order to get a symmetrical design. One child who marked her circle incorrectly and who did not have this ratio of 2 to 1 ended up with a "spiral" design which was most attractive even though it was not what we had planned.

4. The Pentomino work went well and the children seemed to like it. They had no trouble transferring the designs to paper..

Grooman-Brusa
Peterson-Nicholson
Powell-Ousset
Fuller-Mente
Walsh-Merritt

OUTSIDE EVALUATION REPORT 1968

APPENDIX A

Excerpt from Outside Evaluation Report conducted in January of 1968 by a team, consisting of Dr. Victor Dupuis, Pennsylvania State University and Dr. David Rice, Indiana State University.

The Evaluation Team members interviewed the Model Program Coordinator at the T & D Center, and studied the Model Program Description made available prior to the visit. Since the program is developmental, Evaluation Team members raised a series of inquiries about the background and history of the notion itself for this particular type of developmental thrust in the area of mathematics, and found that the Model Program Coordinator appeared both confident and capable in providing this type of information. The Model Program Coordinator appeared to possess comprehensive knowledge about, and be able to discuss convincingly, the various target areas of the current developmental effort including rationale, instructional goals, instructional materials and processes, personnel strengths and weaknesses, and concern for receptivity toward educational change on the part of participants in the Developmental Program. A decided strength of the Model Program Coordinator as viewed by Evaluation Team members seemed to be her clear ability to work effectively with instructional personnel involved in the Program through helping these persons to overcome day-to-day operating problems which without sensitive and effective treatment, might undermine the development sequence. It appeared to the Evaluation Team members that a very commendable program in evaluation involving teachers, students and the Model Program Coordinator has taken place. This Program Coordinator appeared to be sensitive to evidence and impressions indicating the effectiveness of both directive and non-directive procedures that can be used with in-service training of teachers.

Appendix A - continued

Recommendations

1. That a rationale be developed for potential different instructional strategies used in the team approach and non-grading. (This effort should be undertaken by the Model Program Coordinator in cooperation with her total staff.)
2. As this developmental program moves to the training stage, the Model Program Coordinator and her staff ought to ascertain and prepare information on: the amount of training, costs, materials, staff, program and follow-up evaluation needed to prepare teachers to establish a program in non-graded mathematics. This information would be a valuable part of the training model.
3. Close, continuous and systematic interactions ought to be occurring between the Model Program Coordinators and the respective participating staffs of the Madison Project Mathematics and the Developmental Program to Non-Grade Mathematics K-14 for purposes of advancing the quality of preparations and operation in the Developmental Program as well as providing increased opportunities for gathering and treating evaluative data for either or both of the Programs.

OUTSIDE EVALUATION REPORT 1969

THE DEVELOPMENTAL MATHEMATICS PROGRAM

NON-GRADE MATHEMATICS K-14

The Developmental Mathematics Program, centered in the Juliette Low Elementary School was initiated in September of 1967 through the resources of the T & D Center. It is staffed by a Model Program Coordinator and one assistant. The program is best described as a non-graded approach to mathematics laboratory and an eight member teaching team in the instructional process. Students are involved in large group, small group, and individual instructional activities. The core of the program is a math laboratory consisting of two rooms separated by a folding door which makes large group presentations possible. The lab is well equipped with media equipment and instructional materials including Cuisennaires, Diene's Blocks, Counters, Geo Boards, Fractional Circles (magnetic), Attribute blocks, Think Stix, and additional games and materials for mathematical instruction. The developmental dimension of the program is in the design of the laboratory and the non-graded team teaching approach to instruction since materials used in the program have been prepared elsewhere.

The primary purposes of the program are demonstration and training. Teachers and administrators from the

surrounding area are afforded the opportunity to observe the effective use of the math lab and team teaching in grades K through 5 in a school setting. During the past two years approximately 250 visitors from a multi state area have observed the program. In addition, the coordinator has made an estimated 30 presentations relative to the project.

Two groups have been involved in the training program of this project. The eight teachers directly involved in the mathematics teaching of the Juliette Low School have received training. Additionally, the staff directed a four-week summer training institute in 1968 for 30 participants with teaching responsibilities ranging from Kindergarten through the junior high school level. The participants were teachers from the member schools of the T & D consortia. Continuation training is available to the summer institute participants through monthly follow-up seminars scheduled during the present school year.

Assessment

The evaluation team observed excellent mathematics instruction in the limited number of classes observed. Students and teachers alike appeared to enjoy their activities. A review of anecdotal records indicated

that approximately three-fourths of the students in a sample group indicated that "math lab" was their favorite subject. A cursory review of the results of achievement test summaries indicates that the students instructed in mathematics through this program have achieved at or above grade level on standardized tests. The evaluation team members were further impressed by the capability, sincerity and leadership of the Model Program Coordinator and her staff.

The number of observers from an extended geographical area would seem to indicate adequate demonstration involvement. Limited data rendered it impossible to assess the quality of the summer training institute. Certainly the model program would be strengthened by a design that would accommodate greater specificity of description of program activity, objectives, costs, and evaluation. The evaluation was deemed particularly weak in that substantial evidence was limited in the areas of student achievement, teacher-administrator perceptions (attitudes), and the program's impact on individuals and the institutions who had visited.

Recommendations

The MPC is to be commended on the excellent description of the program which is very thorough and provides an adequate rational for the model. It is recommended that

attention be given to the questions on page 9 as basic guides to evaluate the model. There is probably a need for more evaluation input from the T and D Center in order to evolve appropriate designs and assist in instrumentation.

COMMUNITY CONSOLIDATED SCHOOL DISTRICT 59
ELK GROVE TOWNSHIP SCHOOLS · P. O. BOX 100 · ELK GROVE VILLAGE
BOARD OF EDUCATION ADMINISTRATIVE OFFICES
2123 S. Arlington Heights Road · Arlington Heights, Illinois 60005 · Phone 312/437-1000

January 24, 1969

Mrs. Phyllis C. Ferrell
The Elk Grove Training and Development Center
1706 West Algonquin Road
Arlington Heights, Illinois 60005

Dear Mrs. Ferrell:

The Developmental Program to non-grade mathematics under your supervision, funded by the Training and Development Center has made a considerable impact in the District 59 Schools.

In addition to developing a definitive program at some of the schools, it has had a strong influence in re-evaluating the mathematics program for the entire district. In addition, I have heard very fine comments about your work from superintendents in other districts. I hope that a plan can be developed that will continue this work.

Of the many things that the Training and Development Center initiated, the Developmental Mathematics Program is one of the best. I hope that the effort of the National College of Education to obtain funding from N.S.F. will be successful.

District 59 is prepared to continue and expand this program. Your work in this area has my complete support.

Sincerely yours,

Donald Thomas
Superintendent

DT:eg

COMMUNITY CONSOLIDATED SCHOOL
DISTRICT No. 21. COOK COUNTY
999 W. DUNDEE ROAD • WHEELING, ILLINOIS 60090
537-8270

January 21st, 1969

Mrs. Phyllis C. Ferrell, M.P.C.
Developmental Program for Non-Grade Mathematics
Elk Grove Training & Development Center
1706 W. Algonquin Road
Arlington Heights, Illinois 60005

Dear Mrs. Ferrell:

The Developmental Program to non-grade mathematics has been a very effective program of in-service training for our staff. However, we are just at the beginning stage of effecting such a program and would like to participate in the further development of a coordinated training program in this area.

You are to be congratulated for your efforts in this work.

Sincerely yours,

Kenneth F. Gill

K. F. Gill, Superintendent

kfg/dgw

Arlington Heights Public Schools

DISTRICT NO. 25
ARLINGTON HEIGHTS, ILLINOIS 60005

ADMINISTRATION BUILDING
301 W. SOUTH STREET
CLearbrook 3-6100

January 21, 1969

Mrs. Phyllis C. Ferrell
Developmental Program to Non-Grade Mathematics
Elk Grove Training and Development Center
1706 West Algonquin Road
Arlington Heights, Illinois 60005

Dear Mrs. Ferrell:

The developmental program currently under development by the Elk Grove Training and Development Center in relation to non-grade mathematics appears to have significant potential for the years ahead. The relationship between children, teachers, and media materials, and the overall concept of a mathematics laboratory appear to fuse together an integrated mathematics program of merit. The extension of this program will be of importance to a number of local school districts.

It is my judgment that funding of the National Science Foundation proposal submitted by the National College of Education would result in expansion and development of programs and ideas which are well worthy of such support. I would certainly urge funding of this most worthwhile proposal.

Sincerely yours,

Donald V. Strong
Superintendent

DVS:tc

MOUNT PROSPECT PUBLIC SCHOOLS
ELEMENTARY DISTRICT NO. 57
701 WEST GREGORY STREET
MOUNT PROSPECT, ILLINOIS 60056
PHONE 312 CL 9-1200

SUPERINTENDENT
ERIC A. SAHLBERG

ASSISTANT SUPERINTENDENTS
ROBERT E. ANDERSON, INSTRUCTION
J. C. BUSENHART, BUSINESS

January 21, 1969

Mrs. Phyllis Ferrell, MPC
Developmental Program to Non-Grade Mathematics
The Elk Grove Training and Development Center
1706 West Algonquin Road
Arlington Heights, Illinois 60005

Dear Mrs. Ferrell:

School District 57, Mt. Prospect, Illinois acknowledges the leadership shown by the Training and Development Center in providing in-service work for area teachers in the non-graded mathematics program. The timeliness and quality of the program are commendable.

The staff of District 57 encourages the Training and Development Center to continue the non-graded mathematics program work and stands ready to cooperate and participate in further efforts to improve mathematics instruction.

Very truly yours,

Eric A. Sahlberg
Superintendent of Schools

EAS:DP

COMMUNITY CONSOLIDATED SCHOOL DISTRICT 15

PALATINE, ILLINOIS 60067

E. S. CASTOR, SUPERINTENDENT

ADMINISTRATION BUILDING
906 SOUTH QUENTIN ROAD
312-358-4400

January 23, 1969

National College of Education
Evanston, Illinois

Gentlemen:

The developmental program to non-graded mathematics which has been a program of the Elk Grove Training and Development Center for the past two years has generated a high interest level in this school district.

This district joins other districts in the consortium supporting the proposal for its being continued.

Sincerely,

E. S. Castor

E. S. Castor, Superintendent

ESC/hck

Schaumburg Township Elementary Schools

Community Consolidated School District 54

105 AUDUBON PLACE

HOFFMAN ESTATES, ILLINOIS 60172

'AYNE E. SCHAIBLE
»erintendent of Schools
529-1806

January 27, 1969

Mrs. Phyllis C. Ferrell, M.P.C.
Developmental Program for Non-Grade Mathematics
Elk Grove Training and Development Center
1706 W. Algonquin Road
Arlington Heights, Illinois 60005

Dear Mrs. Ferrell:

We have found the Developmental Program to non-grade mathematics to be a very effective and valuable program of in-service training for our teachers.

Because we are just beginning to establish such a program in our district, we would like to participate in the further development of a coordinated training program in this area.

Thank you for your efforts in this area.

Very truly yours,

Wayne E. Schaible,
Superintendent

WES/bjh