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ABSTRACT

The purpose of this study was to gain information which would be helpful in designing and implementing a mathematics clinic in a university setting which would serve three purposes: provide remedial instruction for elementary- and secondary-school under-achievers, provide a situation in which the process of learning mathematics might be studied, and provide a facility for use in training pre-service and in-service teachers. Six existing clinics identified by a panel of mathematics educators were surveyed using an instrument constructed for this study and on-site visits. Literature and conferences on diagnosis and remediation served as sources of additional information. For each of the university clinics surveyed this report provides information concerning personnel, history of the clinic, nature of pupils served, diagnostic methods used, and relationship with the university. (SD)

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THE MATHEMATICS CLINIC

Faculty Research Grant

Final Report

Presented to the

Office of Dean of the Graduate School

Stephen F. Austin State University

by

Jerry L. Irons Ph.D.

August, 1974

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INTRODUCTORY STATEMENT

INTRODUCTORY STATEMENT

Since the Massachusetts law of 1789, mathematics has held a key position in the American school curriculum.[1] During this time there has been a continuous struggle of what mathematics actually should be taught and the superior modes for teaching it. However, computational skills, problem solving techniques and application have always made their presence felt to some degree.[2]

With the launching of Sputnik in 1957, the mathematics curriculum was dramatically brought onto center stage and examined from almost every angle. The National Science Foundation was established and a considerable amount of money was expended for curriculum studies. Such projects as the School Mathematics Study Group, Stanford Project, Madison Project and Greater Cleveland Mathematics Program provided extensive research which has revamped elementary school mathematics throughout the entire country.[3]

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[1]Charles H. D'Augustine, Multiple Methods of Teaching Mathematics in the Elementary School, (New York: Harper and Row, Publishers, 1968), pp. 1-8.

[2]Vincent J. Glennon and Leroy G. Callahan, Elementary School Mathematics: A Guide to Current Research, (Washington D.C.: Association for Supervision and Curriculum Development, NEA, 1968), pp. 1-32.

[3]Foster E. Grossnickle and John Reckzeh, Discovering Meanings in Elementary School Mathematics, (New York: Holt, Rinehart and Winston, Inc., 1973), pp. 1-52.

Significance of the Study

In spite of all these efforts, thousands of American children who sit in math classes each day can see only frustration when they come to grips with this subject. They don't understand it, don't like it and see absolutely no connection between mathematics and what they do in the normal course of every day. The speculated answers to why this situation exists are many, but the two presently receiving national attention are those of how we train our teachers and the way we teach the subject.

The former of these two reasons implies that there is a need on the part of some pre-service and in-service teachers to have an indepth study of children and mathematics which is field centered. The latter reason implies the need for basic research in the area of how children learn mathematics. Thus, the role of the mathematics clinic comes sharply into focus. The clinic could serve fundamental needs of both the university and the public schools at the same time. It could be used as a training ground for pre-service and in-service teachers, as a laboratory for basic research, and at the same time assist low achieving elementary school pupils in their efforts to master mathematics.

Purpose of the Study

The purpose of this study was to produce a design for

a mathematics clinic at Stephen F. Austin State University and a plan for the implementation of this design. In completing this task, the specific objectives were:

1. To identify and establish contact with outstanding college and university sponsored mathematics clinics.
2. To obtain field information regarding the function and operation of college or university sponsored mathematics clinics.

Procedure of the Study

Step 1: The first task was to determine if there was a demand for the services of a mathematics clinic. Since geography dictated that most of the pupils served would be Nacogdoches children, their achievement records were searched to see if there were any weak math students among them. Achievement test printouts for fifth graders during the 1972-73 school year were made available to this investigator.

Approximately twenty-two percent of the students scored twenty-two months lower than their actual grade placement. Since the tests were administered near the first of October, this meant that these students had been in school just over four years and were already functioning nearly two years below grade level. From this data it was projected that approximately six hundred seventy-five students in grades one through eight were in extreme need

of help in mathematics.

Step 2: In order to identify institutions currently operating mathematics clinics a panel of outstanding educators was selected to serve as judges. The judges were:

Dr. Charles Allen	Director of Mathematics Los Angeles City Schools
Dr. Robert Ashlock	Director of the Arithmetic Center University of Maryland
Dr. Roy Callahan	Associate Professor of Education State University of New York-Buffalo
Dr. John Engelhardt	Director of the Mathematic Clinic Arizona State University
Dr. Howard Fehr	Director of the Mathematics Curriculum Improvement Study Columbia University
Dr. Vincent Glennon	Director of the Mathematics Education Center University of Connecticut
Dr. George Grossman	Director of Mathematics New York City Schools - Brooklyn
Dr. Michael Hynes	Director of the Mathematics Center for Diagnosis and Remediation Florida Technological University
Dr. Leonard M. Kennedy	Professor of Education California State University-Sacramento
Dr. Alice Kidd	Mathematics Consultant Texas Education Agency

Dr. Klaas Kramer	Professor of Education State Univ. College - Brockport, N.Y.
Dr. Lola May	Professor of Education Northwestern University
Dr. Jo Phillips	Professor of Education University of Cincinnati
Dr. Fredricka Reisman	Assistant Professor of Education University of Georgia
Dr. Alexander Tobin	Director of Mathematics Education Philadelphia School District
Dr. Ed Uprichard	Director of Mathematics Clinic Director of Early Childhood Education University of South Florida-Tampa

Step 3: Each panel member was asked to submit a list of from one to eight outstanding university operated mathematics clinics. All sixteen responded. A tabulation of their choices is indicated in Figure I.

It should be noted that seven judges did not know a single clinic in operation. The information submitted about Temple proved to be incorrect. While the remaining ten were able to identify at least one clinic, four was the most anyone could identify and only two members could do that.

Step 4: The decision was made to visit the following five universities: Florida Technological University, University of South Florida, University of Maryland,

FIGURE I

	Florida Tech. Univ.	University of South Florida	University of Maryland	Wayne State University	Arizona State University	Temple University	Kent State University	Knew None	
Allen								X	
Ashlock		X	X		X				
Callahan								X	
Engelhardt	X	X	X	X					
Fehr								X	
Glennon		X	X						
Grossman								X	
Hynes	X		X				X		
Kennedy								X	
Kidd								X	
Kramer	X								
May					X				
Phillips	X								
Reisman		X	X		X				
Tobin						X			
Uprichard	X	X	X		X				
TOTALS	5	5	6	1	4	1	1	6	

Arizona State University, and Kent State University. Communications were not completed with officials at Wayne State University.

Step 5: Attempts were made to locate other mathematics clinics. Two additional clinics were located with the assistance of a study by Joyce Sutton.[4] These two institutions were West Virginia University and University of Oregon. Other leads ended in despair.

Step 6: An instrument was developed in order to organize and standarize data. The same instrument was used in surveying all clinics.

Step 7: The field study was made to the chosen clinics.

Step 8: A personal interview was held with the West Virginia University Clinic Director at the National Conference on Remedial Mathematics in Kent, Ohio.

Step 9: Information was gained through an extensive search of the literature and attendance at two conferences. Diagnosis and Remediation in School Mathematics - Arizona State University, and National Conference on Remedial Mathematics - Kent State University.

Step 10: This document was developed from the findings in the literature and the practicing clinics.

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[4]Sutton, Joyce, "A Survey of Diagnosis and Remediation Programs in Mathematics Education in One Hundred Selected Institutions of Higher Learning," Unpublished Paper, Florida Technological University, Orlando, 1973.

CHAPTER II

FIELD STUDY REPORT

ACKNOWLEDGEMENTS

A study of this type is dependent on the patience and generosity of the professors at the different institutions. These gracious people gave their valuable time and information to provide this investigator with interviews and tours of their facilities. While this writer is grateful to many for their help, a special thanks and recognition is offered to the following dedicated people:

Dr. Jon Engelhardt, Arizona State University

Dr. Michael Hynes, Florida Technological University

Dr. James Heddens, Kent State University

Dr. Robert Ashlock, University of Maryland

Dr. John Wilson, University of Maryland

Dr. Ed Uprichard, University of South Florida

Dr. Boyd Holtan, West Virginia University.

UNIVERSITY

Institution: Arizona State University-Tempe, Arizona

Enrollment: Undergraduate-20,000; Graduate-Approximately 5,000

SUPPORT PERSONNEL

Dean: Dr. Del D. Webb

Head, Department of Elementary Education: Dr. Carl J. Wallen

Clinic Director/Teacher: Dr. Jon M. Engelhardt

The clinic is a part of a course taught by Dr. Engelhardt. The main secretarial assistance is from a work-study person who spends some 20 hours per week on matters pertaining to the clinic. In addition, one graduate assistant is assigned to Dr. Engelhardt and the clinic for 20 hours per week. The graduate assistant, however, is considered temporary in that his service can be expected for only the first year of clinic operation. The staff responsibility is essentially the same here as for any other course--that is

HISTORICAL DEVELOPMENT

Dr. Engelhardt initiated the ASU Mathematics Clinic in response to teachers' appeals for help in the area of diagnosis and remediation in mathematics. He received a faculty research grant to visit existing clinics and recognized scholars. During the Spring of 1973 he visited Dr. Ed Uprichard (University of South Florida), Dr. Vincent J. Glennon (University of Connecticut at Storrs), and Dr. John Wilson (University of Maryland). Based on a

review of the literature and these visits, he developed the ASU Mathematics Clinic.

Plans are for the clinic to be operated in both the fall and spring semesters. If there is a demand, it will also operate in the summer. Spring 1974 was the first semester of operation.

UNIVERSITY STUDENTS

Students enrolled in the clinic course are working on the graduate level. Since most of the students are graduates of ASU, they have had a minimum of from 3 to 6 hours of mathematics. The course can be taken as an elective or will fit into certain degree programs. (Master of Art, Doctor of Ed., Ph.D.). Four core courses are required for a graduate major in education, but none are considered a prerequisite to the clinic course. Since this course is an outgrowth of the cry of teachers' needs, the idea is not to build in prerequisites that would prohibit students from taking the course. Rather, availability and individual instruction are the key phrases.

CLINIC COURSE

The clinic course, basically, has three primary purposes. First, it serves as a research vehicle on why and how children can and cannot learn mathematics. Second, it is a training ground for graduate students and teachers who need assistance in classroom and clinical diagnosis and remediation. Finally, it is a community service in that it assists students who are having difficulty in mathematics.

At present, there is only one clinic course, although future plans call for three. The course meets both fall and spring semesters. There are sixteen meeting nights for the course. The first four meetings are basically foundation for the twelve week practicum. During the first four weeks discussion and study is clustered around causes of learning difficulties, how children learn mathematics, general diagnostic/remedial strategies, commercial diagnostic tests, identifying student computation error patterns, and constructing and interpreting individual diagnostic tests. The reamining twelve weeks are spent in practicum sessions, parent conferences, and seminars.

The course is scheduled for one three-hour meeting each week. However, during the twelve week clinic practicum a different schedule is in effect. Students meet as a group one two-hour session per week. The first hour is a practicum with the child, the second hour is used for seminar and preparation. In addition, another one hour practicum is scheduled each week with the child. At this point, then, the ccurse consists of two hours of practicum (one is total group-supervised; one scheduled during the week-not necessarily supervised) and a one hour seminar. The final meeting includes a parent conference. Teaching is on a one-university student to one-pupil basis.

Two texts are used in the course. They are A Guide to Diagnostic Teaching of Arithmetic by Fredrick K. Reisman and Error Patterns in Computation by Robert Ashlock.

The diagnoses are mainly from three sources. The commercial tests for survey diagnosis are Stanford Diagnostic Arithmetic Tests and Key Math. Probes for analytic diagnosis are individually constructed measures.

Remediation takes into account the concrete, semi-concrete, abstract sequence. Many "things" are available in the math lab for use in instruction, although a number of aids are home-made. At this point, remediation is not geared to any particular content taxonomy. The class size is restricted to twenty.

PUPILS

Children enrolled in the clinic range in ages from nine to thirteen. They may or may not be weak on other school subjects, but they are weak in math.

In order to advertise the availability of the clinic services, an ad is placed in the local papers. Also, letters are mailed to school officials in the metropolitan area explaining the program and seeking their assistance in locating pupils. A list of pupils names are then assembled based on referrals from the schools and parent responses to the paper ad.

The enrollment procedure is for the parent to contact the clinic staff by phone, complete and return an application form and wait for notification of acceptance. Children are selected by the clinic director on the basis of age, need, and preference of the university student. The university student, should he be a teacher, is not allowed to work with a pupil from his own classroom.

There are several reasons for this, one of which is that the student may still identify him in his discipline role and not make expected progress.

University clinicians hold two planned conferences with the parents. The first is immediately after the initial diagnosis which is about the sixth week of the course. The diagnostic-prescriptive information gained in initial diagnosis is the basis for the conference. The final night of the course is the scene of the final parent conference. While these are the only two planned conferences, others are held as needs arise.

The university clinician makes three copies of the final report. One is given to the parents, one to the clinic director and one is retained. While a report is not automatically mailed to the school, a report is mailed to any individual or institution upon request of the parents.

The cost for the pupil is $35 per semester. This includes initial diagnostic tests, support for instructional materials and all clinic tutoring. This is payable to the university via the clinic director at the first meeting. If the pupil wishes to participate in the clinic the next semester, he must reapply and pay another $35 fee.

UNIVERSITY CLINIC FACILITIES

Diagnosis and tutoring is generally held in two parts of the same building on the same floor. The main area is a large classroom with the mathematics materials center extending across the end of the room. The other area if the individual

rooms of the reading clinic which are adjacent.

UNIVERSITY

Institution: Florida Technological University-Orlando, Florida

Enrollment: Undergraduate-Approximately 6,000; Graduate-Approximately 1,000.

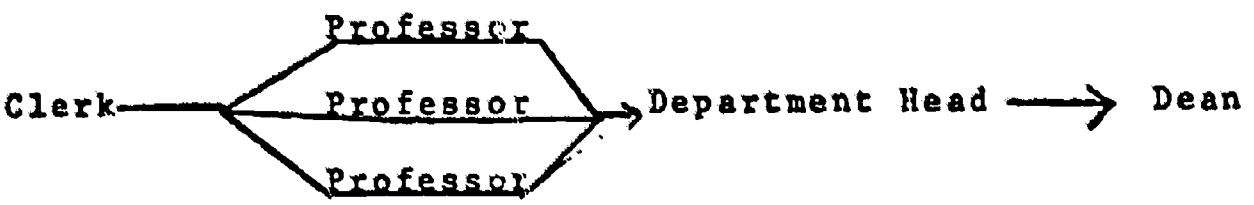
SUPPORT PERSONNEL

Dean: Dr. C. C. Miller

Head, Department of Elementary Education: Dr. Robert W. Martin

Clinic Directors/Teachers: Dr. Doug Brumbaugh Secondary Education
Dr. Mike Hynes Elementary Education
Dr. Marcella Kysilka Teaching Analysis

The clinic is a summer program which is taught by as many as all three of the above mentioned professors. Because of the large number of public school students involved, one full-time clerk is assigned to work with the professors in managing the program. None of the three is actually assigned the responsibility as head of the clinic. Rather, the responsibilities and duties are shared equally. The staff organizational structure would be:



HISTORICAL DEVELOPMENT

No single factor was responsible for the origin of the mathematics clinic as it exists. However, the fact that a reading clinic was established at this same institution one year before the math clinic started cannot be overlooked. Another factor was the influence of the institutions where the professors did their graduate studies.

For example, Dr. Hynes is a graduate of Kent State and studied with Dr. Heddens who operates a mathematics diagnostic clinic for children. Another influence was the professors' recognition of children in the Orlando locality in need of help. Applications of students requesting admission to the math and reading clinics for the summer of 1974 were already in excess of 500 by May 1. This is an amazing statistic since it is only the third summer for the math clinic. (Fourth for reading).

UNIVERSITY STUDENTS

The university students who work in the clinic are graduate level students. Almost all students are experienced teachers (this is better than 90%). These two factors alone automatically create a high quality climate. For instance, the average amount of mathematics completed by students is 9 quarter hours. Also, their teaching background provides many experiences which helped in their communications with children. In addition to this, two courses in trends and diagnosis in elementary school mathematics are prerequisites to clinic tutoring.

Not all university student enrolled are from elementary education. Several are secondary math people who are taking this as a part of their program. All of the secondary people are mathematics education majors.

CLINIC COURSES

There are two main purposes of the mathematics clinic. First it is used to train graduate students who wish to specialize in diagnosis and remediation in

in mathematics. Second, it is a community service in that it helps youths who need special assistance in mathematics.

There are actually three courses directly related to the clinic. The first is a course in diagnosis, which must be taken prior to the summer clinic. This course deals with the many aspects of understanding a child. Included in the study are interest, attitude, physical and social measures. Also, a large number of standardized achievement and diagnostic tests as well as informal cognitive measures are examined. The telebinocular and audiometer are mastered.

The two summer clinic courses, remediation and practicum, are taken simultaneously. While the eleven week program may vary, the time element is generally as follows: (1 week-2 weeks-7 weeks-1 week).

The first week of the term is spent reviewing diagnostic procedures, studying remedial procedures, and examining the tremendous accumulation of mathematics material, equipment and books. Class meets five days per week during that time. Pupils report at the beginning of the second week. The second and third weeks of the program are for diagnostic purposes. The students are grouped first as primary, intermediate, or secondary. During and at the end of the diagnostic period they are sub-grouped as to mathematical deficiency. Each clinician works with a small group of from 5 to 8 pupils. Seven weeks of the program is for remediation and the writing of the reports is accomplished in the final week.

The remediation is unique in several respects. The pupils are working in a clinic for two hours each day. If they are in math and reading, the time is split. If they are in only one clinic, they receive two hours of remediation (excluding break) in one subject. Also, assigned to this math group might be university students who are studying to be guidance counselors, physical education teachers or some other type of specialist. These people help the children in their speciality where a need exists.

In general, it can be said that remediation follows the content taxonomy produced by Heddens and Werner. A large number and a wide variety of materials are available for use. Included are filmstrips, slides, tapes, mathematics systems, some fifty commerical games, skill, puzzle, and application kits to mention a few.

PUPILS

Pupils enrolled in the clinic range from grades 1 to 10. The clinic, however, contains levels K-12. When the clinic first started, advertisement was necessary. This was done mainly through local school officials. The demand for the clinic services has become much greater in recent times on the part of parents who make applications directly to the university. Of the some 500 applications for reading and math, only a very small number will be admitted (some 80 to 120 in math). These participants are selected on the basis of a combination of student and university needs and to a large extent on a first come first served basis. The admission is restricted because

of the number of graduate students available to tutor and an unwillingness on the part of the directors to increase the tutor-pupil ratio.

There are two planned conferences by the university clinician with the parents. The first is during the second week of the practicum (diagnosis). This conference covers a complete diagnostic summary. Included in the discussion are such things as pupil interests, perceptual abilities, speech, vision, hearing, attitude, as well as cognitive test results.

The final conference is near the end of the last week and is a general progress report along with recommendations. The parent and the university keep a copy of this report. Also, a copy is sent to the school where the child will enroll the next school year if the parent desires.

The clinic fee is $30. A pupil wishing to repeat the clinic must apply again the following year.

UNIVERSITY CLINIC FACILITIES

The clinic itself is not located in one particular building at this time. Classrooms are used where space is available. The university is relatively new and still expanding. The clinic will probably find a permanent home when the new education building is completed.

In addition to the classrooms, there is a storage room for the math materials and equipment. The administration of these materials is handled by the clerk.

UNIVERSITY

Institution: Kent State University--Kent, Ohio

Enrollment: Graduate: 4000 Undergraduate 14,000

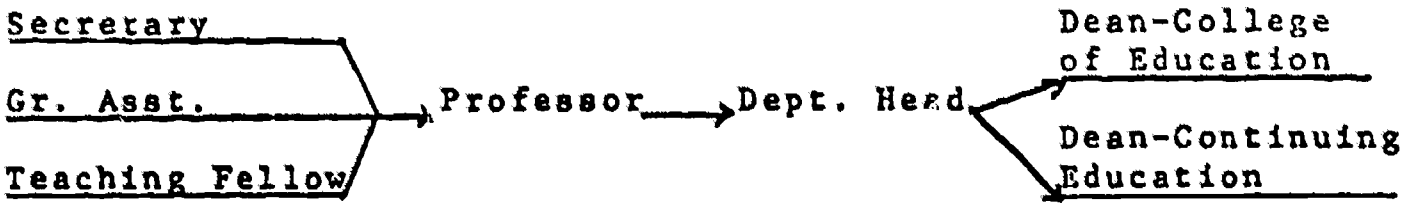
SUPPORT PERSONNEL

Dean: Dr. Robert L. Alfonso

Head, Department of Elementary Education: Dr. Ambrose Clegg

Clinic Director/Teacher: Dr. James W. Heddens

The clinic at the present time is a part of a workshop offered during the summer quarter. Two teaching fellows and two graduate assistants are available for assistance. Secretarial help is that of the normal secretarial pool. The organizational structure is like that of any other course with the exception that the workshop is usually sponsored by the Department of Continuing Education.



HISTORICAL DEVELOPMENT

Dr. Heddens and Dr. Werner codirect an extensive field centered undergraduate mathematics program in the University Laboratory School. This program has been in existence for some ten years. The mathematics clinic itself has been an outgrowth partly of the work in the lab school and partly of the observed needs of classroom teachers who request help in the area of diagnosis and remediation. The clinic course itself has been in operation two years.

UNIVERSITY STUDENTS

The clinic workshop is a course offered at the graduate level. The fact that only experienced teachers are allowed to enroll for the course has certain built-in prerequisites. They have had a minimum of from 4 to 8 quarter hours of mathematics and several courses in education and/or psychology, which they have completed while working toward their undergraduate degree. They have had at least one year of work with children which has given them many practical field experiences. So, while the only prerequisites are teaching experience and consent of the instructor, these prerequisites in themselves make a highly professionalized group.

CLINIC COURSE

At the present time the clinic course at KSU focuses specifically on diagnosis of students who are having difficulty in mathematics. Although there is not a time set aside for remediation, future plans call for the program to be expanded in that direction.

There are two primary purposes of the clinic. The first is concerned with training teachers. This purpose is to train teachers in diagnosing difficulties of children and make recommendations which can be carried out by a classroom teacher. The second purpose deals with community serivce. Diagnosing and making recommendations on children with mathematics difficulties will help classroom teachers when teaching that child.

The clinic workshop extends over a two week period for a full day on each of the ten days. The training is intense. The first week is spent studying theory, techniques, instruments, and practial application. Also, evaluation and teaching equipment are constructed in a well-equipped shop under the direction of a special consultant.

The days of the second week are divided at noon in reference to the activities. Three hours each morning are spent in a practicum with children. This time is spent in one-to-one diagnosis. The afternoons are set aside for constructing equipment, seminars, reading and writing evaluation reports.

The diagnosis is divided into two parts--the formal and the informal. Although each measure is not required of all clinicians, some of the instruments used in the past have been Key Math, Slosson Intelligence Test, Memory for Designs Test, Keystone Visual Survey Test, and the Slosson Oral Reading Test.

The informal tests are extensive and include more than just cognitive capabilities. Such things measured are manipulative skills, attitude, reading interest, eye and limb dominance, conservation of number and speech. This is done through a wide range of activities.

The informal cognitive measurement is designed around the Checklist of Mathematical Concepts developed by the mathematics education team at Kent State University. This is an extensive list of over two hundred fifty mathematical

concepts organized under some fifteen headings called Concept Clusters. Clinicians construct evaluation items to measure competence in each of the clusters. Emphasis is placed on recording the remarks and behavior of the child during the testing sessions. Analysis of the remarks is made when the child is not present.

Special attention is given to pupil responses. Information from responses is gained that shed light on rapport, attitude, speed, speech, posture, emotional tone, self-perception, attention span and mannerisms.

PUPILS

The age range of the children in the clinic is usually from eight to fourteen. These students may or may not be weak in other subjects but have demonstrated that they are weak in mathematics.

There is a wide range of disability among the students. However, children who have acute brain damage or who are extremely retarded are not selected. The emphasis is placed on those students who, it is felt, would be helped most by this service.

The children are located by the clinic primarily from teachers referrals and reputations of the clinic. If the parent expresses an interest in the service, he completes an application form and has the school to forward certain other information to the clinic. The student is then notified of his acceptance or rejection based on clinic demands and student needs. The student fee is $15.

There is only one parent conference during the workshop. This is the last day of the two week period. In that conference, the final report is reviewed. This would include formal tests, informal tests, pupil responses, the analysis and interpretation of the data, a list of specific cognitive difficulties and suggestions for the parents and the school. One copy of the report is given to the parents, one copy is sent to the school and one copy is retained by the clinic.

UNIVERSITY CLINIC FACILITIES

The clinic course is in the University Laboratory School. The regular classrooms are utilized for the testing. The materials and equipment are constructed in the extensively equipped workshop under the direction of a specialist.

UNIVERSITY

Institution: University of Maryland-College Park, Maryland

Enrollment: Graduate: 10,000; Undergraduate: 25,000

SUPPORT PERSONNEL

Dean: Dr. Robert Emans

Chairman, Department of Early Childhood-Elementary Education:
Dr. V. Phillips Weaver

Director, The Arithmetic Center: Dr. Robert Ashlock

Director, The Arithmetic Clinic: Dr. John Wilson

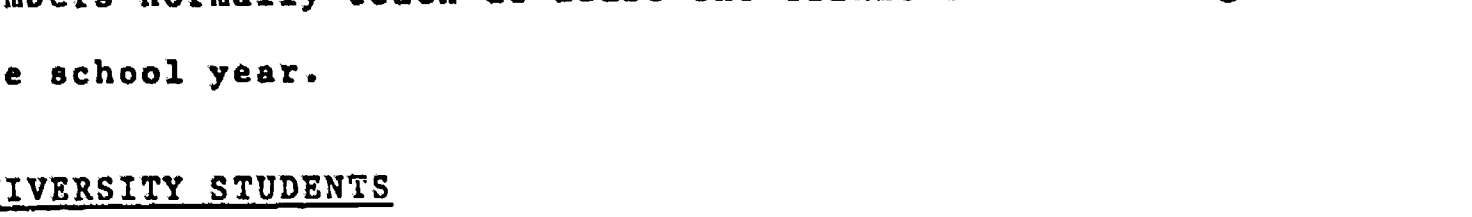
The Arithmetic Clinic is one of the functions of the Arithmetic Center at the University of Maryland. The Center itself is in the Department of Early Childhood-Elementary Education. There are five professors involved in elementary math education. Of these five, four are scheduled to teach at least one clinic course during the 1974-75 school year.

The EC-EE Department has several full-time secretaries. One is assigned to the Arithmetic Center. All math education professors use this person for their work. In addition, the special phone for the Arithmetic Center is the same as for the Arithmetic Clinic. The Center secretary, then, handles all phone messages for the clinic.

The Arithmetic Clinic is assigned one Graduate Assistant, usually a full-time assignment. Among the duties is to assist the Math Lab Graduate Assistant with organization and care of the mathematics supplies and equipment. Also,

this person is responsible for the initial screening of children who desire the services of the Clinic.

The organizational structure actually has a group within a department. The flow would be:



HISTORICAL DEVELOPMENT

Dr. Ashlock was responsible for starting the clinic at the University of Maryland. Included in his preparation was a visit to Dr. Wilson who was then directing the clinic at Syracuse University. The initial clinic at Maryland had only one university related course. Since this beginning in 1968, both the interest and clinic staff have grown. The feeling here is that this whole area is still evolving. There are presently three courses directly related to the clinic, one of which is beginning to have a multiple section demand. Also, Dr. Wilson has brought his expertise as clinic director and four of the five math education staff members normally teach at least one clinic course during the school year.

UNIVERSITY STUDENTS

Almost all students enrolled in the courses are graduate level students. One course (415), is open to both undergraduates and graduates. However, 1974 was the first year for undergraduates in the program. These undergraduates

are seniors who have taken two four-semester hour courses in math plus the math methods course. Most have completed student teaching although this is not a prerequisite. The 415 course is the first in a sequence of three clinic courses and is a prerequisite to the other two, therefore, it has a heavy graduate enrollment.

The background of those students interested in the clinic is aried and impressive. Enrolled in the previous year was the Director of Mathematics Instruction for a large city school system, and individuals completing a Ph.D. in School Psychology. Other graduate students enrolled have met the mathematics requirements for state certification and most are experienced teachers.

CLINIC COURSES

The clinic has three purposes. The first purpose is the training of clinical specialists. When these trained people take their places in the schools throughout the country, they will be able to have a tremendous impact on other teachers as well as youth. Not only will they be able to practice their speciality, but they will be excellent sources to disseminate research data to their colleagues. The second is research. It is suggested that the clinic is an excellent setting for generating experimentally testable hypotheses. A third purpose is the community service. Through the university system, children are able to receive treatment for their mathematical problems. It is quite likely that these same children would have gone through school with

their cries for help unheeded.

There are three separate advanced programs in the Department of Early Childhood and Elementary Education. One degree is in Reading, one in Early Childhood Education and a third in Elementary Education. In the advanced program in Elementary Education, one can designate a subject area of specialization. The clinic is a part of this math specialization choice. Also, the clinic has recently been included in special education as a part of their Diagnostic Prescriptive Program.

There are three courses directly related to the clinic and must be taken in sequence. The first concerns techniques and materials useful for working with children in both clinical and classroom settings. Also included is a case study with a child previously diagnosed as primarily corrective rather than severely disabled. The second course is essentially an in-depth extension of the first. Theoretical models, specific research and techniques are explored. The third course in the sequence involves the extension of diagnostic, teaching and reporting procedures included in the first two courses. The student in the third course also acts as a consultant for students taking the first two courses. The third course may be repeated once for additional credit. The first two courses are normally limited to a maximum of fifteen students, while the third course does not exceed ten.

A fourth course, while not directly tied to the clinic

is sometimes related. This research seminar is usually centered around the specialty of the professor. Often this specialty involves the clinic.

The administrative aspects of the courses are similar. The clinic classes usually meet fifteen times. The first three or four meetings deal with information needed in preparing to meet the child. Included are the study of the Content Taxonomy by John Wilson and some thirty-five pages of content objectives and behavioral indicators. Also, the necessary forms and background for recording the clinical sessions are reviewed. Extensive reading and discussion concerning the history and developing views on diagnostic teaching dominate the remainder of the time.

The next eleven weeks is a clinic practicum. The class is two hours forty-five minutes in length with the first hour and fifteen minutes with children. The remaining time is used for lecture, lesson preparation, seminar, demonstrations or any matter of immediate importance for students.

The class is scheduled to coincide with the dismissal of school in the afternoon. This way no school is missed and pupils can get home early.

The initial screening of pupils is not necessarily the same for all and is changing. Normally a child takes a test of mental maturity, the Stanford Diagnostic Achievement Test and part of the SRA Mathematics Diagnostic Kit. Diagnostic tasks using a variety of manipulative devices are also administered.

The diagnostic teaching procedures follow the Content Taxonomy by John Wilson. Consideration is given to the concrete, semi-concrete, abstract sequence and the sense modes. Materials for instruction are either constructed by the student or checked out of the math lab adjacent to the clinic. Publications required include Error Patterns in Computation by Robert Ashlock and Some Guides for Elementary School Mathematics by John Wilson.

PUPILS

Pupils enrolled in the clinic are elementary and junior high age children. There is a wide range of abilities and disabilities among them. At this time, the clinic prefers to handle those students who can be helped most in the least amount of time. It, therefore, places a low priority on working with a child who is extremely mentally retarded or who has severe brain damage.

If a parent wants his child in the clinic, he calls the Arithmetic Center at the university. The secretary then sends the parent four information sheets. Included is an overview of the clinic services, a statement of fees, an information form for the parents and one for the school. When the information forms have been returned, an appointment is made for the initial screening. The cost of the screening is $20.00 payable at the initial screening. An interview explanation of the findings is held with both parents (if possible) and recommendations are made. If remediation is necessary, the name of the child is placed on

the waiting list. The fee for the clinic is $5.00 per hour of one-to-one instruction. The total is about $60 to $65 per semester.

A final report is made at the end of the semester. One copy is given to the parent at the final conference or mailed soon thereafter, one copy is sent to the school and one copy is retained in the clinic. The final conference with the parents is centered around this report. The report includes sections on general background, mathematical daignosis, treatment, a breakdown of concent objectives and exemplars used in each session, major findings and recommendations.

A student is not automatically dropped at the end of the semester. If university officials, clinicians and parents agree that further work is necessary or would be useful, the child is retained in the clinic the next semester.

UNIVERSITY FACILITIES

The clinic actually uses two rooms. One is a large classroom with partitions perpendicular to the walls. The children then face the wall with the clinician so as not to be disturbed. The second room is the Math Lab materials center. Here is housed an extensive supply of math games, supplies and equipment.

UNIVERSITY

Institution: University of South Florida-Tampa, Florida

Enrollment: Undergraduate-16,000, Graduate-3,800

SUPPORT PERSONNEL

Dean, College of Education: Dr. Roger Wilk

Head, Program of Elementary/Early Childhood Education

Director/Teacher: Dr. Ed Uprichard

Ms. Diana Busciglio (Adjunct)

The mathematics clinic is a part of a two course sequence taught by Dr. Ed. Uprichard. Dr. Uprichard has the help of a secretary through the regular secretary pool. In addition he has two doctoral assistants assigned to him. His own time, however, must be shared with the Elementary/ Early Childhood Program of which he is the Director. Also, when there is enough demand for multiple sections of the clinic course, he employs a former student to be a visiting professor and teach the course. Such was the case when this study was made. He then supervises and helps coordinate clinic activities for the extra section. The structure of responsibility is the same as for any other course, i.e.,

Doctoral Assistant ⟶ Visiting Professor ⟶ Professor ⟶ Department Head ⟶ Dean

HISTORICAL DEVELOPMENT

The clinic started in the Spring of 1971 and has been in continuous operation since that time. The clinic is a

direct outgrowth of the graduate training of Dr. Uprichard. He was a student of Dr. John Wilson and Dr. Vincent Glennon and received extensive clinic training in mathematics. At one time Dr. John Wilson was a part of the clinic work at the University of South Florida before moving to the University of Maryland to direct the clinic there.

UNIVERSITY STUDENTS

The clinic courses may be taken by both undergraduates and graduates. The first clinic course (EDE 515) is actually built into four undergraduate and graduate programs. It may be taken as an elective by an Elementary Education major. This is usually done after student teaching when students realize they need additional help in math. It is a required course for the undergraduate Special Education major in mental retardation. It is also required for the graduate students majoring in Specific Learning Disabilities. Finally, it is a required course for master and doctoral students specializing in Mathematics Education. The second course (EDE 516) in the clinic sequence is built into the above programs as needed by the university student.

There are several prerequisites a student must meet to enroll in the clinic courses. These include 13 quarter hours of mathematics (number systems, algebra and geometry) plus a mathematics methods course. While student teaching is not a prerequisite, most students have had this plus other lab experiences involving children before clinic work.

CLINIC COURSES

The goal of the clinic at U.S.F. is threefold. First is the research factor. By utilizing specified techniques of instruction and recording these on standard forms, it is possible to determine what methods and stimuli are effective with certain kinds of cognitive problems students are having. (The University of South Florida uses the Functional Analysis of Classroom Tasks (FACT) to classify stimuli available to the learner.)

A second purpose of the clinic is for the training of the teacher in diagnostic, remedial and research procedures. The recognized importance of this purpose is witnessed by the large number of programs in which the clinic is involved.

The third purpose is service to pupils and the community. In Tampa, as well as other geographic regions, many students are experiencing difficulty in mathematics. The clinic work lends special attention to students who might not have been able to command the subject to fit their need.

The first of the two clinic courses is a study of symptoms, etiology and consequences of children's learning disabilities in mathematics. This knowledge is then applied to theoretical models used in diagnosis and remediation. The second course is an extension of the first and includes a detailed case study. Clinic practice in both courses is

usually on a one to one basis. Class size is limited to twenty.

There are two sections of the first course. One is taught by Dr. Uprichard and has the practicum in the public school setting. The second is taught by one of his former students, coordinated by Dr. Uprichard and has the practicum on the university campus. The mechanics of each course will be explained separately with the public school practicum being designated as (PSP) and the university practicum as (UP).

The PSP course meets eleven weeks, five days a week. The first two weeks are one hour class sessions on foundations and clinic preparation. Beginning the third week the course meets three days a week in class at the university and two days a week in a public school cafeteria for practicum. This schedule is followed the remainder of the course. Altogether there are eighteen sessions with children. Dr. Uprichard makes all the arrangements with the public schools through the proper administrative channels. The classroom teachers are primarily responsible for selecting the students.

The UP course also meets for eleven weeks at night. They have tried both two meetings a week and longer sessions of one meeting a week and report advantages and disadvantages of each. The current session is one meeting per week by university student choice. The first two weeks are equivalent to the PSP course. The practicum then meets

the first hour of each weekly session for the remainder of the quarter. The last part of the period is spent in seminars, reading, evaluation, and preparation. The pupils for the UP course fill out applications either on teacher referrals or they have knowledge of, and request this service. Dr. Uprichard makes the final decision on acceptance or rejection.

The first clinic session is usually spent gaining background information on the child and administering the Stanford Diagnostic Achievement Test. Additional data is gained through clinician constructed and clinic tests. A profile of the testing results is written up based on a content taxonomy developed by John Wilson. While mathematics is the vehicle for instruction, other areas of concern are attitude, self-concept, and the fun and usefulness of the subject.

PUPILS

Pupils enrolled in the clinic usually range from grade one to eight. If they are in the PSP program, they are selected by the classroom teacher and if they are in the UP program they make application through Dr. Uprichard at the university. These youth have a wide range of disabilities, but the severe cases are usually not accepted. Pupils are selected based on their needs and university requirements. The greatest number of participating students are simply very weak in math.

In the PSP program the university clinician is in

constant contact with the classroom teacher, though this is not required. There are no formal conferences scheduled with parents unless the need arises. In the UP program, the final session is a scheduled conference with the parents. The conference is centered around a final report prepared by the university clinician. This report includes certain background information, diagnostic and remedial procedures used, objectives covered (both cognitive and affective), major findings and recommendations. In both programs a summary of the final report is given to the parents and public school teacher and one is filed for clinic references.

There is no fee charged for any of the above services. State law in Florida forbids such a fee. The lack of a fee, however, has occasionally led to cases of inconsistent attendance on the part of youth in the UP program.

UNIVERSITY CLINIC FACILITIES

The PSP program utilizes the public school cafeteria. A different elementary school is used each year in order to spread the service throughout the school district.

The UP program utilizes a large banana shaped room which is adjacent to the round lecture room for the practicum. Many individually partitioned carrels are available. The parents wait in a lounge area on another floor where refreshments may be purchased from vending machines.

UNIVERSITY

Institution: West Virginia University-Morgantown, West Virginia

Enrollment: Undergraduate-Approximately 12,000; Graduate-Approximately 6,000.

SUPPORT PERSONNEL

Dean-Dr. William Monahan

Head, Department of Curriculum and Instruction-Dr. John Carline

Clinic Director/Teacher-Dr. Boyd D. Holtan

The clinic is a part of a course taught by Dr. Holtan. He receives no released time or extra finances for the added duties and responsibilities that accompany the clinic operation. The secretary assistance is from the normal secretarial pool. There is no relief from graduate assistants or teaching fellows. The staff responsibility is essentially the same here as for any other course.

HISTORICAL DEVELOPMENT

The idea for the clinic came from a project in the course, "Corrective Techniques in Mathematics Education", taught the Fall semester, 1972-1973. In that course, a student designed a plan for a clinic as a project. A study of a reading clinic in the College was also used as a source for ideas. The clinic director has done previous research in the areas of underachievers and general mathematics students which fit into this type of a plan.

The clinic started on a small scale with 10 children during the fall semester 1973-74.

UNIVERSITY STUDENTS

The university students working the clinic are working on the graduate level. The only mathematics or education courses that are prerequisites are those taken in the normal degree requirements. It would be possible for an undergraduate to enroll in the course with the instructor's consent. Other than the above, there is no special screen of univeristy students. Most of the people working in the clinic are experienced teachers. Those who are not have had contact hours with students through the normal laboratory requirements in their undergraduate programs.

CLINIC COURSES

The primary purpose of the clinic course is to train classroom teachers in techniques of diagnosis and remediation on a one-to-one basis. A secondary purpose is to provide a service to children that are weak in mathematics.

At present there is only one clinic course. This course is on the graduate level and meets the fall semester only. There are sixteen meetings during the course. The first two are to provide a background in diagnosis. The next two meetings are used in the initial diagnosis process. The remaining twelve meetings are concerned with remediation and parent conferences. The class meets for three hours each week. The first forty-five minutes is spent with

children. The remainder of the time is spent exploring new areas of concern, making teaching aids, planning the next lesson, and/or lecture and seminar.

A philosophy is established the first two meetings by reviewing A Guide to the Diagnostic Teaching of Arithmetic by Fredricka Reisman. Computation diagnosis is examined through use of Error Patterns in Computation by Ashlock. The diagnosis consists primarily of the survey and probes from the SRA Diagnostic Kit. Also, gaps are filled in by individually constructed measures.

Remediation takes into account the concrete, semi-concrete, abstract sequence. Several of the "things" used are commercial, while many are made. Remediation is not geared to any particular content taxonomy.

The course can be taken as an elective in the M.Ed. program for elementary teachers. Also, in the secondary classroom teacher M.Ed. program for mathematics teachers, it may be used as a math education elective. The class size is restricted to a maximum of fifteen.

PUPILS

Children in the clinic range in ages from eight to thirteen. They may or may not be weak on other school subjects, but are weak in math. The classroom teachers refer names to the clinic director as students who might use the services of the clinic. The clinic director writes a letter to the parents which explains the program.

Included in this letter are application forms. Children are selected from the list of those who apply based on age, need, and preference of the university student.

University clinicians hold two planned conferences with parents. The first conference is the first night. The final conference is held the last night of the course. There may be other conferences during the semester for individual cases, but these two are required. Tutors and parents often have telephone contact.

At the end of the semester, a final report is prepared by the university student. This report is the basis for the final conference. A copy is given to the parents, one is turned in to the clinic director and a third is retained by the student. There is no report sent to the elementary school where the child is a student. The school, however, can see a copy of the report with permission from the parent.

UNIVERSITY CLINIC FACILITIES

There is one classroom assigned for the course in the same building which houses the College of Human Resources and Education. Near the classroom is a study room which contains study carrels that may be used by tutors and children for individual conferences. In addition, some offices are nearby and they are also available for use. A mathematics education resource center is across the hall. The resource center stores manipulative materials and sample textbooks which may be used in remediation activities.

CHAPTER III

CLINIC DESIGN FOR

STEPHEN F. AUSTIN STATE UNIVERSITY

THE MATHEMATICS CLINIC

Historical Development

The writer first entertained the idea of a mathematics clinic in 1968. Dr. John Thornton had visited reading clinics across the United States and reported on a mathematics clinic at Syracuse University. As time went by, the need for specialized training of professionals was recognized to a greater extent. In the spring of 1973 it was decided that a mathematics clinic was one approach to solve the problems mentioned in the introduction.

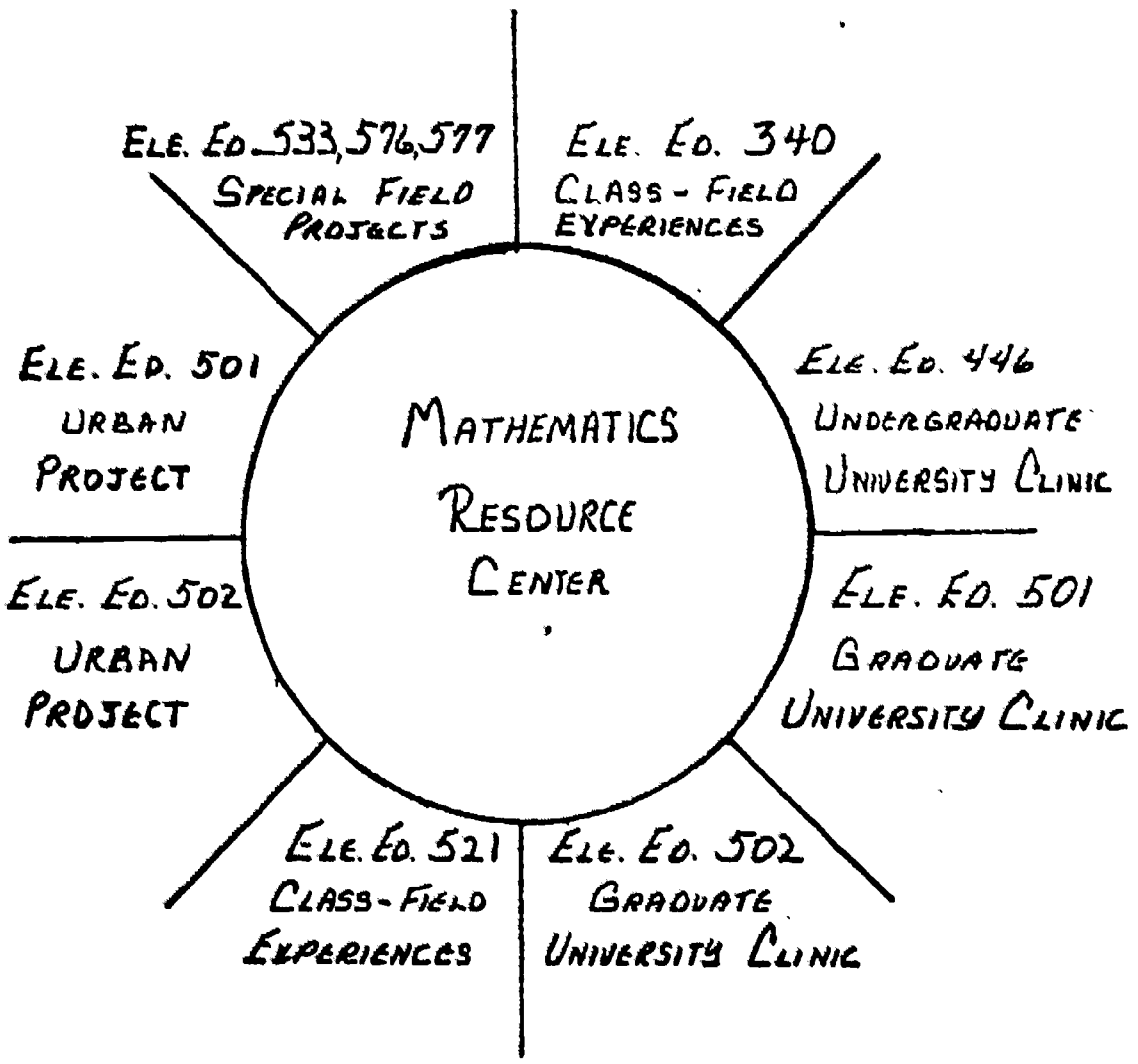
Prominent educators were selected to act as judges in recommending clinics to visit. The entire project became a part of a faculty research grant at Stephen F. Austin State University. The field study took place in the winter and spring of 1974. The report was completed in the summer of 1974.

Proposed Mathematics Education Program

The proposed Mathematics Education Program actually contains two parts. (See Figure II) The left half of the circle represents field services provided for in-service teachers. The right half of the circle represents university centered services for both pre-service and in-service teachers. There are eight courses in the program,

five of which already exist. The circle itself represents an extensive mathematics resource center to be developed from a proposed grant during the 1974-1975 school year.

FIGURE II



Elementary Education 340 is the required methods course for Elementary Education majors. This past year

one section of the course was field centered at the Rapid Advancement School in Nacogdoches. Arrangements have been completed so that all sections will be field centered beginning in September 1974.

Education 521 is the optional mathematics education course for the Masters Degree with a major in Elementary Education. In this course, a certain amount of basic research is required. Another main emphasis is materials, both teacher made and commercial. The course satisfies needs both at the university and in the field.

Education 533, 576 and 577 are professional development courses and are not specifically listed as math, reading, social studies, etc. These courses are generally used when a school district or the university has a special need or porject to be completed.

The clinic courses are 446, 501 and 502. All three courses are taught at the university. In addition, 501 and 502 are a part of the Urban Mathematics Project to be explained later.

A time frame for implementing the mathematics education program follows.

1. Elementary Education 340 (Field Experiences) Fall 1974
2. Elementary Education 446 Spring 1975
3. Elementary Education 521 Now Operational

4. Elementary Education 501 University Clinic Summer I 1975

5. Urban Mathematics Project, Elementary Education 501, 502 Summer II 1975

6. Special Field Projects, Elementary Education 533, 576, 577 As Requested

7. Mathematics Resource Center Spring 1975. Hopefully, a grant will be approved for some $5,000 to $7,000 for supplies and equipment to service the mathematics program. Other necessary items will be added as funds become abailable.

THE CLINIC

Support Personnel

Dean: Dr. Robert W. McKibben

Head, Department of Elementary Education: Dr. Thomas D. Franks

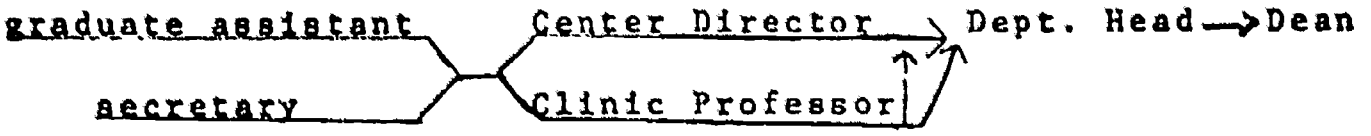
Director, The Learning Center: Dr. Beverly Young

Clinic Professor: Dr. Jerry Irons

The clinic functions as a part of The Learning Center and is directly supported by the three clinic courses. One course is offered each semester. Thus, the clinic is in operation the entire year. The only exception is the month the professor is engaged in the summer Urban Mathematics Project.

The Learning Center staff includes the director and a graduate assistant assigned some twenty hours per week. The secretarial pool of the Elementary Education Department is also available when needed.

The line of staff responsibility is



The clinic professor works with the center director on administrative matters concerning the center use. Curriculum affairs are handled directly with the department head.

Purposes of the Mathematics Clinic

1. The mathematics clinic serves as a training ground for pre-service and in-service teachers in techniques of diagnosis and remediation.

2. The mathematics clinic provides a service to students who have difficulty with mathematics.

3. The mathematics clinic elevates university relations with the general public.

4. The university mathematics clinic serves as a source for basic research.

University Students

Students enrolled in the clinic course 446 are working at the undergraduate level majoring in Elementary Education. Some have an area of specialization in mathematics, some are getting certification in special education while others are taking the course as an elective. The course is not required in any program but can count as an elective from

a group of courses in special education, and for reading specialists with majors in elementary education. The course is an elective for all others. All students have had at least three semester hours of mathematics and/or the mathematics methods course.

Students enrolled in the clinic courses 501 and 502 are graduate level students. The education and experience of the students varies. However, the approval of the instructor is the only prerequisite. The courses are an option in the Masters Degree with a major in Elementary Education, and also on the Educational Diagnostician Certificate. The courses are electives for all other students.

Clinic Courses

The undergraduate course basically serves the first three purposes listed earlier. The research purpose is limited to the graduate level courses.

The undergraduate clinic course is offered in both the fall and spring semesters. Each semester is approximately sixteen weeks in length. Attention the first six weeks is focused on the university students preparation for the practicum. The subject matter includes study of learning theory, learning problems and their implications, diagnostic instruments and procedures, analyzing pre-

requisite learning as applied to available models, and remediation materials and procedures.

The practicum is the next nine weeks. The school pupils report to the clinic Monday thru Thursday for one hour (three till four o'clock) each day. Clinic faculty (students and professor) meetings are held once each week at the regular class time. No class or clinic sessions are held on Friday. The plan allows thirty-six hours practicum. The last week of the semester is used to complete records and make reports.

Two texts are used. They are A Guide to Diagnostic Teaching of Arithmetic by Fredrick K. Reisman and Error Patterns in Computation by Robert Ashlock. Three content taxonomies by Jim Heddens, Robert Underhill and John Wilson are also studied along with several periodicals.

Diagnosis includes a student constructed survey test followed by student constructed probes. Should it be determined that the child has special problems requiring diagnosis, The Learning Center Director is contacted to furnish this service.

Remediation follows the concrete, semi-concrete, abstract sequence. Materials are either made or obtained from the extensive resource center in the same building as the clinic. The graduate clinic course 501 is offered

in the first summer term with approximately the same class-practicum ratio time allotment as Elementary Education 446. Essentially the same content is studied in 501 as the undergraduate course. In addition, the graduate class will utilize the Functional Analysis of Classroom Tasks developed by A. E. Uprichard. Plans call for the 502 course to be used mainly as a part of the Urban Mathematics Project.

Stephen F. Austin State University is located in rural East Texas. In an effort to have an impact on a larger number of people, the Urban Mathematics Project was conceived. This project will operate in the urban centers in Texas when there is a demand.

The project will last one month (twenty class days) in either June or July. The project will consist of six graduate hours (501 and 502). Class size will be limited to twenty students with each student enrolled in both courses. Some one hundred school children will also be involved.

The plan is to have a large remedial mathematics school for children who are weak in that subject. The first week university students will be concerned with principles and strategies of diagnosis and remediation. Children will report by appointment during the second

week for diagnosis.

Instruction will begin the fourth day of the second week. The children are taught in groups of from three to six for a two hour period each morning. The session is in three parts. The first forty-five minutes is personalized instruction. The second forty-five minutes includes break, play and outdoor application of mathematics. The last thirty minutes is personalized instruction. All work is in groups (3-6) but the children are not taught as a group except in the outdoor class and other occasions where their needs dictate.

The two hour afternoon session includes seminars, lectures, record keeping and preparation for the following day. In all, this makes a four hour day for a four week period. The last two days are used for synoposis, reports and parent conferences. The schedule will vary slightly with each urban center.

Pupils

Pupils enrolled in the mathematics clinic range in age from eight to fourteen. They may or may not be weak in other school subjects but are weak in math.

In order to enroll in the clinic, parents of potential clients must contact the university professor. This is usually done through The Learning Center. Parents complete forms and are given a list of policies. Names of the

children are then placed on a waiting list. The parents are contacted by the university professor as a spot becomes available.

University students hold two planned conferences with parents. The first is immediately after diagnosis. The second is the last week of the course. Other meetings may occur if needed.

A final report is completed in triplicate by the university student. One is for the university professor who retains it in the childs folder. A second is for the parents. The third will be submitted to any institution of the parents choice.

The pupil fee is $15.00 which is the same as the fee in the reading clinic. It is payable before the final meeting. (Many parents are poor, have two children in attendance and must pay by the month. This has not been a problem in The Learning Center.) Students accepted by the clinic can remain in the clinic from one semester to the next provided they have not reached grade level performance. When a student reaches grade level performance he is dismissed from the clinic.

University Clinic Facilities

The university mathematics clinic is housed in The Learning Center. This complex includes twelve individual study rooms, a library, a reception area, two offices, a

storage room and two classrooms. The Mathematics Resourse Center is also available in the same building but on another floor. All these facilities are in the new education building which was first occupied in September 1974. The Learning Center services the reading clinic, the mathematics clinic and the developmental reading program for university students.