ABSTRACT

AN INVESTIGATION OF THE COMPOSITION, ESTABLISHMENT, TRANSACTIONS, AND OUTCOMES OF A COMPETENCY DEVELOPMENT TEAM

By

Joyce Hemmingsen Putnam

The problem focus of this investigation is related to the lack of information on recommended developmental procedures for competency performance-based teacher education. Competency performance-based program developers, aware that there are neither specified teacher behaviors nor measures available, find that there is a lack of related information on recommended developmental procedures. There is a general absence of information about such issues as (1) how decisions or valid performances are made, (2) how the identified teacher behaviors can be incorporated into practical and accurate measures, and (3) approximately how much time it takes to identify behaviors and develop related measurement instruments.

In order for competency-based teacher education programs to move beyond the "good-in-theory" stage, program developers obviously need valid and reliable measures of teacher behavior; but before such measures can be constructed, they need to know more about the organizational procedures and decision processes of development that must

naturally precede construction of such instruments. It is to this lack of information problem and the concomitant need for direction on developmental procedures that this investigation is directed.

It must be noted, however, that the investigation reported is but one part of a comprehensive research and developmental effort presently underway in the School of Teacher Education at Michigan State University.

In an effort to lend assistance to the development and advancement of competency-based teacher education programs, the specific objectives of this investigation are to describe:

1. the composition of a developmental team charged with the task of identifying and defining "competency" for the mathematics teaching area;
2. the procedures and transactions actually used by this competency development team; and
3. the outcomes of the team's collaborative design efforts.

Realization of these objectives is meant to provide a systematic record of the set of activities engaged in by one developmental team, working to define and refine "competency" in the area of mathematics teaching with elementary school children.

Due to the exploratory nature of this study, the method of investigation selected was that of participant observation. The role in which this investigator acted as a participant was that of a member of the MSU Mathematics Competency Development Team. As a team member, this researcher attended all team meetings, participating in the discussions and developmental tasks. In the role of a team member, this researcher also shared in the work and responsibilities associated with a competency development team. In the role of a researcher this writer attended all team meetings, subteam developmental sessions, recorded her observations, later classifying and verifying her notes through informal and formal interviews. In addition, two opinionaires and a survey instrument were developed and administered in an effort to collect information relative to the team's composition.

The major findings relative to the team's composition indicated an apparent importance of a balance between common and diverse background experiences among team members, a willingness to explore the concept of competency-based teacher education programs, and a tendency to view self and others as positive and non-threatening. One observation that appeared important relative to the team's establishment was the lack of imposed deadlines for initial developmental tasks. Another primary observation relative to the team's establishment was that the questioning and communication skills of the team's initial discussion leader appeared to contribute to the developmental procedures eventually engaged in by the team. Relative to the team's transactions and outcomes the major findings included the team's use of consensus decisions, the team members sharing of the developmental leadership roles, and the team's ability to continue to review and up-date decisions and materials. Finally, relative to the team's transactions and outcomes the team found that it was helpful to organize their development around the following five major steps: (1) Identify the behavioral outcomes for learners (children) in terms of specific modular knowledge/skill units. (2) Identify if the teacher trainee has acquired the desired knowledge/skill him or herself. (3) Identify if the teacher trainee can apply the knowledge and/or skill in problem solving. (4) Identify what a teacher needs to know in order to do what is necessary to bring about the desired behaviors in learners. (5) Identify what a teacher needs to do in order to bring about desired behaviors in learners. While the team found that it was essential to begin with Step 1, after that, they could work on any or all of the ensuing Steps in any order. Each of the five steps had to be completed, however, before any unit could be considered "developed."

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Jim, Bill, Judy and Perry

who each in their own special
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Problem Statement

The problem focus of this investigation is related to the lack of information on recommended developmental procedures for competency/performance-based teacher education. Programs in teacher education are being modified at a rapid pace from a traditional "course-passing" approach with its emphasis on knowledge acquisition, to a "teaching behavior mastery" approach which emphasizes the demonstration of desired teaching performance. Competency/performance-based program developers, aware that there are neither specified teacher behaviors nor measures available, also find that there is a lack of related information on recommended developmental procedures. There is a general absence of information about such issues as (1) how decisions on valid performances are made, (2) how the identified teacher behaviors can be incorporated into practical and accurate measures, and (3) approximately how much time it takes to identify behaviors and develop related measurement instruments.

In order for competency-based teacher education programs to move beyond the "good-in-theory" stage, program developers obviously need valid and reliable measures of teacher behavior; but before such measures can be constructed, they need to know more about the organizational procedures and decision processes of development that must naturally precede construction of such instruments. It is to this lack of information problem and the concomitant need for direction on developmental procedures that this investigation is directed.

It must be noted, however, that the investigation reported herein is but one part of a comprehensive research and developmental effort presently underway in the School of Teacher Education at Michigan State University. This writer is in agreement with Bruce Biddle's (1964) observation, "It seems likely that little of significance will come from dissertation research unless the dissertations are embedded in broad programs [p. 37]." This is clearly the case for this effort. Numerous references will, therefore, be made to the Experimental Competency-Based Elementary Teacher Education Program under development at Michigan State University (MSU).

Discussion of the Problem

One needs only to review current publication titles, program agendas of various national association meetings, and published bibliographies to see that competency/performance-based teacher education is a concept being explored by numerous educators. It is apparent that educators are indeed curious as well as eager to discuss and debate the topic. Examination of the numerous discussions and debates at this time reveals wide disparity of opinion, however, about what competency/performance-based teacher education is, what constitutes a competency/performance-based teacher education program, and how one goes about "getting there" (wherever "there" is).

The confusion surrounding the numerous issues is illustrated by the fact that an individual trying to determine what is meant by the abundant terminology finds a variety of definitions and explanations. Cooper et al. (1972) states that:

> Competency-based teacher education programs have been viewed as programs in which the competencies to be demonstrated by the students and the criteria to be applied in assessing the competencies of the students are made explicit and the students are held accountable for meeting those criteria. Further, the competencies specified are those particular understandings, skills, behaviors, and attitudes believed to facilitate the intellectual, social, emotional, and physical growth of children [p. 3].

Cooper makes clear that the specified competencies must be related to the growth of children.

Houston (1972), on the other hand, asserts that the following two characteristics are the only essential points in the concept of competency/performance-based teacher education: (1) Precise objectives, defined in behavioral and assessable terms, which are known to the learner and teacher alike; and (2) Accountability, where the learner knows that he is expected to demonstrate the specified competencies to the level required and in the manner agreed upon.

Clarke (1971) suggests a very general definition when he states that performance criteria are used to denote end products of instruction that are in the form of distinguishable elements of teaching behavior.

Schalock (1971) contends that competency/performance-based certification now includes the following three classes of criteria:

(a) Knowledge Criteria, a more stringent criteria for knowing than course grades; (b) Skill Criteria, the performance of specified teaching or teaching related behaviors; and/or (c) Competence Criteria, the demonstrated ability of a prospective teacher to bring about desired instructional outcomes, that is, desired outcomes in pupils, or desired noninstructional outcomes, for example, the ability to design and carry out a curriculum evaluation study.

Elam (1971) lends some assistance in determining the stance that educators presently hold in relation to the concept of competency/performance-based teacher education when he points out that,

> There now appears to be general agreement (with American Association of Colleges of Teacher Education definition) that a teacher education program is performance-based if:
> 1. Competencies (knowledge, skills, behaviors) to be demonstrated by the student are (a) derived from explicit conceptions of teacher roles, (b) stated so as to make possible assessment of a student's behavior in relation to specific competencies, and (c) made public in advance;
> 2. Criteria to be employed in assessing competencies are (a) based upon, and in harmony with, specified competencies, (b) explicit in stating expected levels of mastery under specified conditions, and (c) made public in advance;
> 3. Assessment of the student's competency (a) uses his performance as the primary source of evidence, (b) takes into account evidence of the student's knowledge relevant to planning for, analyzing, interpreting, or evaluating situations or behavior, and (c) strives for objectivity;
> 4. The student's rate of progress through the program is determined by demonstrated competency rather than by time or course completion;
> 5. The instructional program is intended to facilitate the development and evaluation of the student's achievement of competencies specified [pp. 7-8].

In Competency/Performance-Based Teacher Education: A Paper for Discussion, Henderson and Lanier (1972) found, after reviewing numerous definitions and descriptions of competency/performance-based programs, that there was some agreement, though little, and that the source of disagreement across definitions could be identified.

> Professional agreement across definitions appears to exist on (1) commitment to the use of public behavioral objectives in specifying evaluative criteria and (2) in applying a mastery model for evaluation. The disagreement across definitions is primarily on the issue of performance criteria. Some definitions make no reference to what is or is not essential criteria. Still others imply that knowledge criteria is adequate, so long as it is explicitly stated and derived from teacher roles. Others say teacher behavior, i.e., performance criteria is also needed either by itself or in place of knowledge criteria. Still other definitions include product or consequence criteria, which are used to assess the prospective teacher's effectiveness in terms of pupil growth. Beyond these agreements and disagreements, there is no consensus; in fact, surprisingly little discussion and direction on decisions relative to the nature of the competencies themselves, e.g., what criteria should be used for competency identification and/or how they should be evaluated [pp. 3-4].

Henderson and Lanier (1972) view a competency/performance-based teacher education program as "any training program that requires its trainees to demonstrate at a specified level of mastery, behaviors that have been explicitly described and prescribed as desirable and effective professional behaviors." A major distinction between the operationalized definitions posited by Henderson and Lanier, Cooper (1972), Schalock (1971) and other definitions, e.g., Houston (1971) and Elam (1971) which remain general in nature, is the inherent need for the description of (1) specific and desirable pupil outcomes, (2) the effective teacher behaviors needed to bring about the desired pupil outcomes and (3) the knowledge needed to bring about the recommended professional behaviors. That is to say, the essential conditions for an "authentic" (Competency-Based Teacher Education, CBTE) program include not only behavioral objectives and a mastery evaluation model, but also that the nature and scope of the objectives to be evaluated include product, performance and knowledge objectives. Henderson and Lanier (1972) place an additional restriction on the essential conditions and further require that the performance and knowledge objectives be derived from the product objectives. While few teacher educators have as yet supported this last key attribute recommended by Henderson and Lanier, it is increasingly apparent that along with objectives and a mastery evaluation model, more and more definitions of competency/performance-based teacher education, are including in their criteria, knowledge, performance and product objectives.

The strong implication this move carries is, that if teachers-in-training are to be held accountable for criteria relating to specific pupil outcomes, as well as teacher behaviors and knowledge, then numerous controversial questions must be answered about "effectiveness" decisions relative to these bases. Some of the "nitty-gritty" questions that must be dealt with have been described by Schalock (1971). They include such questions as,

1. What classes of teaching behavior are prospective teachers to be able to demonstrate? And who is to determine what these classes of behaviors are to be?
2. What are the pupil outcomes to be realized? What are the non-instructional outcomes to be realized?
3. What will the "effective performance of specified teaching behaviors" look like? That is, what will the criteria be for the successful performance of a given teaching behavior? Who will determine these criteria? How will a behavior be assessed to determine if it meets these criteria? Who will be assessing?
4. In what settings will the behavior be demonstrated? With small groups or whole classrooms of children?
5. What variation in the performance of a given teaching behavior or in the selection of teaching behaviors to be demonstrated is acceptable for students? Are all students in a given program expected to perform to the same criterion level on the same set of teaching behaviors? If not, who is to determine what variance is acceptable [pp. 46-47].

Educators across the nation, at conference after conference, ask for answers. Books and pamphlets cite the issues and questions, but refrain from laying out specifically recommended answers. General suggestions abound, such as "No one person should decide." "Teacher Educators should not assume the sole responsibility." "Consortium approaches should be developed." "Parity relationships with school personnel and community persons must be established." But these sorts of responses only leave further questions. One naturally asks, for example, "Who should comprise the consortium?" and "What does 'parity' really mean?" <u>Pleas</u> for answers far exceed <u>suggested</u> answers.

Most teacher educators proceed with the business of developing Competency-Based Teacher Training Programs. They identify and list hundreds and thousands of "needed" teacher behaviors but with only vague descriptions of their rationale and/or the procedures they used to identify them. That is to say, their "basis for judgment" remains unclear.

This writer was involved in the development of one of the early attempts made to change teacher training in this direction. Working on the United States Office of Education funded project to design a "model" elementary teacher education program, the staff of the Michigan State University project developed 2,700 modules that contained behavioral objectives for teachers-in-training. Perhaps because of time limitations imposed on the developers of "BSTEP" (Behavioral Science Teacher Education Program) and the other federally funded models, pupil outcomes were not dealt with in a systematic fashion as they related to specific teacher knowledge and behaviors.

This is not only inherent with Michigan State's program but is true of most other programs. Smith (1971) states:

> Although hundreds of teacher performance criteria are specified in the U.S. Office of Education's Model Teacher Education Programs, the programs do not describe how these particular criteria were chosen. None of the proposals contains a detailed review of the literature upon which the model builders based their decisions [p. 39].

It has thus been disappointing to note that little change in this "vague" state of affairs has apparently occurred at this time. The continued lack of clarity and specification of goals or objectives for pupil outcomes is confirmed by Schalock (1972):

> A number of problems are inherent in implementing an output referenced personnel development program. The most obvious one has already been alluded to, namely, the necessity of being clear about the educational outcomes that we want from our schools, the difficulty in measuring such outcomes, and the fact that the discipline is not at all clear as to the factors that contribute to the development of particular learning outcomes in particular kinds of children. <u>Without clarity about such matters it obviously will be difficult to implement such a program.</u> On the other hand, it is precisely these matters that education must be clear about. Adopting a stance in teacher education that forces the discipline and the profession to confront its weaknesses in this regard would seem to be a reasonably good strategy for eliciting movement within the profession as a whole. It goes without saying that the teacher education programs so designed would be at best a bit "rickety" until the conceptual, methodological and empirical base needed to support them has been established [p. 120]. (Emphasis added.)

Schalock's prognosis appears to have been on target. At the present time, "rickety" conceptual, methodological, and empirical bases abound. And while Schalock may have been right in that they are apparently no "less productive," one wonders if they are any "<u>more</u> productive."

Lanier and Henderson (1973), in a comprehensive review of the present content and process status of teacher education conclude:

. . . there have been few significant innovations in the past generation--despite the new terminology "evidence" to the contrary. . . . Thus, following a rather extensive examination of existing and emerging program developments, we bring to this review very deep concerns regarding the rate and scope of qualitative direction being taken by teacher educators [p. 2].

Similarly, Jones (1972) notes some of the explicit problems characteristic of the recent "competency movement."

Many of the existing developmental efforts toward change have been piecemeal and isolated. To implement portions of programs along competency-based guidelines, individual teacher-education professors have identified the behaviors that they wished their students to demonstrate at the end of a course. Competency-based courses then were developed through modification of objectives (to behavioral standards) or through modification of instructional procedures, or through both.

Competency-based programs typically began in this fashion at institutions where such programs now exist. In some cases there may have been a push from outside influences--administrative approval, seed money, released time, etc.--but the initial surge came from the faculty. This involvement is critical; a key ingredient in any process of educational implementation is the participation in its definition by the persons whom the change will impact.

The real strength of the competency-based effort, however, lies in its emphasis on total programs. Course-by-course-development results in a program of uneven quality. Graduates of a teacher-education program usually can identify some courses that have had the most impact on their effectiveness. However, even if all courses in the program were effective, there still would be gaps and overlaps among courses. Unfortunately, there have been few systematic attempts to alleviate discontinuity among courses in most teacher-education programs. Few teacher educators have attempted to view the totality, the gestalt, of teacher-education programs. The search for this totality is the heart of the competency-based movement. The movement toward competency-based ideas often loses its effect because of half-way measures--a single course, poorly integrated instructional materials, etc. Although some have described partial programs as "competency-based," they are dealing, in fact, with answers that are not solutions to the real problem--revitalization of teacher education through effective total-program development [pp. 103-4]. (Emphasis added.)

In the College of Education at Michigan State University, however, a group of teacher educators have undertaken the task of developing a "total" competency-based teacher education program of the sort that

Jones describes. In concert with Jones' opinion that "course-by-course development results in a program of uneven quality" and believing that questions of the sort raised by Schalock must be tentatively answered, a number of teacher educators concerned with the improvement of training programs for elementary teachers has begun the needed design and development activities.

The conceptual basis of the program has been described by Lanier and Henderson (1973). The conceptual framework they have described guides the developmental activities and requires the integration of the basic, applied and clinical aspects of all subject matter areas. Thus, the development of the mathematics "competency area" brings together educators from the basic math instruction (instructors of a course referred to as Math 201), the math methods instruction (instructors of a course referred to as ED 325E) the psychological foundations instruction (instructors of a course referred to as ED 200) and the practice teaching component (instructors of a course referred to as ED 436). These persons are charged with the collaborative design and development of the new competency based instruction for the mathematics competency area. Educators from other competency areas, e.g., reading, social-emotional education, science, language arts, social studies, etc., follow a similar organizational plan, with instructors from the basic, applied and clinical units coming together as a team to plan their portion of the total instructional program.

To allow for articulation of all areas within the total program, each team subscribes to a common teaching-process model.

The purpose of holding the teaching model constant across teams is to reduce the conflicting and/or contradictory prescriptions made for the teachers in training. With the common teaching model approach, the teacher educators hope to increase transfer; they hypothesize that by recommending a teaching process that is reinforced with continuous practice in a variety of contexts and situations their instruction will be more powerful in terms of retention and application. The problem that the developmental personnel faces, however, is that there is a dearth of data available that would provide direction relative to the optimal nature and procedural aspects of the tasks they need to perform. Persons asked to serve on these teams wonder about such things as: "What is the nature of the task?" "How much time will it take?" "How will we ever reach agreement when we all think so differently?" "Will we have to compromise our beliefs and values about teaching?" "What questions should we tackle first?"

Many questions stem from the new developmental and instructional procedures that must be employed, but nowhere are there specific and/or explicit answers to be found. The amount of general advice and inspiration has increased in the literature in the past year, however. Schein (1972) describes what is needed as it relates to the collaboration concept.

> . . . a professional school organized around modules which integrate basic, applied and skill components; run by an innovative . . . faculty who are expert in learning theory, teamwork, and interpersonal skills; administered flexibly with heavy involvement from students, faculty, and future employers; constantly evaluating itself, its output, and the effectiveness of the profession itself through perpetual self-diagnosis and evaluation [p. 149].

Schein (1972) also describes some of the characteristics needed by persons serving on development teams. He says that:

> . . . The kind of faculty needed . . . will be learning-centered and knowledgeable about learning principles, capable of working in team settings, interpersonally competent and positive toward people, concerned about the career development of students, and role-innovative [p. 143].

This type of general description (e.g., that provided by Schein) of the organization needed and important characteristics of those persons who will be involved is typical of the descriptive and/or prescriptive information presently available to program developers. Program developers, therefore, have been and are still forced to work in a "trial and error" manner.

Purpose. The purpose of this thesis is to begin the modification of this state of affairs by making available a description of the activities (problems and procedures) and learnings (tentative solutions and recommendations) of the developmental team for one competency area. This study represents, therefore, an effort to provide needed descriptive data relative to how educators might proceed in a collaborative manner to establish a competency-based program. The descriptive data collected will hopefully help other educators involved in the process of establishing and developing competency programs in teacher education, as well as the participants engaged in this developmental effort who will have a descriptive record of their "trials and errors" (and success) so that improvement and refinement of their procedures might be facilitated. In addition, it is hoped that this study will demonstrate a method of inquiry appropriate for the exploratory type of research needed for furthering competency-based program development.

Objectives. In an effort to lend assistance to the development and advancement of competency/performance-based teacher education programs, the specific objectives of this investigation are to describe:

(1) the composition of a developmental team charged with the task of identifying "competency" for the mathematics teaching area.

(2) the procedures and transactions actually used by this competency development team, and

(3) the outcomes of the team's collaborative design efforts.

Realization of these objectives is meant to provide a systematic record of the set of activities engaged in by one developmental team, working to define and refine "competence" in the area of mathematics teaching with elementary school children.

Procedures. Due to the exploratory nature of this study, the method of investigation selected was that of participant observation. The appropriateness of this identified method for gathering data helpful for diminishing the problem is discussed in Chapter II.

The role in which this investigator acted as a participant was that of a member of the MSU Mathematics Competency Development Team. As a team member, this researcher attended all team meetings, participating in the discussions and developmental tasks. In the role of a team member, this researcher generally shared in the work and responsibilities associated with a competency development team. A detailed description of these procedures is included in Chapter III.

The results of the participant observation activities that were employed are described in Chapter IV and their implications discussed in Chapter V.

CHAPTER II

REVIEW OF RELATED LITERATURE

The literature review contained in this chapter is organized into two major sections: the first section presents the literature relevant to the competency-based teacher education movement and the second section presents the literature pursuant to the mode of inquiry used in this investigation, i.e., participant observation.

Section I: Competency/Performance-Based Teacher Education

Introduction

With the advent of increased concern for educational accountability, both in the certification and preparation of teachers, there is a concomitant increased concern for redesigning teacher education programs. Schalock (1971) describes the existing basis for certification as it relates to teacher preparation and notes some of the weaknesses:

> For several decades the primary basis for teacher certification has been a given grade point average for a given number of courses in given areas of study, coupled with a recommendation from a recognized teacher education institution that a particular student is "qualified to teach." Operationally such criteria for certification require that a student demonstrate that he knows enough in various courses that he can pass them with a grade of "C" or better;

> that he is able to apply that which he knows at some minimal level as a "student teacher"; and that he is physically, mentally, morally, ethically, and attitudinally acceptable as a member of the teaching profession. The judgment is by representatives from the faculty of the college at which he is matriculating and by the supervisor of this student teaching experience.
>
> Generally speaking that basic assumption underlying such an approach to certification is that knowledge of subject matter, teaching methods, children's learning, and so forth--as measured by course grades--is a basic predictor of teaching capability. Such knowledge is coupled with a brief testing of the ability to apply what is known in a student teaching situation and a subjective judgment as to the acceptability of a particular student to the teaching profession. The reverse assumption is also applied; there is no need to systematically gather evidence as to the ability of a prospective teacher to behave in specified ways, or of his ability to carry out the functions for which he will be responsible within a school once he is certified [p. 43].

The weaknesses in preparation and certification logic that Schalock describes have been similarly noted by state legislators and state boards of education. A number of states have already "legislated" moves toward accountability by ruling to the effect, that certification be based on teaching performance criteria rather than knowledge criteria. As in most states, Michigan's State Board of Education is presently wrestling with the inherent weaknesses of existing certification codes and preparation programs. Dr. John Porter (1971), Michigan's State Superintendent, describes the present situation as he works to improve the delivery of educational services to the children and youth of the state.

> To some, consideration of an accountability model or new elements in education has appeared to represent a threat or a challenge to historically developed educational approaches, and a judgment as to the efficacy of such approaches at this point in time. No threat is intended, but each of us must find challenge in consideration of the new educational elements, and there must be general recognition that whatever its

> strengths and weaknesses, the historically developed system of educational services does not today serve effectively all of the children and youth entrusted to our care [pp. 2-3].

Even the National Education Association (1971), the teachers' union that maintains a conservative stand on most issues which imply that demands might be placed on teachers at any level, recognizes the inevitability of the approaching accountability moves. Even while trying to "dodge" the issue, they begin to "face it."

> The NEA recognizes that the term "accountability" as applied to public education is subject to varied interpretations. The Association maintains that educational excellence for each child is the objective of the education system. The Association believes that educators can be accountable only to the degree that they share responsibility in educational decision-making and to the degree that other parties who share this responsibility--school boards, parents, and taxpayers--are also held accountable [p. 776].

Thus, the increased demands and pressures for accountability forces teacher educators to re-examine their preparation programs. The major consequence of the re-look that teacher educators have been taking is an increased interest in and support for the development of performance/competency-based teacher education programs. It behooves us, therefore, to examine in detail the nature of this movement and the implications it has for the activities of teacher educators.

Characteristics of Competency-Based Teacher Education

As noted in Chapter I, many of the characteristics of competency-based teacher education are both vague and controversial, due to the relatively recent emergence of the concept.

Howsam et al. (1972), suggests that "the concept of competency-based instruction has emerged from the emphases on goal-orientation and individualization [p. 3]." Howsam et al. (1972), asserts that:

> Learning goals or objectives can be made explicit by and for the learner. The individual then can pursue learning activities and can develop performance skills or competencies in the process. When this approach is coupled with an appropriate management and delivery system, the accountability principle can be applied to all aspects of the instructional program [p. 3].

"Standard dictionaries provide no definition for competency-based," since it " . . . is a coined word of recent origin. The word competency has been chosen to indicate an emphasis on the 'ability to do,' in contrast to the more traditional emphasis on the 'ability to demonstrate knowledge [Howsam et al., 1972, p. 3].'"

> The term competency-based has become a special designation for an educational approach, for a movement. The term cannot be defined in a simple phrase; its meaning emerges from the compiles of characteristics of this educational mode . . .
>
> Two characteristics are essential to the concept of competency-based instruction. First, precise learning objectives--defined in behavioral and assessable terms--must be known to learner and teacher alike . . .
>
> The second essential characteristic is accountability. The learner knows that he is expected to demonstrate the specified competencies to the required level and in the agreed-upon manner. He accepts responsibility and expects to be held accountable for meeting the established criteria.
>
> A third characteristic, that of personalization, is of a somewhat different order from the previous two. It is associated almost universally with competency-based instruction, but it is not necessarily a distinguishing characteristic when comparing this with other programmatic thrusts. Competency-based programs characteristically are individualized; they are self-paced, and thus time is a variable. They are personalized as well; each student has some choice in the selection of objectives and of learning activities . . . Group and even mass instructional processes are viable alternatives; in some cases, they may be the most effective and efficient options.

> . . . This approach is criterion referenced, in contrast to norm-referenced approach that has been emphasized throughout much of our educational history . . .
>
> . . . The emphasis shifts from the teacher and the teaching process to the learner and the learning process . . . [Howsam et al., 1972, pp. 3-5].

The responsibilities of faculty and students involved in competency-based teacher training programs are described by Schalock (1972) as follows:

> Persons responsible for preparatory programs must make explicit that which graduates of their programs will be able to accomplish in the schools; they must make explicit the indicators they will accept as evidence of such accomplishments; and they devise a program that insures the majority of students in it are able to develop to the point where they are able to realize such accomplishment. They must also make explicit the kind of systematic linkage called for . . . between the expected outputs of their program and the personal needs of schools, and these in turn to the outcomes expected in schools. Students who wish to become certified must show that they can "put it all together." . . . Performance based certification at the output level requires that they know what it is that they wish to accomplish with the children they wish to work with, and that they can in fact accomplish those things with at least the majority of children with whom they do work . . . [p. 132].

General characteristics concerning competency teacher education can be seen in the following statement by Howsam (1972).

> As in all professions, this preparation involves on the one hand the acquisition of knowledge and the ability to apply it, and on the other the development of the needed repertoire of critical behaviors and skills. Insofar as they thus become the competency objectives for the teacher-education program. The criteria for performance are derived from these objectives [p. 6].

Concerning the development of objectives for a competency-based elementary mathematics teacher education program, Davis et al. (1972), states:

> The purpose of the Elementary Mathematics Teacher Education Project is to develop a "competency based" training program in mathematics for inservice and preservice elementary teachers.

> The program is "competency based" in that specific statements of the competencies needed by elementary schools teachers for the teaching of mathematics are formulated. These statements form the basis, and are the objectives, of the instructional materials which are developed and implemented [p. 29]. (Emphasis added.)

Cooper et al. (1972), indicates that "once the role of the teacher has been conceptualized, it is possible to generate statements of teaching competencies from the conceptualized role. He points out that teaching competencies can be derived from the following three bases: (1) Empirical Base, (2) Subject Matter Base, and (3) Practitioner Base [pp. 3-6]." In addition, Cooper et al. (1972), says:

> While teaching competencies can be and should be generated from empirical, subject matter, and practitioner bases, they must be screened through a philosophical base and the conceptualized model of the teacher's role. Unless proposed competencies are compatible with the conceptualized role of the teacher, they should not be included in the program [p. 7].

Lanier and Henderson (1973) agree with Cooper that a common philosophical base is needed. In addition, however, they argue that teaching competencies must not be derived separately from different bases, but must bring together the subject matter, methodology and practice orientations. They consistently argue for bringing together the basic, applied and clinical instruction by unifying them in all modules in each competency area.

In spite of the many unresolved issues and numerous differences in beliefs about how competency-based programs should be developed and implemented, however, the movement receives continued support.

Smith (1972) comments on the optimistic and encouraging ideas contained in the notions of competency-based programs.

> Discussion has ranged far and wide in education circles for the past several years about the need for a performance base in teacher education and certification. Everyone is for it in theory. It is an innovative response in a critical area that is very much in need of innovation. In theory, performance-based training provides a way for prospective teachers to build on their individual skills and interests. It implies an open-ended education with freedom to move, to develop an individual teaching style and individual competencies. It suggests that preparation to be a teacher is an exciting and rewarding experience, one that will lead to lifelong intellectual curiosity and growth; the effective teacher never stops learning. The competency-based approach assumes that such advantages in the teacher's own preparation will enable him as a graduate to enter the classroom and pass on these advantages to the next generation of youngsters.
>
> Moreover, preparation, evaluation and certification of teachers so that they can be all but guaranteed to be more effective teachers of children is a direct response to the growing concern among parents, taxpayers, and minority spokesmen for accountability on the part of our education institutions.
>
> If we buy the argument that schools indeed are accountable for the educational attainment of students coming up through the system, then competency-based training and certification for the school staff is a logical starting point. In fact, it is *the* starting point [p. 172].

In spite of Smith's favorable overview of competency-based teacher education, however, one still must reckon with the many unresolved issues related to the development and implementation of these programs. Some of these issues will now be considered.

Central Issues Related to Competency-Based Programs

Even though the issues related to competency-based teacher education cover a wide spectrum, two major classifications seem to emerge. The first classification concerns those issues relative to the changing university faculty roles that appear to be necessitated by the movement. The second classification is organized around the developmental issues which must be dealt with as a consequence of the decision to develop a competency-based training program.

New Faculty Roles

The recent literature on competency-based teacher education is filled with references to the new roles and skills needed by staff who will work in such programs. In Professional Education, concerning new faculty roles, Schein (1972) indicates that:

> The state of ferment in the professions and in the education establishment makes this a good time to rethink education for the professions. It is increasingly obvious that the professional of the future must have a different set of skills, a different self-image, and a different set of attitudes from the professional of today . . . [p. 4].

Concerning changing professional education, Schein (1972) says:

> Professional education can be changed by a deliberate yet controlled process . . . The particular relevance of planned change derives from the fact that we are dealing with organizational change in a setting where there are strong forces opposing the change. We do not mean, however, that changes should be imposed on the professional schools. Our concept of planned change implies a heavy involvement of the organization in the planning of its own change programs.
>
> Planned change involves the learning of new concepts and ideas, new attitudes and values, and new patterns of behavior and skills. Part of any planned change model must therefore be a model of how individuals in a social system learn and thereby transform the social system. This learning has to occur in a situation in which, by virtue of their membership in the social system, individuals already have ways of thinking, feelings, and acting to which they are committed and which make sense to them. . . . the change agent must assume that the members of the system will be committed to their present ways of operating and will, therefore, resist learning something new. As a consequence, the essence of a planned change process is the unlearning of present ways of doing things [p. 4].

Discussing the change in faculty roles in The Individualized, Competency-based System of Teacher Education at Weber State College, Burke (1972) states:

Being transformed from the role of class leader and lecturer to that of advisor and consultant, the faculty members found a definite need for adjustment, but each seemed to fit quite readily into the new status. For some it was a pleasant change from the unwanted lecturer role; while others missed the spotlight as class leader. About double the time was scheduled for office consultation than was formerly scheduled for classes. Requests for students to check with faculty members for specific purposes were built into many of the modules. Also, students were constantly encouraged to seek the help of faculty members whenever needed. The faculty members directed the assessment of the student's progress, assisted the students with their own assessments, and checked out the students on completion of the modules [p. 14].

In "Redirections in The Education of Prospective Elementary Teachers," Gibb (1971) says concerning new faculty roles:

The interdisciplinary faculty team, the counselor, the flexible blocks of time and the close communication and cooperation with and continuous experiences in the schools combine to make the operational Personalized Teacher Education Program a rich, diverse, and profitable experience for students, university and school faculty alike [p. 8].

Bowles (1973) reports that at the University of Houston a proficiency-based program in mathematics teacher education is being developed "with a nucleus of knowledgeable young professors, . . . supplemented by senior members of the staff." Bowles also states:

The roster of graduate students may very well carry the names of individuals destined to make significant contributions to competency-based programs in the next decade. One cannot say that the students are clustered at the feet of the masters; hard-headed, hardworking action research and development team leaders, yes, but there are no masters of this approach. It is even conceivable that the master may learn from the student [p. 511].

Relative to changing faculty roles are Schein's (1972) comments concerning the contributions that the behavioral sciences have to offer a changing profession. He states:

. . . the behavioral sciences have made considerable advances in understanding the psychology and sociology of client systems, the processes by which learning and socialization take place,

> the theory and practice of planned change, the theory and practice of giving and receiving help, group dynamics, and leadership phenomena. All these areas are of increasing relevance to the professions [p. 4].

DeVault and Gilladay (1972) in their discussion related to faculty training submit that,

> New programs in new schools require new teachers. Both at the university level and in the schools, retraining is essential. . . . teachers will play roles either in addition to or completely other than those which are presently exhibited in the lecture halls and classrooms throughout the country. No reform in teacher education will succeed without a comparable reform in the faculty member's concept of his own role. . . . Not only must vigorous efforts be made to initiate the needed reform in faculty roles, both in the universities and in the schools; comparable study and effort must be made to assure that the nature of faculty roles for the future can be designed and redesigned as the nature of schooling takes on new dimensions reflecting the variety envisioned . . . [p. 55].

The following is an example of the type of problems which universities must face if new faculty roles related to competency-based teacher education are implemented. Burke (1972) says,

> One problem of concern was that of calculating and reporting faculty load under the new system. Some administrators hoped this would prove to be a way of operating with a higher student-faculty ratio. Others assumed more faculty members would be needed to do the same job . . . It appeared that the previous method of equating load on the basis of credit hours taught, would have to give way to a determination based on numbers of students served. . . . [p. 15]

If the development of a successful new professional education is to occur, issues will arise that are related to such questions as: What new skills and abilities do we need? What new organizational and reporting procedures will be needed? How do we bring about the changes? The Committee on National Program Priorities in Teacher Education (Rosner, 1972) recommends the following:

> The Committee on National Program Priorities in Teacher Education recommends a major test of the power of competency-based teacher education to improve the performance of educational personnel in the nation's schools [p. 24].

The committee feels that in order to implement the above recommendation, an integrated program development effort must be undertaken. The integrated program suggested by the committee (1972) includes:

> a) a committee for program planning and coordination;
> b) training laboratories for education personnel;
> c) instructional materials for concept and skill attainment;
> d) instruments to define competencies in actual classroom settings; and
> e) career development for master-level teacher and teacher trainers [Rosner, p. 24].

In conclusion, Schein (1972) asserts that "development of a genuinely different and more responsive professional education would require four major changes:

> (1) new kinds of learning modules built on better theories of how students learn; (2) new kinds of faculty members who bring different skills, attitudes, and values to their job; (3) new kinds of administrative structures and procedures that are more flexible and that adapt to the learning tasks to be met; and (4) perpetual self-diagnosis and evaluation research [p. 129].

The essential message one gleans from the literature related to new faculty roles is that many educators have noted the need, but few have described what they have actually done to meet these needs, as they go about developing and implementing their competency based teacher education programs.

Issues Related to New Developmental Concerns

The following subsection describes examples of the types of issues university faculties may have to resolve, if they decide to develop competency based teacher education programs.

Burke, Elam, and Smith discuss the area of humanism. Burke (1972), in "Curriculum Design," Competency-Based Teacher Education, states that "all of the issues raised at the conference seem to be grounded in one fundamental question: Is it morally right to change people?" He says,

> The participants seemed to be seeking a rationale for behavioral modification that would square with philosophical notions of individual freedom and integrity. Many questions revealed this basic concern: What safeguards can be built into competency-based programs for the preservation of humanistic values? Who is wise enough to program systematically the learning experiences of college students [pp. 41-42]?

Elam reports that:

> Among the more difficult questions asked about the viability of performance-based instruction as the basis for substantial change in teacher preparatory programs are these: What should the scope of the program be? Should it include the humanities and other portions of the academic program? Is the performance-based approach more applicable to certain components than to others? Will it tend to produce technicians, paraprofessionals, teacher aides, etc., rather than professionals? Does it deal only with instrumental values and not with consumatory values? (Some experiences are worthwhile in and of themselves.) [p. 748]

Smith (1972) points out that:

> Some observers view the accountability/teacher-competency movement as the enemy of another basic concern: the need to individualize and humanize instructional programs to accommodate the abilities and interests of each child [p. 173].

He feels that those with legitimate concerns that accountability is in conflict with humanistic and personalized education should be reassured. He states: "This critical issue must be put on the table for conflict resolution."

Bowles (1973) identifies the following questions as ones which module developers must face.

1. What behavior is truly terminal?
2. At what stage of development is the student motivated toward the terminal behavior with maximum consequence validity?
3. Do the learning modules exhibit consequence validity?
4. Can or should a module be developed that is teacher proof [p. 511]?

Howsam et al. (1972) assert that "a number of issues concerning objectives are of importance to those seeking to implement competency-based-teacher education programs. These issues involve questions such as the following:

> (1) Is it desirable to base a teacher-education program on objectives? (2) Is it possible to base a teacher-education program on objectives? (3) Who would make the decisions about the behaviors that teachers need? (4) What behaviors characterize effective teachers? (5) Should objectives of various teacher-education programs be standardized? (6) Should teachers be held accountable for meeting the behavioral criteria specified by objectives [p. 18]? (Emphasis added.)

During the development of competency programs many questions related to the area of specification of teacher behaviors arise.

Cooper et al. (1972) assert that one important question that many educational researchers insist can only be answered empirically is "What teaching behaviors are positively related to desired pupil outcomes?" If one attempts to specify teaching competencies from subject matter bases, Cooper et al., suggest that the following questions then arise.

> What knowledge and/or skills should be required as evidence of subject matter competency?
> Should these competencies reflect the current curriculum of the schools?
> Should subject matter competencies be specified for what is regarded as general education in the arts and sciences?
> If valid knowledge changes so rapidly, what subject matter competencies are more likely to stand the tests of time [pp. 5-6]?

Once behaviors have been identified then how to insure teacher performance becomes a problem. Related to assessment of mathematics teaching, McKillip et al. (1972) say "There is little agreement on techniques for the assessment of mathematics teaching methods or the criteria for acceptable practices." He adds,

> We recognize competencies in mathematics as necessary attributes of a good teacher and are aware of the literature demonstrating that elementary teachers are lacking in mathematics competencies. Many teachers also lack ability and knowledge of fundamental principles of teaching mathematics, and even where both knowledge of content and knowledge of methodology are present, they may not be evident in teachers' classroom behavior [p. 70]. (Emphasis added.)

McDonald (1972) speaks to the issue which arises once teacher performance of specified behaviors has occurred. Concerning teaching performance McDonald says,

> A teaching performance is a complex of knowledge and teaching skill, extending over time, involving many specific items of knowledge, and usually involving several specific skills . . . [p. 73]. (Emphasis added.)

McDonald (1972) assumes that " . . . there is a willingness to accept measurement as a necessary ingredient in scientific inquiry about teaching and to accept evaluation as requisite to the improvement of teacher education." He also notes, however:

> The current state of the art of measuring teaching behavior can only be described as dismal. . . . No testing program dominates the field of measuring teaching behavior. Many will not lament these omissions. Yet their absence is strong testimony to the lack of attention paid to quantitative description of one of the most important human activities.
>
> In other vocations, tests of mechanical ability or performance skills often are available. No comparable tests exist for the assessment of teaching skills.
>
> There are several reasons for this lack. First, the very concept of a "teaching skill" has been repugnant to teacher educators for a long time. They see teaching as an art in

> which the teacher fashions the teaching activity from moment to moment. Second, it is difficult to apply the concept of skill to teaching behavior. Teaching skill is not merely a psychomotor activity, nor is it a pattern of kinesthetic responses, nor is it a set of easily programmed behaviors. A teaching skill may have many components. Furthermore, the definition of teaching skills will be possible only when we have data indicating a well-defined set of students' responses that are elicited by each teacher behavior.
>
> Given these conceptual and empirical difficulties, it is not surprising that we lack measures of teaching skill [p. 73].

McDonald (1972) indicates that while the problems related to assessment of teaching behavior will be difficult to solve, " . . . they are not insolvable, if a national effort is mounted to seek the solutions." He further states:

> Unless such an effort is undertaken by many people, performance-based education is likely to flounder. The basic concepts of competency-based education are widely accepted today, and there is widespread interest in the changes needed to make teacher-education programs focus on the acquisition of teaching skill. It is obvious that we are at a critical point; interest and support will wane quickly if substantial progress is not made rapidly.
>
> . . . Progress is needed in gathering data on teaching performance, both of teacher trainees and of experienced teachers. Pilot assessment systems must be established as quickly as possible. Immediate, concrete steps must be taken to begin to measure teacher behavior.
>
> If these steps are taken now, the development of competency-based teacher-education programs will gain momentum and their future development can be assured. It is clear where we must begin and that we must begin now [p. 74].

Howsam et al. (1972), agreeing with McDonald that the problems are not insurmountable, state:

> A major current need is for a willingness on the part of many sources to provide adequate funds for curriculum development. Even more important is the need to recruit our best faculty and school personnel into the effort. The chief goal of the movement is not a collection of new institutions--although some may be required--but a cadre of new teachers, whose effectiveness with children will bring about the real educational revolution: the realization of the full learning potential of our school children [p. 55].

In addition, McDonald states that "competency-based education will succeed or fail to the degree that its effects can be determined and judged. This assertion is supported by straight forward logic." He emphasizes his point:

> There is more fundamental reason why it is necessary to demonstrate the effectiveness of competency-based programs. Such a program will be effective--as its advocates both know well and say--to the degree that its construction and operations are infused with the spirit of scientific inquiry. . . . The training program is designed to achieve . . . specific goals. Evaluation of the effects of the program obviously is necessary to determine whether the program has been designed properly, and whether the skills acquired by its graduates affect the learning of students in significant and desirable ways [p. 57].

Section II: Participant Observation Research

Introduction

This section of chapter two presents a review of literature pursuant to the mode of inquiry used in this investigation; i.e., participant observation. The literature reviewed here discusses the definition and appropriate application of the participant observation method.

> When we know where we are at present and where we wish to be, a third kind of knowledge is needed. This is concerned with how to get where we wish to be [Good and Scates, 1954, p. 256].

How does a researcher proceed to study something about which very little is known? Blalock (1970) suggests that "since the research cannot rely on specific hypotheses or a relatively small list of variables that are likely to be significant, it clearly must be highly exploratory."

Good and Scates (1954), in discussing the early stages of research in a given area, state:

> General description is characteristic of the early stage of work in an area where the significant factors have not been isolated, and where perhaps one would not have means for measuring them if they were identified [p. 258]. (Emphasis added.)

They also assert that "descriptive studies are of large value in providing facts on which professional judgments may be based." Similarly, they suggest that "description tells us what we reckon with" and can "help us in learning how to accomplish desired purposes."

Characteristics of descriptive investigation are identified by Good and Scates as:

> . . . All studies that purport to present facts concerning the nature and status of anything--a group of persons, a number of objects, a set of conditions, a class of events, a system of thought, or any other kind of phenomena which one may wish to study [p. 259].

The purpose of exploratory research, usually necessary for laying the ground work for theorizing, is further described by Blalock (1970) when he states:

> The major objective of such exploratory research is that of selecting out a relatively small number of possible variables, or categories, from the extremely large number that can be developed. To do this the investigator must become immersed in the data and he must rely very heavily on his own insight and intuition, without benefit of any well defined scientific principles as guidelines [p. 40].

Blalock (1970) proceeds to emphasize that " . . . exploratory studies are just that. They are beginnings, not ends in themselves [p. 40]." (Emphasis added.) He continues:

> After the beginning has been made, there are many opportunities for more rigorous methodological principles to serve as useful guidelines [p. 40].

The general label which one type of exploratory and descriptive research of this nature has been given is that of "participant observation." Participant observation is defined by Kluckholm (1940). She says:

> Participant observation is conscious and systematic sharing, in so far as circumstances permit, in the life-activities and, on occasion, in the interests and affects of a group of persons. Its purpose is to obtain data about behavior through direct contact and in terms of specific situations in which the distortion that results from the investigator's being an outside agent is reduced to a minimum [p. 33].

Becker and Geer (1958) in "Participant Observation and Interviewing: A Rejoinder" describe the kind of problem to which participant observation is most suited:

> Briefly, it is the problem in which one is more interested in understanding some particular group or substantive social problem rather than in testing hypotheses about the relations between variables derived from a general theory. These two aims are naturally not mutually exclusive but many studies are particularly focused in one or another of these directions. In the study aimed at understanding substantive problems, the greatest difficulties lie in discovering appropriate problems for sociological analysis and in discovering valid indicators for theoretical variables. Participant observation is particularly useful in meeting these difficulties. Also when one wishes to construct a model of the social system of an organization, a technique which allows one to see the interrelations of elements of that system in action is especially helpful [p. 40].

Holmberg (1960) presents the perspective of participant intervention as a method for studying change. He states:

> Traditionally, anthropologists have approached the study of culture change from the perspective of the outside observer of a naturally on-going process. By contrast, few attempts have been made to study change from the perspective of an intervening participant, one who both designs and activates the sociocultural process [p. 76].

Holmberg discusses the potentialities of the research-and-development or participant intervention method and perceives that this method provides a " . . . fruitful approach to further investigations of the dynamics of culture change."

The participant observation research method as Powdermaker (1970) explains, " . . . was forged in the study of small homogeneous societies, in which the anthropologist lived for an extended period of time, participated in them, learned the language, interviewed, and constantly observed." Blalock (1970) suggests, however, that "because anthropologists are probably the most frequent users of this approach, the participant observation method is sometimes erroneously identified with the anthropological approach." (Emphasis added.)

Examples of classic participant observation studies include: (1) William F. Whyte's (1943) Street Corner Society in which he describes his participant observation of lower-class street-corner life in Boston, (2) Elliot Liebow's (1967) Tally's Corner where he used the participant observation method to study the lower-class black male, (3) Philip Jackson's (1968) Life in Classrooms where he employed the method in his study of teachers and students in classrooms of the University of Chicago Laboratory School, (4) Louis M. Smith's (1972) work described in The Complexities of an Urban Classroom employed the techniques of participant-observer, and (5) Philip Cusick's Inside High School: The Student's World (1973) where he reports his findings after using the research methodology of participant observation.

The definition that appears to most accurately describe the method as employed by these and other similar leaders is that participant observation is a mode of inquiry that focuses on data collection through " . . . conscious and systematic sharing, in so far as circumstances permit, in the life-activities and, on occasion, in the interests and affects of a group of persons . . . [Kluckholm, 1940, p. 331]." The method of participant observation appears to be most appropriately applied, as Biddle (1964) describes in "The Integration of Teacher Effectiveness Research," Contemporary Research on Teacher Effectiveness. He states:

> . . . participant observation is best used when one is totally unfamiliar with the situation and when one wants an overview in order to develop hypotheses [p. 23].

The participant observer method, therefore, appears to be especially appropriate for the new developmental efforts being engaged in by developers of competency/performance-based programs.

Variations in Field Roles, Suggested Procedures, and Related Problems

This subsection of the review of literature pursuant to participant observation investigations discusses the various field roles, related problems, and suggested procedures for dealing with the various roles and problems.

The term, "participant observation," covers several kinds of research activity. However, Blalock (1970) suggests that:

> The basic prerequisite of all participant observation . . . is that the social scientist must gain the confidence of the persons being studied . . . [p. 41].

While Becker and Geer (1960) agree that, "there is little agreement on the specific referent of the term 'participant observation,'" they do suggest Gold's classification of the various procedures as a useful source. Gold (1958) explains:

> While a field worker cannot be all things to all men, he routinely tries to fit himself into as many roles as he can, so long as playing them helps him to develop relationships with informants in his master role (i.e., participant-as-observer) [p. 219].

The four roles as defined by Gold (1958) are:

> Complete Participant:
>
> The true identity and purpose of the complete participant in field research are not known to those whom he observes. He interacts with them as naturally as possible in whatever areas of their living interest him and are accessible to him as situations in which he can play, or learn to play, requisite day-to-day roles successfully. He may . . . work in a factory to learn about inner-workings of informal groups. After gaining acceptance at least as a novice, he may be permitted to share not only in work activities and attitudes but also in the intimate life of the workers outside the factory.
>
> Role-pretense is a basic theme in these activities. It matters little . . . or whether he has an upper-middle class background quite divorced from factory work and the norms of such workers. What really matters is that he knows that he is pretending to be a colleague.
>
> Participant-as-Observer:
>
> Although basically similar to the complete observer role, the participant-as-observer role differs significantly in that both field worker and informant are aware that theirs is a field relationship. This mutual awareness tends to minimize problems of role-pretending; yet, the role carries with it numerous opportunities for compartmentalizing mistakes and dilemmas which typically bedevil the complete participant.
>
> Observer-as-Participant:
>
> The observer-as-participant role is used in studies involving one-visit interviews. It calls for relatively more formal observation than either informal observation or participation of any kind. It also entails less risk of "going native" than either the complete participant role or the participant-as-observer role. However, because the observer-as-participant's contact with an informant is so brief, and perhaps superficial, he is more likely than the other two to misunderstand the informant, and to be misunderstood by him.
>
> Complete Observer:
>
> The complete observer role entirely removes a field worker from social interaction with informants. Here a field worker

> attempts to observe people in ways which make it unnecessary for them to take him into account, for they do not know he is observing them or that, in some sense, they are serving as his informants. Of the four field work roles, this alone is almost never the dominant one. It is sometimes used as one of the subordinate roles employed to implement the dominant ones [pp. 219-221].

Cusick (1973), agreeing that "under the heading of participant observation are a number of variations," feels these are "best stated by Lutz and Iannaccone who explained that

> A researcher who undertakes a participant observation study may assume one of three roles:
> 1. "The participant as an observer": In this case the researcher has his group membership before he undertakes a study and therefore his role as observer or researcher would be unknown to his subjects.
> 2. "The observer as a limited participant": The observer would join a group for the expressed purpose of studying it. The members would, perhaps more than likely, know of the researcher's intent in joining the group.
> 3. "The observer as a non-participant": That is, without group memberships. Here the presence of the observer may not even be known to the group and if it were known, he would still be outside the group [p. 233].

Good (1963) says that an investigator may play any one of several roles in the observation of social situations. He includes the following four roles: (1) a visiting stranger, (2) an attentive listener, (3) an eager learner, or (4) a more complete role as participant-observer [p. 305].

The following examples seem to typify the extremes in participant involvement found among descriptions of the participant observer role. Becker (1970) describes the extreme <u>lack of participation</u> when he states " . . . the observer may not participate at all, as when he hides behind a one-way screen in an experimental room." Holmberg's description, on the other hand, of the investigator's role as an interventionist, exemplifies the extreme for involved participation. Holmberg (1960) states, "His job is to assist the community to develop itself and to study this process while it is taking place."

Depending on the research situation and the data desired, a role for the participant observer is selected. Relative to the type of role selected, two basic philosophies seem to exist concerning the intent of the researcher. The philosophy ascribed to generally is summed up by Powdermaker (1966). She states that, "The anthropologist is primarily not interested in helping his informants, although he may do so inadvertently." Holmberg (1960), on the other hand, contrasts the perspective of the investigator who tries not to affect a situation when the subject of study is the process of research and development. His viewpoint is expressed in the following:

> In purely observational studies of the natural process of change, it is generally assumed that the investigator stands outside of the sociocultural process he is studying, that he himself is not a part of it. In such approaches the investigator is little concerned with the means or ends of a sociocultural process; he tries hard not to affect the situation; he minimizes his influence as much as possible. In fact, he aims for complete objectivity.
>
> The same cannot be said, however, for the method of research and development. Here, for the most part, just the opposite holds true. The investigator becomes a vital part of the process he is studying; he defines and manipulates both means and ends; he tries strategically and economically to influence the situation. In fact, we might almost say that he aims for completely "objective" subjectivity [p. 82].

Distinctive in Holmberg's comments about the participant observation mode of inquiry, is the manner by which the researcher gains knowledge. It is clear in reviewing the various points-of-view, however, that consensus does not exist, and there is considerable room for varied decision-making about the most appropriate degree of involvement, as the researcher seeks to gather data.

Having decided on the extent to which he will participate, the researcher next selects group roles in which to act, in order to gain the perspective of the group to be studied. Blumer (1962) says:

> To catch the process, the student must take the role of the acting unit whose behavior he is studying. Since the interpretation is being made by the acting unit in terms of objects designated andappraised, meanings acquired, and decisions made, the process has to be seen from the standpoint of the acting unit . . . to catch the interpretive process by remaining aloof as a so-called "objective" observer and refusing to take the role of the acting unit is to risk the worst kind of subjectivism--the objective observer is likely to fill in the process of interpretation with his own surmises in place of catching the process as it occurs in the experience of the acting unit which uses it [p. 188].

Bruyn (1966) in <u>The Human Perspective in Sociology: The Methodology of Participant Observation</u> presents a number of axioms which are interpretations of a field researcher's experience. The axioms deal with the major issues and problems a field researcher must face. A relevant one to be considered here is Axiom 1:

> <u>Axiom 1</u>:
> The participant observer shares in the life activities and sentiments of people in face-to-face relationships.
> Thus, we may observe at the outset that while the traditional role of the scientist is that of a neutral observer who remains unmoved, unchanged, and untouched in his examination of phenomena, the <u>role of the participant observer requires sharing the sentiments of people in social situations; as a consequence he himself is changed as well as changing to some degree the situation in which he is a participant</u>. . . .
> Researchers have noted that although they become changed through their participation it is important that the change not be total in character, that some part should remain unchanged and detached. Therefore, even though they "share" the experience, they are not entirely "of it." Herein lies a second significant descriptive trait of the researcher's role.
> <u>Corollary</u>:
> The role of the participant observer <u>requires both detachment and personal involvement</u> [pp. 13-14]. (Emphasis added.)

Bruyn (1966) cites Schwartz and Schwartz to describe the personal involvement of the researcher who should be accepted and recognized as part of the research process.

> The issue is not whether he (participant observer) will become emotionally involved, but rather the nature of the involvement. The involvement, whether it is closer to one end of the continuum (sympathetic identification) or the other end (projective distortion), is very little a function of an observer's role. Rather, it is primarily a function of his experience, awareness, and personality constellation and the way these become integrated with a particular situation. . . . Sympathetic identification includes empathic communication and imaginative participation in the life of the observed through identification and role-taking. In this type of involvement the observer is both detached and effectively participating; he feels no need to moralize or judge the interaction; his attitude is one of interested curiosity and matter-of-fact inquiry directed toward understanding the observed [pp. 14-15].

Powdermaker (1966) in discussing communication, which is one aspect of the participant observer's unique role, says:

> A peculiar character of field work in anthropology and in other social sciences is that the scientist has to communicate with the objects studied and they with him and that he is part of the studied situation [pp. 286-287].

Powdermaker also describes the following three conditions as necessary for successful mutual communication: (1) physical proximity of the field worker to the people he is studying, (2) knowledge of the people's language, and (3) psychological involvement. She stresses that language is only one of the necessary communication conditions. Discussing verbal and non-verbal communication, Powdermaker explains:

> The more subtle and often deeper levels are conveyed consciously and unconsciously by nuances of behavior, such as the facial expression, tone of voice, and gestures. The desire to communicate and an alertness or sensitivity (on both verbal and non-verbal levels) to communication from others are part of the process. . . . Some degree of personal involvement is essential for successful non-verbal, and even for much of verbal, communication (the two can rarely be separated) [p. 289].

Concerning psychological involvement, Powdermaker explains:

> . . . More difficult to explain, is the psychological involvement which underlies communication. The problem includes the field worker's self image of himself and of the situation, which as Goffman has pointed out, any individual "knowingly and unwittingly projects" when he appears before others [p. 289].

Related desirable personality characteristics are identified by Powdermaker as "kindness, patience, good manners, and a fresh but not innocent eye."

To the field worker, psychological mobility is important in hierarchical situations. In these situations it is important for the field worker to move easily between different levels in the power structure. An example of a problem that may occur is a field worker identifying too closely with the underdog(s) or with a social status higher than he maintains in his society. "In general," Powdermaker (1966) concludes, "it is easier for the field worker to make effective communication if he likes himself, if he expects others to like him, if he can communicate easily and directly."

In contrast to Powdermaker and others, Holmberg (1960) feels that the investigator's role, when the emphasis of study is a research and/or development process, is to assist the community to develop itself and to study the process while it is taking place. Holmberg says of the investigator under these conditions:

> He cannot "cure" the community as a surgeon cures a patient; the community must perform the operation on itself. At first . . . the investigator may have to intervene frequently and boldly, but as problem-solving and decision-making skills are developed the investigator intervenes less and less until he works himself out of the role of intervener and into the role of consultant and observer [p. 84].

The second axiom posed by Bruyn (1966) is also relevant to this issue.

> Axiom 2:
> The participant observer is a normal part of the culture and the life of the people under observation.
> The role of the participant observer may take many forms but in any case it is designed to be a normal part of the life of the people being studied. . . . The type of role which is taken is affected by the research design, the framework of the culture to be studied and the abilities of particular researchers to assume tasks which can be accepted as a natural part of a culture [p. 15]. (Emphasis added.)

Bruyn also points out the importance of the participant observer finding "a satisfactory way of entering the group to be studied, developing and maintaining a role adequate to meet his scientific needs, and terminating relationships. What the participant observer actually does to fulfill the above requirements depends entirely on the culture of the group to be studied."

Two behaviors which Richardson (1960) asserts are important for the field worker initially entering a group are as follows: (1) structuring for the people the reason he is in the research area, and (2) a picture of himself, who he is and what his background is. Richardson also feels that knowledge of the customary stereotypes attached to people new to the group will be helpful to the field worker in structuring his role [p. 132].

In discussing the field worker's role and responsibilities in gaining and maintaining cooperation for a research project, Richardson (1960) suggests the use of incentives. Following are examples of incentives he suggests as potentially helpful in gaining acceptance of a research project:

> 1. Altruism, or the opportunity to advance scientific knowledge. This appears to be a powerful incentive. . . .
> 2. Related to altruism is the prestige that may accrue from cooperating with a research project. . . .
> 3. Better understanding of misrepresented or unknown institutions [p. 137].

Richardson also suggests that a field worker should alleviate the participants' possible fears of becoming involved in too much work.

Once the field worker has gained entry into the group to be studied, Richardson claims that the field worker should make use of incentives to gain and maintain cooperation of the group. Examples of incentives to gain and maintain cooperation suggested by Richardson are as follows:

> . . . In any community or organization it is valuable for the field worker to know various objects which are particularly valued by their owners. . . .
>
> Perhaps the most important incentive one can offer is friendliness, sincere appreciation, and conversation of a nature that may be interesting and different from the kind the informants generally carry on. Most people like to talk about themselves to a sympathetic listener. . . .
>
> . . . Willingness on part of the field worker to talk freely about himself . . . appears to be a valuable incentive. . . .
>
> An important area of incentives appears to be the willingness to do odd jobs for people . . . joining in and helping to do a job, or offering specialized skills. . . . There is a danger, however, that a field worker will become so busy with these activities that they will seriously limit time he needs for other research activities [p. 125].

Richardson warns that, unfortunately, the work incentive,

> . . . has the connotation that these actions are all premeditated and are being used only in order to get something in return. If the way in which these incentives are offered is not accompanied by genuineness and sincerity, it will probably become immediately obvious to the people in the research area [p. 139].

The corollary for Bruyn's (1966) axiom two is also worthy of consideration:

> Corollary:
> The scientific role of the participant observer is interdependent with his social role in the culture of the observed [p. 18].

Concerning the interdependence of the scientific and social roles Bruyn also notes:

> In his scientific role the participant observer seeks to apprehend, register, interpret, and conceptualize the social facts and meanings which he finds in a prescribed area of study. . . . He finds his social role an interdependent and indispensable part of the scientific process.
>
> This social interdependence . . . becomes a distinguishing characteristic of the role of the participant observer, causing many problems and nonscientific repercussions in terms of confidences, commitments, and other personal involvements which penetrate the life of the field worker. The participant observer assumes he can make these commitments and become involved without ignoring scientific standards or the interests of the people he is studying.
>
> The researcher may even take into consideration the interests of his subjects in formulating his hypotheses and designing his study . . . [pp. 18-19].

Bruyn believes that the participant observer must not only be aware of the interdependence of the scientific and social roles, but also must assume that because of the interdependence, one role makes the other possible. Due to the interdependence of the roles, problems related to scientific and ethical integrity may arise. The field worker faces " . . . problems both of how to become a natural part of the life of the observed; and thereafter, how to maintain scientific integrity while affectively involved in research." Bruyn further states:

> If scientific integrity is maintained, there may be problems of ethical integrity in terms of personal obligations and commitments which develop in the process of research [p. 19].

Another contribution to the discussion of the participant observer's role is made by Webb (1966) and associates who point out that "a central assumption of participant observation is that the investigator shares as intimately as possible in the life and activities of those he is studying." They clarify the above point by stating that " . . . the investigator may not actually 'live in' with his subjects, but he does partake in as many . . . activities as possible [p. 187]."

Participant observation, according to Kluckholm (1940) calls for a "conscious and systematic sharing." Therefore, she states, " . . . the investigator must survey his field for roles in the playing of which he will be regarded as a participant, he must analyze these roles for the data and insights they afford, and he must examine them for the biases inherent in them [p. 331]."

Kluckholm, feeling that "the quest for the roles . . . is the key to the use of this technique," describes " . . . a distinction between roles which are general and specific in character." A general role is defined as " . . . that role which one plays without reference to any particular person." She explains that the general role " . . . is played in relation to various persons, and, although it becomes a part of the specific relationship with each of these persons, it is general in terms of all of them." The specific role is defined as " . . . that which one plays in relation to a definite person." To help clarify the distinction, Kluckholm, uses the following example. "The role of the married woman of the upper class is, for example, a general role; the role of a wife is specific [p. 332]."

Related to how the participant observer plays out his various roles is a problem identified by Miller, in "The Participant Observer and 'Over-Rapport.'" To help the investigator in protecting himself from developing impeding "over-rapport," Miller (1952) suggests that the researcher ask himself, "At what point does closeness to subjects limit the research role?" While in the research situation Miller asserts that the researcher should keep this question in mind and try to make clear that he is interested in a number of people in the particular situation, and that his research activities are his prime reasons for being present. Concerning relationships between the researcher and participants, Miller says:

> In some cases, he must resolutely decide to prevent relationships from becoming more personal than is desirable for the development of insight and the maintenance of rapport.
>
> For the participant observer, the problem is not merely that of developing rapport; the question rather is what kind and quality of rapport are desirable [p. 99].

Finally, relative to the discussion concerning the roles of the participant observer, is the third axiom listed by Bruyn (1966):

> Axiom 3:
>
> The role of the participant observer reflects the social process of living in society.
>
> In a very real sense, the researcher participates in a social process which has meaning for people in groups outside the group he studies, since the processes of living in any society are similar for people everywhere . . . The more the researcher shows perception into the universality and relevance of the culture in the particular group he studies, the more likely his conclusions will have significance beyond the local setting [p. 20].

Summary

In summary, then, it can be said that depending upon the research topic, the nature of the group to be studied and the situation in which the group is to be studied, the investigator for a participant observation study determines the extent to which he will participate in the activities of the group to be investigated (e.g., complete participant, etc.). While this initial choice of role may change during the course of the investigation, procedures used for entry into the group will be based, in part, on the above choice of role. The researcher will select from group roles those roles in which he wishes to participate.

The personality and ability of the researcher to establish relationships appropriate to the participant observation method is of utmost importance. Problems associated with the playing of roles by an investigator range from lack of communication to over-rapport and from not being accepted as a participant in the group to assimilation. The most common procedures suggested for dealing with these problems are of a preventative nature.

Participant Observation Methodology

This subsection is a review of literature pursuant to commonly identified methodological problems in participant observation studies.

Cusick (1973), in Inside High School: The Student's World, discusses two standard objections to participant observation studies. He identifies the first problem in terms of generalizability, " . . . that participant observation studies, dealing with a limited and perhaps unique sample, may be ungeneralizable." Cusick responds to this problem by replying that:

> . . . while an instance of social phenomena may be unique, that need not prevent one from learning about and from it by intelligent study. That is, one should not have to duplicate

> or recreate the Battle of Saratoga to understand the lessons therein. While a situation may be unique, human reaction to it may be quite common. . . . Uniqueness, . . . lies in the social setting and not in the human reaction, and a good description of a social phenomenon, however unique, may be quite intelligible to one who never participated [p. 231].

Cusick (1973) identifies the second standard objection to participant observation studies, as having:

> . . . to do with the absence of standardized tests of validity and reliability. . . . As one lives close to a situation, his description and explanation of it have a first-person quality which other methodologies lack. As he continues to live close to and moves deeper into that situation his perceptions have a validity that is simply unapproachable by any so-called standardized method. Likewise, as his validity becomes better, so his reliability, which is an extension of his validity, becomes better. As the researcher is the actual instrument, as he becomes more aware, more valid, so he must of necessity become more reliable [p. 232].

In "Some Methodological Problems of Field Studies," Zelditch (1962) acknowledges:

> . . . the spirited controversy between on the one hand those who have sharply criticized field workers for slipshod sampling, for failing to document assertions quantitatively, and for apparently accepting impressionistic accounts--or accounts that the quantitatively minded could not distinguish from purely impressionistic accounts; and, on the other hand, those who have, sometimes bitterly, been opposed to numbers, to samples, to questionnaires, often on the ground that they destroy the field workers conception of social system as an organic whole [p. 566].

However, he goes on to indicate, " . . . there is reason to believe that the issue itself has been stated falsely." Further, he suggests that "A more fruitful approach to the issue must certainly recognize that a field study is not a single method gathering a single kind of information." As he suggests, the crucial question for this approach is "What kinds of methods and what kind of information are relevant?"

This writer agrees with Zelditch that various methods should be used. Therefore, in this study the researcher has used within the participant observation context, survey techniques, interviewing techniques, and observation-recording techniques. As Zelditch recommends, the researcher has used these different methods " . . . as analytically different aspects of the same study."

Another "problem" frequently discussed related to participant observation centers around the questions of validity and reliability. When discussing validity and reliability of the participant observation approach, Bruyn (1966) emphasizes the following: "In some ways, the participant-observer approach has already been demonstrated to be more reliable than other formal empirical methods. . . ." He adds:

> . . . the workability of the method under varying conditions must be tested, and its ability to contribute practical knowledge which connects with the traditional empirical and theoretical approaches to knowledge must be examined. . . . the reliability of the procedures and conclusions of particular researchers must be tested over the years [p. 180].

In contrast to Cusick, who does not feel every investigation must be repeated, Bruyn (1966) perceives that "if a piece of research cannot be repeated there is no basis for considering a study valid or reliable or, consequently, scientific."

Bruyn suggests that an investigator involved in participant observation study Homans' six indices of subjective adequacy. Of Homans' indices, Cusick (1973) also says, "to produce a worthwhile study a researcher should endeavor to tailor his work to the six indices of subjective adequacy stated by Homans." The six indices as stated by Homans in Cusick's and Bruyn's (1966) work are as follows:

1. Time: The more time an individual spends with a group, the more likely it is that he will obtain an accurate interpretation of the social meanings its members live by.
2. Place: The closer the observer works geographically to the people he studies, the more accurate should be his interpretations.
3. Circumstance: The more varied the status opportunities within which the observer can relate to his subjects, and the more varied the activities he witnesses, the more likely the observer's interpretations will be true.
4. Language: The more familiar the observer is with the language of his subjects, the more accurate should be his interpretations.
5. Intimacy: The greater the degree of intimacy the observer achieves with his subjects, the more accurate his interpretations.
6. Consensus: The more the observer confirms the expressive meanings of the community, either directly or indirectly, the more accurate will be his interpretations of them [p. 183].

While Bruyn (1966) points out that objective adequacy is also involved when the six indices of subjective adequacy are met, he goes on to say: "objectivity may be studied as part of both the character of knowledge and the conscious experience of the observer." Basically, Bruyn examines objectivity of knowledge in two ways: "(1) in terms of the relationships the observer draws between his subjective data and other forms of scientific knowledge, and (2) in terms of the relationships the observer draws to the larger contexts of his subject [p. 219]."

Objectivity of consciousness is examined by Bruyn, " . . . in terms of the degree to which the observer remains open to viewpoints other than those he is involved in studying, and thus avoids becoming over involved in the context of his work." One of the guidelines suggested by Bruyn for maintaining objectivity of consciousness is to monitor " . . . the degree of distortion that appears in the record of his observations." This suggests that the participant-observer continuously check the agreement afforded by other participants of the observations he records.

While indicating that a researcher who undertakes a participant observation study, with the six indices in mind, would have some assurance that his findings would reach an acceptable degree of validity, Cusick (1973) asserts: "the real proof, however, is in the presentation of the data." He says that:

> 1) it is especially important to avoid over-inferring, 2) the writer must allow the reader to draw his own conslusions, and 3) the data is presented in as realistic and complete a manner as possible.
>
> If as others who are engaged in similar situations upon reading the data agree that "that is the way it is," so the researcher's findings demonstrate a higher degree of validity [p. 233].

In discussing participant observation reports, Good and Scates (1954) indicate that it is important that:

> The work was done in the spirit of research. The report is not presented as being something more than it is--it is offered as a starting point for further thought, not as the answer to all problems [p. 271].

Good and Scates, offer the following guide as generalized characteristics of non-quantitative research:

1. The research report usually has a distinctive form, with definite attention to describing the methodology, the sources, the population, the trait being studied, and other appropriate methodological or technical details.
2. Presumably original observations are taken.
3. Each step in the work proceeds with meticulous care and with due consideration for the large plan and purpose of the work. The data are verified and evaluated.
4. The data are resolved, or organized into certain more general terms, and are sometimes related to a single, over-all thesis. Certainly the data will be summarized in some

form or other, as systematic as possible. What is done with the data is a definite part of the contribution of the study.

5. The background, sensitivity, and general competence of the investigator as well as the spirit with which he works, are vital elements [p. 271].

This researcher has attempted to follow these guidelines whenever possible. Some deviations may occur, but as Good and Scates (1954) report:

> Whether a study must have more or less than the qualities in this list probably no definite rule can be stated. These qualities vary in degree; various types of research have their own criteria . . . [p. 271].

CHAPTER III

PROCEDURES AND METHODOLOGY

Introduction

This investigation is a description of the activities (problems and procedures) and learnings (tentative solutions and recommendations) of a mathematics competency development team at Michigan State University. The study represents an effort to provide needed descriptive data relative to how educators might proceed in a collaborative manner to establish a competency-based program. Due to the lack of information relative to how educators have proceeded in the past or should proceed in the future with the development of competency-based programs, participant observation was selected as the appropriate method of investigation.

Chapter III will describe the procedures and methodology used to carry out this investigation. The description is divided into three major sections: (1) Procedures utilized to establish and maintain a constructive participant-observer role, (2) Activities undertaken to fulfill the participant role of a developmental team member and (3) Methods of data collection.

Procedures Utilized to Establish and Maintain a Constructive Participant-Observer Role

This section describes the major steps taken to assure a cooperative and productive enactment of the participant-observer role. It includes a description of (1) the steps taken for acquiring permission to carry out the study, (2) the researcher's entry into the group, (3) the procedures for establishing rapport with team members, (4) steps taken to maintain cooperation of the participants, and (5) steps taken to reduce the probability of potential problems arising due to the graduate student status of the researcher.

Permission to Carry Out Study

This researcher sought permission to carry out this investigation from two of the three MSU professors who were involved in the initiation of a competency development team in mathematics. The conception of the mathematics competency development team was an outgrowth of the MSU experimental teacher training programs for which these two professors acted as program directors. Prior to the initial actions leading to the establishment of the competency team, these two professors had established cooperative working relationships with the individuals who were eventually asked to participate in the first sessions to explore the possibilities of (1) establishing a competency development team and (2) studying the developmental process as it occurred. Therefore, the professors' current roles as program directors, their roles in providing leadership in furthering competency-based development, and the nature of their previously established relationships with potential participants enabled the two professors to grant her permission to seek the cooperation necessary to carry out the study from those attending the first exploratory meetings.

In order to gain the cooperation of those individuals who eventually comprised the mathematics competency team, this researcher was in attendance at three exploratory discussion meetings. While some of the individuals invited to attend the exploratory discussion meetings attended all three sessions, others attended only one or two sessions. Therefore, it was necessary for this researcher to explain the purpose of and solicit the cooperation for this investigation at each of the three exploratory meetings.

It was also necessary to explain that there was a lack of available information concerning establishment of a competency team. This researcher explained that one way to gain this type of information was through participant observation study. Specifically, they were told that the purpose of this investigation, in which they could be involved, was to provide descriptive information relative to the composition of a competency team, the procedures used by that team, and the outcomes of the team's developmental work. She further elaborated that a description of one team and the procedures actually used by that team could be useful to others involved in the processes of establishing similar developmental teams in other areas. In addition, this descriptive investigation would contribute to one aspect of the exploratory stage of research in the area of performance/competency-based teacher education. Finally, individuals involved in the investigation would have available to them a description of the process in which they were involved.

After this researcher explained the purpose of the study, she asked those in attendance at each meeting to verbally express their personal concerns or feelings relative to being a member of a competency team involved in a participant observation study. No concerns relative to participating in the study were expressed by individuals attending the exploratory meetings. All those individuals in attendance at any of the three sessions consented to participate in the study if there was an agreement to establish a competency team.

In summary, the steps followed by this researcher in gaining permission to carry out this study were (a) contacting two of the three professors involved in the initiation of a competency development team, and receiving permission to contact and request perspective team members' cooperation, (b) attending the three exploratory sessions, (c) explaining the purpose of the project to individuals attending the exploratory sessions, and (d) requesting feedback and cooperation from those attending the meetings.

Researcher's Entry Into the Group to be Studied

This subsection describes the procedures used by this investigator to gain entry as a member of the competency team.

At the outset of the study, the establishment of a competency team was to begin. By joining the team in the same manner as the other members, it was felt that this researcher would more readily be accepted in a participant team-member role.

During this researcher's graduate study, she had worked with the professional staff developing an undergraduate experimental elementary teacher training program at MSU. Through this experience, all but two of the regular and resource team members had previously become acquainted, to some extent, with her. Therefore, due to the relationships that had been established no formal process of communicating background information about this researcher was used. (See Appendix N for description of Researcher's Background.)

It was explained by the team's discussion leader that the researcher's main purpose as a team member was that of an investigator for a participant observation study. The discussion leader further explained that as a member of the competency team she would act in the role of a participant in the team's development work.

To enter the group to be studied, this investigator employed two procedures: (1) becoming a member of the team in the same manner as other selected participants and (2) providing for the team an explanation that she would act as both a participant and a researcher.

In summary, the specific procedures used by this investigator to gain permission to both carry out the study and enter the group as a participant were based on an assessment of the specific needs, for the situation as determined by the nature of the existing relationship with the group to be studied.

Procedures for Establishing Rapport with Team Members

This section describes the procedures used by this researcher to establish rapport and credibility between the various team members and herself.

Rapport and credibility between the researcher and all but three of the other thirteen regular and resource competency team members had been established prior to the origination of the competency team. This researcher was not acquainted with two of the three individuals at the outset of the investigation.

Rapport was established with the two participants with whom the researcher was not acquainted through the use of situations naturally arising out of the team's developmental work. This was accomplished with one individual by questioning and sharing perspectives of classroom teaching and pre-service teacher training. An opportunity to work with the other person on a development task provided an opportunity to communicate and eventually establish rapport.

It was this researcher's observation, which was verified through elicited feedback, that there was a definite lack of rapport in the existing relationship with the third team member. This researcher acted specifically to try to establish with the third regular team member the identified non-existing rapport relationship. This was done after the administration of the instruments used to collect descriptive data relative to the composition of the team (to be discussed later in Chapter III). This researcher became aware that the team member was interested in mathematics games. Since she was involved in helping undergraduate teacher education students plan and teach mathematics lessons to elementary school children, she was interested in learning more about different types of mathematics games which could be used with children. On several occasions, it was convenient to drop into the third team member's office when he was observed to be working with mathematical games. Acting in the role of an interested learner, the researcher sought to establish a comfortable rapport.

In summary, this researcher had established rapport with nine of the other thirteen team members prior to the outset of this study. The procedure for establishing rapport with two individuals was via communication during team meetings and subset developmental work sessions. The role in which she acted in order to establish rapport with the third individual was that of an interested learner.

Maintaining Cooperation of Participants

This section describes the procedures used by this researcher to maintain continuous cooperation during the course of this investigation. The decisions relative to procedures selected by the researcher to maintain participant cooperation were based on an assessment of the environment and human factors comprising the university culture in which this study occurred. A result of this assessment was that insincere behavior on this researcher's part would more than anything else contribute to the demise of the relationships necessary for a participant observation study.

This researcher and the director of her dissertation felt that one way to contribute to the maintenance of participant cooperation was through careful selection of the participant observer's roles. Therefore, the participant observer's various roles were selected on the basis of this researcher's ability to authentically act in the role, the role's contribution to the research project and the role's contribution to the competency team's development tasks. (See the reference to Kluckholm, Gold and others in Chapter II.)

In addition to careful selection of roles, this researcher also made use of the work incentive idea as a technique for maintaining cooperative relationships throughout the course of the study. However, in using this technique, she was aware that the other team members might identify her in a stereotype graduate assistant role; i.e., clerical or "busy work" role. The awareness of this problem allowed her, with the help of her graduate committee chairman and the director of this dissertation, to avoid the development of a role subservient to other team members. Therefore, the following procedure was used by this researcher to decide whether or not to help with a given task.

At various times team members would inquire as to whether this researcher had the interest or time to help with a given task. This researcher's decisions to accept or decline a request for help were based on the following: (a) estimated time available for doing tasks, (b) estimated time needed to perform tasks, (c) deadline for completion of tasks, (d) nature of the tasks and this researcher's ability to complete the tasks, and (e) the possible effects assisting with the task would have on the investigation. If, for one of the above reasons, this researcher felt that she should not perform a given task she would make suggestions or question the initiator of the request as to alternative ways of accomplishing the task.

The researcher knew when the between-session developmental work was requiring more than the usual amounts of a given team member's time. On these occasions, this researcher tried to be cognizant of tasks with which assistance could be provided. During these times, she volunteered to help team members either in general or with a specific task.

In summary, one procedure used was careful selection of roles played by this researcher to maintain participant cooperation during the course of this investigation. Another was careful selection of tasks with which this researcher assisted various team members.

Graduate Student Research Projects Involving University Professors

The following section describes procedures used by this investigator to prevent types of problems specifically related to a graduate student research project which involves university professors' participation.

It must be recognized that any investigator involved in a participant observation study is susceptible to potential scientific and ethical problems, as discussed in the review of literature (e.g., over-rapport or over-identification with an underdog, a particular social class, or level in a given hierarchy; pressure to accept a particular participant's mental set; or lack of rapport). The potential for "stronger-than-usual" pressures and controls may exist when a graduate student is the investigator in a participant observation study and the study's population includes faculty members with whom the student studies.

This researcher was aware that potential problems related to a participant observation investigation involving the study of personnel at the university in which she was enrolled could arise. In the case of this study, three of the thirteen competency team members were also involved in this researcher's graduate program as committee members. In addition to being a committee member, one of the three people also had the position of chairman of her graduate committee. Another of the three individuals was the director of this dissertation.

It was determined that various types of problems had the potential for arising between or among this researcher and various committee members, as well as between or among the various committee members. It was decided that awareness of the types of problems that might arise during the course of the investigation should be considered. The graduate student researcher, for example, might receive the brunt of political problems arising between her committee members due to situations created by the research method. The research method and situation required that this graduate student work closely over a long period of time with three of her committee members. Due to the researcher's close working relationships with three committee members, the other two committee members might react in a negative manner toward one or more of the committee members involved in the investigation. The establishment of social and professional relationships between the researcher-graduate student and committee members involved in a participant observation study might lead to social and professional problems. For example, strong social and/or professional relationships might lead to a reduction in the autonomy of the researcher-graduate student. An incident could occur during the investigation which if reported would show a faculty member in an unfavorable light. The graduate student could be put under pressure not to report the incident as it occurred.

During the early stages of this investigation, therefore, this researcher discussed potential problems, of the types mentioned above, with the committee members involved as participants in the study. Following consideration of the potential problems, it was felt that on the basis of the previously established relationships, any problems which might arise could and would be openly discussed and resolved.

In summary, the procedures used in dealing with potential problems related to this investigation, due to this researcher's graduate student status were as follows: (1) awareness of the possibility of problems arising, (2) discussion with the participants who might have been involved concerning types of problems, and (3) agreement to openly discuss and seek resolution of the problems should they arise.

Activities Undertaken to Fulfill the Participant Role of a Developmental Team Member

Due to the circumstances in which this investigation was carried out, this researcher acted in the role of a participant-as-observer. While this researcher interacted naturally with members of the mathematics competency team, they were aware of the investigative purposes of her presence. As described earlier, the team members were informed that this investigator would function in the role of a regular team member in addition to the role of researcher.

The following describes the procedures used by this researcher to fulfill her role as a regular team member. These procedures include participation in total team and subteam developmental meetings, in clerical tasks and in acting as a liaison person.

At the third exploratory discussion meeting, at which time the collected members decided to actually form a developmental team, this researcher was asked to act in the role of recorder for the team. This gave her the responsibility for keeping a record of consensus decisions reached at each session. One team member stated that since this researcher had to record the team's decisions for her dissertation, she might also act as team recorder to eliminate unnecessary duplication of effort. This researcher accepted this responsibility as she felt the role would facilitate verification of her research notes.

During the course of this study, this researcher was also given the responsibility for between-session communication. Responsibility for reminding team members of meetings and/or communicating dates, times, and places of ensuing meetings to any team members who were absent from previous sessions.

Another of the responsibilities, which this researcher accepted as part of her role as a team member, generated from the between-session developmental meetings. Due to this researcher's participation in most of the sub-team developmental work she was asked, when necessary, to act as liaison between sub-teams and individuals. This researcher accepted the responsibility of liaison, as it facilitated her involvement in the various sub-team sessions.

Working in the sub-teams, this researcher participated in the development of hypothetical models ("strawmen") or "common stimuli" to be used as discussion stimulants and "focusers." Examples of these strawmen are the lists of pupil objectives and pupil assessment instruments. (See Appendices A or I.) During sub-team developmental sessions, this researcher, acting in the role of a team member, also participated in the development of pre-service teacher evaluation instruments for instruction and instructional design. Arranging for typing, duplication, and dissemination of developed materials was another responsibility given to this researcher functioning in the role of a team member.

This researcher assumed the role of an interested and capable learner during team meetings and sub-team work sessions. The technique used by this researcher in the learner role was that of questioning. Due to the abundance of the subjective opinion and sometimes desultory nature of the topics discussed, statements made by team members were frequently open to question. Because of the nature of the development task assumed by the competency team, a more profound rationale than just "That's what I think," or "Because God told me so" was needed. Therefore, questioning was a useful and helpful technique. On one occasion, this investigator asked during a meeting, "Do all the questions I ask bother any of you?" The response was, "No. If we can't explain these things satisfactorily to you, how will we ever be able to explain them to a teacher or children?"

In summary, the procedures used by this researcher to fulfill the role of a team member were participation in team and sub-team developmental meetings and acting as clerical and liaison person.

Methods of Data Collection

This section describes the procedures and instruments used for collecting data relative to the nature of the population (team composition) and data relative to the nature of the developmental processes that they actually employed (team transactions and outcomes).

Procedures Used to Obtain Information Relative to the Team's Composition

The original population for this study consisted of nine Michigan State University staff members and five graduate students, including this researcher. Due to the unique nature of the situation in which the group was to be studied, three instruments were developed and administered for the specific purpose of collecting descriptive population data that might assist in the identification of relevant variables for future studies. It would also enhance the possibilities for replication (although "replication" in the strict sense is not possible in this type of research). Not knowing what factors would act as crucial variables in a university competency team, three areas were chosen based on "hunches" about potentially relevant factors.

The three instruments that were developed and administered related to these factors were (1) Instrument I--Biographical Data; (2) Instrument II--Attitudes Toward Performance/Competency-Based

Teacher Education; and (3) Instrument III--A Semantic Differential that assessed personal attitudes among team members. These are included in Appendices B, C and D.

Permission to Administer Instruments

This section describes the procedures used by this researcher to gain permission to administer the instruments. After the team members had been selected and the team established in concept, the members were asked if they would cooperate in responding to three such instruments. The instruments were described to them and it was explained that the purpose and need for administering the instruments was to collect information which would describe the composition of the team. In addition, the participants were asked to express how they personally felt about responding to the three instruments.

The participants agreed to respond to them if the instruments would not be reviewed or analyzed until the end of the research project. At that time there appeared to be no necessary reason to analyze the data before the end of the research project. One team member expressed his concern that knowledge of the data might bias this researcher's observations. Another team member did not want other team members to have access to this information. It was decided that if limiting factors appeared during the study due to not analyzing the instruments, participants would be asked to give their permission based on the problems at that time. However, these factors did not appear and the data from the three instruments was only analyzed at the end of the study to describe the composition of the competency team and to verify this investigator's observations.

In summary, the procedures used to gain permission to administer the three instruments were (a) explanation of purpose, (b) request for participants to respond, (c) feedback elicited on their feelings and opinions, and (d) agreement not to analyze information until the end of the study.

Description of Instrument I--Biographical Data

The biographical information requested from each participant included age, education, university rank, departmental association(s), university responsibilities, memberships in professional organizations, experience in elementary and secondary school teaching, and other educational related experiences.

The above eight areas were expanded to include ten major questions plus requests for additional detailed information pursuant to the major topics (see Instrument I in Appendix B).

It was determined that part of the biographical data being sought was available to this researcher from the college personnel files. The decision was made that this researcher would collect and record on each participant's form any data available. It was felt that the participants would especially appreciate a demonstrated effort not to ask them to do busy work for the research project, since they were already committing an abundance of "overload" work with the developmental tasks.

Description of Instrument II--Feelings Related to Competency/Performance-Based Teacher Education

The second aspect for describing the competency team included the participants' feelings related to performance/competency-based teacher education.

This instrument provided information about the attitudes toward performance/competency-based teacher education held by individual members of the group to be studied at the outset of the project. It was believed that the presence of positive, negative, or neutral feelings about the competency-based notions would, in all likelihood, effect the behavior of the group. Verification or lack of verification of attitude as perceived by the participant observer would also be possible.

The information gathered about participants' feelings toward competency-based teacher education included various attitudes about (1) concepts related to competency-based teacher education, (2) the development of competency-based teacher education programs, and (3) participation in the development and instruction of competency-based teacher education programs. Instructions for participant use and a Likert-type scale were developed for purposes of this study. The instrument is included in Appendix C.

Instrument III--Semantic Differential

A semantic differential instrument was developed and used as the third means of collecting descriptive information about the team. The semantic differential instrument employs language usage as a tool to analyze an individual's attitude toward himself and others. What the attitudes were and how these attitudes would affect the process to be studied was not known at the outset of the study. The semantic differential is not a test having a definite set of items and a specific score. The semantic differential is described by Osgood et al. (1957) as a "highly generalizable technique of measurement which must be adapted to fit the requirements of the research problem to which it is applied [p. 76]."

The content of the semantic differential is composed of a series of concepts or stimuli and a series of scales. The stimuli for this study were identified as the names of each participant. Based on Osgood's previous research, 25 scales (pairs of words) were selected to represent three factors also identified by Osgood (1957). Osgood et al. (1957) suggests that "about three scales" should be selected to represent each factor (p. 78). Therefore, from the original 27 scales used in the instrument which was administered, four scales for each factor were selected for analysis.

The scales for the evaluative factor were unpleasant-pleasant, bad-good, worthless-valuable, and unfair-fair; for the potency factor, gentle-violent, lenient-severe, weak-strong, and safe-dangerous; and for the activity factor scales, slow-fast, labored-easy, passive-active, and still-moving.

Because of the small number of respondents, it was not possible to statistically verify the factor structure of responses as recommended in new uses of the semantic differential (Stiggins, 1972;

Heise, 1969). Therefore, it was necessary to rely on factor structure, based on prior research.

The mean score for each of the four scales of each factor was computed. This resulted in a single person having three different factor scores for each participant judging him. The mean factor score for each participant was then computed. The mean factor scores were then computed for the population classifications as follows: Group I--Mathematics Content Representatives, Group II--Mathematics Education Representatives, Group III--Applied Behavioral Science Representatives and Group IV--Educational Research and Evaluation Representatives.

The format used for the semantic differential was developed by Osgood (1972). The technique for handling Semantic Differential data with Opscan response sheets was developed by Stiggins (1972). (See Appendix B.)

Description of Procedures for Distribution and Return of Instruments

This section describes the packets and procedures used in distributing and returning the packets.

Each of the 14 participants received a packet consisting of the following five items:

1. A cover letter
2. Instrument I--Biographical Information and Directions
3. Instrument II--Feelings Toward Competency/Performance-Based Teacher Education and Directions

4. Instrument III--Semantic Differential and Directions

5. A self-addressed envelope to be used to return the instruments.

The above items were placed in a brown envelope.

Distribution of the packets was carried out through the use of the U.S. mail, university mail service and/or by this researcher personally delivering packets to team members. The participants were asked to respond to the three instruments and return the packet to this researcher prior to the scheduled competency team meeting on April 4, 1972.

Procedures Used to Obtain Descriptive Information Relative to the Team Transactions and Outcomes

This section describes the procedures used by this researcher to gather information pursuant to the developmental process. In general, while involved in this investigation, this researcher used the following five major approaches: (1) attendance and participation in team meetings, (2) attendance and participation in sub-team meetings, (3) informal interviewing, (4) formal interviewing, and (5) observation and recording.

During the course of this investigation, three exploratory discussion meetings and 21 regular team meetings were held. This researcher attended all three of the exploratory sessions and all of the regular team meetings. This researcher participated in 48 sub-team developmental meetings where at least one other team member was present. On other occasions, this researcher worked on developmental tasks for the competency team by herself.

Throughout the course of study, this researcher carried out informal interviews with nine of the other thirteen regular and resource team members. Additional information or verification of observations was the type of information sought by this researcher at these times. Formal interviewing during the early stages of this investigation was not carried on by this researcher but during the latter stages of the investigation she did formal interviewing to obtain additional information and verification of observations.

Observations were recorded by this researcher following team and sub-team meetings and interviews. Verification of this researcher's notes was done through discussions at team meetings and informal and formal interviews.

This researcher initially recorded, for each team meeting, information relative to the following seven areas: (1) date of meetings, (2) time spent on developmental tasks, (3) names of team members present, (4) site of meetings, (5) purpose of meetings, (6) transactions of meetings, and (7) outcomes of the meetings.

An effort was made to collect the above indicated information for developmental work done by individuals working alone or in sub-teams of the competency team when the investigator was not present. Each team member was provided with a packet of cards (see Appendix M) and asked to record the time factors, purpose and outcomes when they worked alone or as a member of a sub-team. However, a recording of the requested information was not done by any member of the team. Subsequently, each member was asked to indicate the approximate time factors, purpose, and outcomes of developmental work he had done individually or as a member of a sub-team during the course of this investigation. The data was received as provided from memory or from personal calendars.

During the time in which the team held regular developmental meetings, four sessions were audio taped. At the meeting where the first audio taping occurred, various team members were observed behaving in ways different from the ways they had been observed acting during previous meetings. For example, one individual frequently broke the flow of the team's discussion by referring to the taping. Another team member began to refer in a joking manner that his comments were being recorded. After the fourth session was recorded, it was decided by this researcher and the director of the dissertation that unless there was an obvious benefit from the audio taped data, future sessions would not be recorded. The four recorded sessions had lasted approximately four hours each, and the type of additional information gained from reviewing the tapes did not appear to this researcher to warrant the extensive time necessary for the reviewing. The taping was thus discontinued, due to the fact that it was laborious to analyze, did not appear to be very productive and the recording of team meetings appeared to make some team members uncomfortable.

Observation notes and materials collected during the period of investigation were classified according to general procedures, procedures specific to a topic, decision rules, and developed materials.

Verification of the team's consensus decisions occurred through team discussion of synthesized rules, reaction to various "strawmen" developed from consensus decisions and elicited feedback from team members.

In summary, while involved in the investigation, this researcher used five major approaches for collecting data on transactions and outcomes. The five approaches were (1) attendance at meetings, (2) attendance at sub-team meetings, (3) informal and formal interviewing, (4) observation and (5) recording.

In reviewing the literature pertinent to competency-based teacher education, one soon becomes aware of the apparent lack of information concerning explicitly recommended procedures relative to the selection, organization and/or training of faculty for new roles as well as a lack of direction concerning actual development procedures, that might be employed. Numerous questions, like those stated in this review of literature, remain to be answered. This study represents an attempt to describe the manner in which one group of professional educators went about seeking answers to these questions and solutions to some of the problems.

CHAPTER IV

RESULTS

Introduction

This chapter is divided into three major sections. The first section describes the composition of the MSU mathematics competency development team. The second section describes the initiation and establishment process of the MSU mathematics competency development team. Section three describes the transactions of the developmental process and the outcomes.

Section I: Description of the Composition of the MSU Mathematics Competency Development Team

This section describes the composition of the MSU mathematics competency development team in terms of (a) biographical information, (b) feelings toward the concept of performance/competency-based teacher education programs, and (c) the attitude of team members toward themselves and other team members.

The MSU mathematics competency development team, formally established on April 4, 1972, was composed of 14 members. The following chart identifies the clusters which denote the composition of the teams. Representation on the team is from the areas of mathematics basic content, mathematics education, applied behavioral science, and research and evaluation.

Identification of Team Composition
by Cluster

Cluster	Area Representing	No. Members
A	Mathematics	2
B	Mathematics Education	6
C	Applied Behavioral Science	2
D	Education Evaluation and Research	4
	Total	14

Instrument I: Biographical Information Form

The biographical information obtained from Instrument I, Biographical Information Form, is summarized in Tables 1, 2, and 3. Thirteen of the 14 MSU competency development team members returned completed biographical forms (see Appendix B for a copy of Instrument I).

The team's composition in terms of age, educational experience, and number of males and females is reported in Table 1. At the outset of the establishment of the competency team the mean age of the team, to the nearest whole year, was 39 years with a range of 28 to 58 years. The highest degrees earned by the team members were earned at eight different universities. The team reported attending 21 different institutions while in pursuance of their higher education. At the outset of the study, nine of the 14 individuals had completed doctoral programs while the remaining five held master's degrees and

Table 1

Description of the Composition of the MSU Mathematics Competency Development Team
Biographical/Demographic Information by Cluster

Cluster	Age at Outset of Study (to nearest whole yr.)		University Granting Highest Degree	Representation of Highest Degrees Held	Number of Males & Females	
	Range	$\bar{X}$			F	M
Math Basic Content Reps.	42-58	50	U of M	2 out of 2 - Doctorate	0	2
Math Education Reps.	31-46	36	WSU U of M U of I U of O UNH	4 out of 6 - Doctorate 2 out of 6 - Masters	1	5
Applied Behavioral Science Reps.	33-36	34	MSU	1 out of 2 - Doctorate 1 out of 2 - Masters	2	0
Research and Evaluation Reps.	28-41	35	U of W MSU UW	2 out of 4 - Doctorate 2 out of 4 - Masters	1	3
Total	28-58	39			4	10

MSU = Michigan State University
U of I = University of Iowa
U of M = University of Michigan
UNH = University of New Hampshire
U of O = University of Oklahoma
UW = University of Washington
U of W = University of Wisconsin
WSU = Wayne State University

were currently enrolled in doctoral programs at Michigan State University. The MSU mathematics competency development team was composed of four females and 10 males.

Table 2 describes the composition of the MSU mathematics competency development team reported in terms of university rank, primary department, discipline affiliation, and number of years experience in university teaching.

Of the 14 team members of the competency team; 3 individuals held the rank of full professor, 2 held the rank of associate professors, and 1 held the rank of instructor. Two of the remaining 4 team members were doctoral fellows, 2 were graduate teaching assistants.

The two individuals representing the area of mathematics content reported their primary departmental affiliation was with the Department of Mathematics. The primary discipline affiliations were reported by the above two people as mathematics and mathematics education. One of the individuals held a dual appointment in the Department of Elementary and Special Education.

Four individuals reported their primary department affiliation as teacher education. Of those four people, two reported their primary discipline as teacher education and the two remaining people reported educational psychology as their primary discipline. The Department of Elementary and Special Education was identified by seven people as their primary department affiliation. Elementary teacher education and mathematics education were identified by these seven team members as their primary discipline affiliations.

Table 2

Description of the Composition of the MSU Mathematics Competency Development Team
Biographical University Information By Cluster

Cluster	Rank	Primary Department	Primary Discipline	No. Years University Teaching	
				Range	$\overline{X}$
Math Basic Content Reps.	FP	Math	Math Math Ed.	13-14	13.5
Math Education Reps.	GA DF ATP ASP	EL	Math Ed. TE	1-10	8
Applied Behavioral Science Reps.	DF ASP	TE EL	TE	5-8	6.5
Research and Evaluation Reps.	FP GA I ATP	TE EP	TE EP	1-11	4.3

Symbol	Rank
DF	Doctoral Fellow
GA	Graduate Teaching Assistant
I	Instructor
ATP	Assistant Professor
ASP	Associate Professor
FP	Full Professor

Departments

EP = Educational Psychology
EL = Elementary Education & Special Education
Math = Mathematics
TE = Teacher Education

All 14 members of the mathematics competency development team reported previous university teaching experience. The number of years of experience reported by the team ranged from 1 to 14 years with a mean of 7.18 years university teaching experience.

The individual members of the competency team were asked to indicate the university courses they had taught. It was found that in some cases, courses other than those directly related to a person's primary discipline were taught. For example, individuals representing the area of mathematics education were involved in teaching seminars in elementary teacher education, individualized instruction, introduction to elementary teaching, and common elements for elementary teachers. Four of the six representatives also had had or were involved in supervision of student teachers and/or intern teachers. In addition the two individuals representing the basic content area of mathematics had both previously taught mathematics methods courses for perspective elementary and secondary teachers.

Table 3 describes the MSU mathematics competency team in terms of their reported kindergarten through twelfth grade teaching experiences (K-12).

The three areas of mathematics education, applied behavioral science, and research and evaluation each had representatives who had taught in elementary, junior high and/or high schools. The representatives of mathematics content reported having taught at junior high and high school levels.

The average number of years of K-12 teaching experience reported by the mathematics content representatives was 8 years. Of

Table 3

Description of the Composition of the MSU Mathematics Competency Development Team
Biographical "K-12 Teaching Experience" Information By Cluster

	Teaching Experience K - 12				Non-teaching Experience K - 12	No. Years of K - 12 Experience		Last Year Involved in K - 12 Experience		Supervision Exp. of Std. Tch. or Interns in K - 12
Cluster	Elem.	Jr.	High Sch.			Range	$\bar{X}$	Year	No. Yrs. Since Last Exper	Total Years
Math Basic Content Reps.		X	X		0	4 - 12	8.00	1951 1961	21 11	0
Math Education Reps.	X	X	X		X	4 - 10	5.60	1960 1966 1968 1969 1970	12 6 4 3 2	12
Applied Behavioral Science Reps.	X	X	X		0	7 - 8	7.50	1969 1971	12 1	3
Research and Evaluation Reps.	X	X	X		0	0 - 3	1.63	1958 1968 1969 None	14 4 3	0

the two members representing mathematics content, one reported 4 years of teaching experience and the other person reported 12 years teaching experience. Mathematics education people reported an average of 5.6 years of K-12 teaching experience with a range of from 4 to 10 years. The two applied behavioral science representatives reported an average of 7.5 years teaching experience. One member reported teaching 7 years and the other member reported 8 years of teaching experience. The evaluation and research representative reported an average of 1.63 years of K-12 teaching experience with a range of from 0 to 3 years.

The range for K-12 teaching experience as reported by the entire team was from 0 to 12 years teaching experience with a mean of 5.68 years.

The two mathematics content representatives reported that their last K-12 experience occurred 11 and 21 years prior to the establishment of the competency team. Mathematics education representatives reported a range of from 2 to 12 years with an average of 5.40 years since their last public school experience. The two representatives for the area of applied behavioral science reported their last public school experience had occurred 1 and 12 years prior to the beginning of the study. Research and evaluation representatives reported a range of from 3 to 14 years with a mean of 3.67 years since their last K-12 experience.

At the outset of the establishment of the competency team, the number of years since the team's last K-12 experience ranged from 1 to 21 years with a mean of 7.75 years since their last K-12 experience.

Members representing the areas of mathematics education and applied behavioral science reported having had experience in supervision of student teachers and/or intern teachers.

The 14 MSU mathematics competency development team members reported holding memberships in the following associations:

1. American Association for the Advancement of Science
2. American Association of Teacher Educators
3. American Council on Measurement in Education
4. American Education Research Association
5. American Psychological Association
6. American Teachers of Mathematics
7. Association for Supervision and Curriculum Development
8. Association of Teacher Educators
9. Detroit Area Council of Teachers of Mathematics
10. International Reading Association
11. Kappa Delta Phi
12. Mathematical Association of America
13. Michigan Council for Teachers of Mathematics
14. Michigan Education Association
15. National Council for Teachers of Mathematics
16. National Education Association
17. Phi Delta Kappa
18. Phi Kappa Phi

Instrument II: Attitudes and Feelings Related to the Concept of Performance/Competency-Based Teacher Education

The results of the survey on the attitudes and feelings of the team members relative to the concept of competency-based teacher education appear in Table 4. (See Appendix C for a copy of Instrument II.) Thirteen of the 14 competency team members returned Instrument II.

Respondents were asked to respond to each of 29 items on the following 7-point scale: 1--strongly disagree, 2--disagree, 3--slightly disagree, 4--undecided, 5--slightly agree, 6--agree, and 7--strongly agree. The items were scored in the following manner: the scores on each of the 29 items were added to obtain a total score ranging from a minimum of 29 points to a maximum of 181. One hundred and sixteen would denote a neutral attitude. The mean and standard deviation (S.D.) for each item was reported.

The mean and S.D. for each of the 29 items were also reported by the following subsets: (a) Cluster A--Mathematics Basic Content Representatives, (b) Cluster B--Mathematics Education Representatives, (c) Cluster C--Applied Behavioral Science Representatives, and (d) Cluster D--Research and Evaluation Representatives.

The MSU mathematics competency development team members tended to <u>strongly agree</u> with the following items: (Numbers correspond to items on Instrument II.)

2. I feel it is important that Competency-Based Criteria Teacher Education Programs be developed.

Table 4

Means and S.D. of MSU Mathematics Competency Development Teams
Responses to Instrument II by Cluster

	Questions															
	1		2		3		4		5		6		7		8	
Cluster	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$
Math Basic Content Reps.	0.71	5.50	0.71	6.50	0.00	7.00	0.00	6.00	0.00	6.00	0.00	6.00	0.71	6.50	0.71	5.50
Math Education Reps.	0.55	5.60	0.55	6.40	0.52	6.40	0.00	6.00	0.55	6.40	0.89	5.60	0.00	6.00	0.45	6.20
Applied Behavioral Science Reps.	0.00	7.00	0.00	7.00	0.00	7.00	0.00	7.00	0.71	6.50	0.71	6.50	0.00	7.00	0.00	7.00
Research and Evaluation Reps.	0.50	6.75	0.00	7.00	0.50	6.75	0.58	6.50	0.00	7.00	0.82	6.00	0.58	6.50	0.50	6.75
TOTALS $\bar{X}$		6.15		6.69		6.69		6.23		6.54		5.92		6.38		6.38
S.D.	.80		.48		.48		.44		.52		.76		.51		.65	

Table 4 (continued)

Cluster	Questions															
	9		10		11		12		13		14		15		16	
	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$
Math Basic Content Reps.	0.00	6.00	1.41	6.00	0.00	2.00	0.00	6.00	1.41	6.00	0.00	7.00	0.00	7.00	0.00	7.00
Math Education Reps.	0.55	6.60	2.39	5.20	0.55	2.40	1.64	5.80	0.55	6.60	0.55	6.40	0.55	6.60	0.45	6.20
Applied Behavioral Science Reps.	0.00	7.00	0.71	1.50	3.54	3.50	0.71	6.50	0.00	7.00	0.71	6.50	0.00	7.00	0.00	7.00
Research and Evaluation Reps.	0.50	6.75	2.94	4.00	0.96	1.75	0.50	6.75	0.58	6.50	0.50	6.25	0.58	6.50	0.50	6.75
TOTALS $\overline{X}$		6.62		4.38		2.31		6.15		6.54		6.46		6.69		6.62
S.D.	.51		2.53		1.32		.55		.66		.52		.48		.51	

Table 4 (continued)

Cluster	Questions															
	17		18		19		20		21		22		23		24	
	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$
Math Basic Content Reps.	0.71	6.50	0.71	6.50	0.71	6.50	0.00	6.00	0.71	4.50	0.71	5.50	0.00	5.00	0.00	6.00
Math Education Reps.	0.45	6.20	0.45	6.20	0.00	6.00	0.89	5.60	0.00	6.00	0.45	6.20	0.71	6.00	0.45	6.20
Applied Behavioral Science Reps.	0.00	7.00	0.00	7.00	0.00	7.00	0.00	7.00	0.00	7.00	0.00	7.00	0.00	7.00	0.00	7.00
Research and Evaluation Reps.	1.50	6.25	0.50	6.75	0.00	6.00	1.50	6.25	1.41	6.00	0.00	7.00	0.50	6.75	0.00	7.00
TOTALS $\bar{X}$		6.38		6.54		6.23		6.08		5.92		6.46		6.23		6.54
S.D.	.87		.52		.44		1.04		1.04		.66		.83		.52	

Table 4 (continued)

Cluster	Questions									
	25		26		27		28		29	
	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$
Math Basic Content Reps.	0.00	5.00	0.00	6.00	0.00	6.00	0.71	5.50	0.00	5.00
Math Education Reps.	0.45	5.80	0.55	6.40	0.55	6.40	0.89	5.40	1.79	4.80
Applied Behavioral Science Reps.	0.71	6.50	0.00	7.00	0.00	7.00	0.00	7.00	1.41	6.00
Research and Evaluation Reps.	0.50	5.75	0.00	7.00	0.00	7.00	0.58	6.50	2.06	5.25
TOTALS $\bar{X}$		5.76		6.62		6.62		6.00		5.15
S.D.	.60		.51		.51		.91		1.57	

3. I feel I can contribute to the development of a Competency-Based Teacher Education Program.
5. I think competency criteria for Professional Teaching Behaviors should be identified.
9. I think Professional Teaching Behaviors should be identified by teams of University faculty.
13. I think Professional Teaching Behaviors should be identified by University teams composed of personnel from various University Departments.
15. I think Professional Teaching Behaviors should be identified by University teams composed of personnel from content related Departments, Teacher Education, and public school teachers.
16. I feel I can contribute to the identification of Professional Teaching Behaviors related to my content area.
18. I think that once Professional Teaching Behaviors have been identified, it will be possible for evaluation instruments to be developed.
24. I feel it is important for Teacher Education faculty to model teaching behaviors they wish students to use.
26. I am interested in learning more about the development of Competency-Based Teacher Education Programs.
27. I think Teacher Education faculties at other Universities can benefit from knowledge about the development of a Competency-Based Criteria Teacher Education program at MSU.

Following are the items with which the competency team members tended to agree:

1. I feel I understand the concept of Competency-Based Criteria Teacher Education Programs.
4. I think competency criteria for Professional Teaching Behaviors can be identified.
6. I think competency criteria for Professional Teaching Behaviors which cross content areas can be identified.
7. I think competency criteria for Professional Teaching Behaviors related to specific content areas can be identified (e.g., mathematics, reading).
8. I think Professional Teaching Behaviors can be identified by teams of University faculty.
12. I think Professional Teaching Behaviors can be identified by University teams composed of personnel from various University Departments (e.g., English, education, math.).
14. I think Professional Teaching Behaviors can be identified by University teams composed of personnel from content related Departments, Teacher Education, and public school teachers.
17. I am willing to contribute time to identify the Professional Teaching Behaviors related to my content area.
19. I would use information about the actual teaching behaviors of my students.
20. I would use information about the actual teaching behaviors of my students as part of their evaluation for my class, if they had a concurrent teaching experience.

21. I would use information about the actual teaching behaviors of my students as part of the evaluation I make of my course.

22. I feel I understand the concepts of Assessment, Goal Setting, Objectives, Strategies, and Evaluation, which are currently being taught to MSU Teacher Education students.

23. I think teacher education students learn teaching behaviors through the example (model) I present as I teach them.

25. I think I model the teaching behaviors I want my students to use when they are teaching.

28. I plan to incorporate competency-based instruction in planning courses I teach in the future.

The following item is the one with which the competency team members tended to slightly agree.

29. I am now using competency-based instruction in planning for the courses I teach.

Team members tended to be undecided about item 10,

10. I think Professional Teaching Behaviors (related to math, reading) can be best identified by University teams composed of personnel specializing in the same content area.

and tended to disagree with item 11.

11. I think Professional Teaching Behaviors can be identified by University teams composed of personnel from one Department.

Instrument III: Semantic Differential

The MSU mathematics competency team members responding to and returning the semantic differential instrument numbered 13 out of a possible 14 respondents. (See Appendix D for a copy of the Semantic Differential Instrument.)

The mean score for each of the four scales of each factor (evaluative, potency, and activity) was computed. This resulted in each of the 14 participants having three different factor scores for each participant judging them. The mean factor score for each participant was then computed. The mean factor scores were then computed for each of the four clusters; Mathematics Content, Mathematics Education, Applied Behavioral Science and Research and Evaluation.

Table 5 describes how each of the clusters composing the mathematics competency team viewed all other team members for each of the three factors (E = Evaluative, P = Potency, and A = Activity factors).

In general, for the evaluative factor each cluster viewed all the other clusters as being more good, valuable, fair and pleasant than unpleasant, bad, worthless, and unfair.

For the potency factor each cluster viewed all other clusters as being more gentle, lenient, weak, and safe than they did violent, severe, strong and dangerous.

All other team members were viewed on the activity factor by each cluster as being more easy, fast, active and moving than they were slow, labored, passive and still.

Table 5

Cluster Views of Others

	Evaluative	Potency	Activity
Mathematics (Content)	5.23	3.83	4.75
Mathematics Educ.	5.07	3.77	4.77
Applied Beh. Sci.	5.43	3.79	4.91
Res. and Eval.	5.10	3.67	4.44

MEAN SCORES ON HOW EACH CLUSTER VIEWED THE OTHER THREE CLUSTERS FOR EACH FACTOR OF THE SEMANTIC DIFFERENTIAL INSTRUMENT

(Note: A scale of 1 to 7 is used on the Semantic Differential Instrument with 4 a neutral score.)

Table 6 describes how each cluster was viewed by all other team members. Each cluster was viewed by all others as being more active than inactive, more impotent than potent, and scoring closer to the positive end of the evaluative scale.

Table 7 describes how each cluster viewed each one of the other clusters. Each cluster viewed each other cluster as being more pleasant, good, valuable, fair, gentle, lenient, weak, safe, fast, easy, active, and moving than unpleasant, bad, worthless, unfair, violent, severe, strong, dangerous, slow, labored, passive and still.

Table 8 describes how each cluster composing the MSU mathematics competency team viewed itself on the evaluative, potency and activity factors. Each cluster of representatives viewed itself as more good, valuable, fair, gentle, lenient, weak, safe, fast, easy, active and moving than unpleasant, bad, worthless, unfair, violent, severe, strong, dangerous, slow, labored, passive and still.

Section II: Initiation and Establishment of the MSU Mathematics Competency Development Team

This section is organized into two subsections. The first section describes the series of events that appeared to facilitate the evaluation of the competency team. The second section describes the procedures used to establish the competency team.

Decision to Try to Establish Mathematics Competency Developmental Team

This sub-section describes the circumstances and events that appeared to contribute to the establishment of an MSU mathematics competency developmental team.

Table 6

Clusters as Viewed by Others

Factor / Cluster	Math Content	Math Educ.	App. Beh. Sci.	Res. and Eval.
Evaluative	5.30	5.04	5.93	5.40
Potency	3.51	3.79	3.71	3.59
Activity	4.74	4.59	5.42	4.61

MEAN SCORES ON HOW EACH CLUSTER WAS VIEWED BY THE OTHER THREE CLUSTERS FOR EACH FACTOR ON THE SEMANTIC DIFFERENTIAL INSTRUMENT

Table 7

Clusters as Viewed by Each of the Other Three Clusters

Cluster	Math. Content			Math. Educ.			App. Beh. Sci.			Res. and Eval.		
	Eval.	Poten.	Act.	Eval.	Poten.	Act.	Eval.	Poten.	Act.	Eval.	Poten.	Act.
Math Basic Content Reps.				5.19	3.56	5.10	6.00	3.50	5.69	4.31	3.75	4.38
Math Education Reps.	5.65	3.63	5.05				5.55	3.70	5.28	4.66	3.96	4.31
Applied Behavioral Science Reps.	5.38	3.81	4.88	5.29	3.70	4.58				5.97	3.78	5.06
Research and Evaluation Reps.	4.56	3.63	4.16	4.52	3.93	4.13	6.09	3.72	5.16			

MEAN SCORES ON <u>HOW EACH CLUSTER VIEWED EACH OF THE OTHER TRHEE CLUSTERS</u>

FOR EACH FACTOR OF THE SEMANTIC DIFFERENTIAL INSTRUMENT

Table 8

Clusters as They Viewed Themselves

Cluster	Math. Content			Math. Educ.			App. Beh. Sci.			Res. and Eval.		
	Eval.	Poten.	Act.	Eval.	Poten.	Act.	Eval.	Poten.	Act.	Eval.	Poten.	Act.
Math Basic Content Reps.	5.88	2.88	5.50									
Math Education Reps.				5.40	4.05	4.55						
Applied Behavioral Science Reps.							6.5	3.38	6.13			
Research and Evaluation Reps.										6.06	3.19	4.94

MEAN SCORES ON HOW EACH CLUSTER VIEWED THEMSELVES FOR EACH FACTOR OF THE SEMANTIC DIFFERENTIAL INSTRUMENT

During January and February of 1972, a series of six discussion meetings were held, relating to evaluation issues in competency-based teacher education. Three MSU faculty members (one from the area of applied behavioral science, one from the area of research and evaluation, and one frome mathematics education) and two doctoral students (one from applied behavioral science and one from research and evaluation) attended. The purpose of these meetings was to discuss and explore the various research and evaluation needs related to MSU's Experimental Competency/Performance-Based Teacher Education program efforts.

The first discussions of the committee centered around the evaluation questions related to the product criteria issue central to the CBTE developmental work being undertaken in elementary teacher education. The discussions dealt with the development of studies dealing with residual gain scores of elementary school children. The results of such studies could prove instrumental in the evaluation of the pre-service teachers' related methods courses. As a result of these discussions the members of the committee agreed that a prior need was a systematic identification of professional teaching behaviors. The reason for this being that if significant gains (or losses) in the learning of elementary school children was observed, and we did not document the teacher behaviors that transpired at the time the learning was taking place, we could not tell if our prescriptions for teachers were valid. The identification of explicit and desired teaching behaviors was needed so that they could be systematically taught to teacher education students, so that teacher educators could develop reliable instruments which could in turn be used to test the validity of the identified "professional" teaching behaviors. That is to say, only after the identification of behaviors and the development and testing of related instruments, could pupil growth be studied in relationship to the specific teaching behaviors.

After much discussion, the committee was able to reach consensus on three major focal points. First, that if one was to eventually evaluate teacher behaviors in light of student gain scores, then there had to be gains in something specific. Therefore, the systematic identification of professional teaching behaviors should be content specific rather than generic in nature. The second point of agreement was that the hypothesized "most appropriate" way to identify content specific professional teaching behaviors was through the organization of university staff members into "competency" development teams. And third, the individuals agreed that ideally a competency developmental team should be composed of individuals from a subject matter's discipline, applied behavioral science, and research and evaluation. The preceding three points of agreement provided the direction for future actions taken by members of the research discussion committee.

The first step taken by the committee involved identifying a group of people willing to volunteer their academic expertise and time. Two of the discussion group's members had been working with the MSU Elementary Teacher Education TTT (Training Teachers of Teachers) project in Mathematics Instructional Development. They suggested that individuals who would be willing to explore the idea of establishing a competency developmental team could be identified in the MSU Department of Mathematics. Therefore, it was decided that the first effort to form a competency team would be made in the area of mathematics. An effort would be made to include in the competency developmental team representatives from the areas of mathematics content, mathematics education, applied behavioral science, and research and evaluation.

It was decided that one of the committee members would contact the selected individuals. The individuals would be asked if they would be interested in attending a meeting for the purpose of exploring the feasibility of forming an elementary mathematics competency development team.

Six individuals, two people from the Department of Mathematics, two representing mathematics education and two people who worked in the area of teacher preparation, were contacted. (Three of the above were members of the research discussion group.)

There was a general feeling of agreement among the research discussion members that if individuals from the area of mathematics were not interested in discussion or establishment of a competency team, then individuals from another content area would be identified and contacted.

Establishment and Initial Organization Procedures Related to Mathematics Competency Team

This section describes the initial meetings with individuals who indicated an interest in establishing a mathematics competency development team. It also describes the selection of regular team members and resource personnel, and the initial organizational procedures and decisions of the mathematics competency team.

The initial meeting for the purpose of exploring the possibility of establishing a competency team was held in the evening of March 2, 1972, at the home of one of the potential team members. The six individuals representing the areas of mathematics content, mathematics education, and applied behavioral science attended.

There were three questions posed at this initial meeting. These were derived from the earlier research discussion sessions and were posed by the professor representing the area of applied behavioral science. They were:

1. Is there a desire/willingness among individuals present to explore the idea of forming a mathematics competency development team? (The fact that there were no funds available for compensation was communicated to the group.)
2. Is it possible to identify specific "Professional Teaching Behaviors" related to the teaching of mathematics?
3. What are teaching behaviors which mathematics personnel currently value?

The group decided to begin their discussion with the questions of preferred mathematics related teacher behaviors. Individually, they felt that they did not have enough information to begin discussion with either of the other two questions.

Each participant's agreement with the following summary of the discussion related to teacher behaviors was determined by questioning participants at the end of the discussion. Participants indicated (at the time) that they agreed with the following statements concerning mathematics related teacher behaviors:

A. Teachers should be able to answer the following two questions: 1) "Why did I do that?" and (2) "What did I expect to change?"

B. Teacher decisions concerning mathematics activities should be based on learner's needs. There was a general feeling that an appropriate teacher behavior was the ability to look at learner behaviors.

C. Record keeping skills were important teacher behaviors. These would facilitate a teacher answering the questions, "What am I doing?" and "What do I expect to change?" Examples for selection of mathematics activities were: 1) need for practice, 2) "enrichment," and 3) continuation.

D. A desired learner outcome was identified as contemplative behavior. Contemplative behavior was defined by the following example: A child when presented with a problem asks, "How might I go about finding an answer to that question?" Teacher behaviors which lead to contemplative learner behavior are:

1. Providing or building on experiences familiar to students' experiences. (Beginning with the familiar and moving to something new.)
2. Use of concrete materials or experiences. (How much money is spent on tobacco in this school each day?)

3. Use of second order questions. (Teacher wants students to eventually demonstrate use of multiplication algorithm. Teacher asks, "How many tiles are on this floor?")
4. Teacher answers learner questions with general responses to mathematics practice activities or questions.

E. There were five points concerning teacher behaviors related to mathematics practice activities.

1. The most desired teacher behaviors would be when teachers provided an environment such that learners, usually, see the need for practice and initiate related activities.
2. On occasion, the teacher may give a practice assignment to an individual student. The content of the assignment is determined from observation of learner behaviors. Practice assigned to an individual by a teacher is less desirable behavior than learner initiation of practice work.
3. On some occasions, the teacher provides members of a subset of the class with the same practice assignment. This teacher behavior is less desirable than teacher assignments given to individuals.
4. The teacher should not ask an entire class to do the same practice assignment.

5. The variables within practice assignments should be altered by the teacher or learner so that practice assignments do not become repetitious.

Following the summarization of the discussion of teacher behaviors, the three questions posed at the beginning of the evening were asked a second time. When posed a second time, the questions elicited the following summarized reactions:

1. In response to the question of desire/willingness among individuals present to explore the idea of forming a mathematics competency team, there was agreement among the individuals that the evening's discussion had been "exciting" and "professionally beneficial." The individuals stated that they would like a) to meet for discussion a second time, and b) invite additional people to participate in the discussion.
2. In response to the possibility of identifying specific "Professional Teaching Behaviors" related to the teaching of mathematics, some members felt that identification of specific teaching behaviors related to mathematics would be an impossible task. Everyone agreed that if specific teaching behaviors could be identified, it would be a long, hard task. Individually, the members said they felt they were committed to at least one more exploratory meeting. The group was then asked to be prepared to respond at the next meeting to the following: a) What kind of commitment do you have to the philosophical position of competency-based

teacher education? b) What kind of commitment are you willing to make to the task of identifying mathematics related teacher behaviors? c) What type of discipline representation should a competency team's membership reflect?

3. In response to the question pertaining to teacher behaviors which mathematics personnel currently value, the temporary leader indicated that she felt that the "Tasks-of-Teaching" teaching model (assessment, goal setting, strategies and evaluation) could be used as an organizer once teaching behaviors were identified. For example, teacher skills of assessment and evaluation could be inferred from the mathematics personnel's preference that teachers give assignments based on learners' needs. Contemplative learner behavior (problem solving skills) may relate to beyond school goals as defined by the model. It was felt that the topic of relating the "Tasks of Teaching" model to mathematics teaching behaviors could be discussed further at the next meeting.

During the week of March 19th, representatives from the Departments of Mathematics and Applied Behavioral Science were contacted to see what additional people should be invited to the March 31, 1972 meeting. Fourteen individuals were invited to participate in the discussions. However, it was impossible for the 14 people to meet on a single date due to previous commitments. Such things as attendance at out-of-state conferences, teaching schedules and consultant appointments were types of conflicts verbalized by the invited participants. In order to determine whether it would be possible to establish a mathematics competency development team, it was decided that the group would meet in two sections, March 31 and April 4, 1972. This researcher attended both meetings.

The idea of establishing an MSU mathematics competency development team had originated with the members of the research discussion group. It was assumed by this researcher that the discussion leader of the exploratory sessions on establishing a mathematics competency team would be the mathematics education member of the research discussion group. However, due to an overseas teaching assignment this person would be absent during the upcoming 12 weeks. In his absence, the applied behavior science person, also a member of the original research discussion group assumed the role of discussion leader during the exploratory competency team meetings.

On the evening of March 30, 1972, the discussion leader met with this researcher and an individual from the area of research and evaluation to plan the meetings on March 31 and April 4, 1972, and to provide the framework for initial facilitation of discussion among participants.

The following items were identified at the above mentioned meetings as possible discussion topics which might prove helpful in making individual decisions:

I. Purpose of Competency Team's Task (Hoped for Outcome)

   A. Can <u>identification of</u> "Professional Teaching Behaviors," as related to mathematics, be identified?

1. Should identified behaviors (objectives) reflect the values and philosophy of the MSU competency development team?

2. Can objectives based on identified behaviors then be used for a (the) competency-based teacher education program in mathematics?

B. Can instruments be developed to determine whether pre-service teachers demonstrate desired behaviors in a field setting?

C. Should the validity of behaviors and instruments be determined by the mathematics competency team?

II. Establishment of a Competency Team.

A. How will we define a mathematics competency team?

B. How will competency team members be selected?

III. Selection of Mathematics Area for Development.

A. What area(s) should be selected for development?

B. What criterion should be used in the selection of a mathematics area for development?

IV. Beginning Task of Professional Teaching Behavior Identification.

A. What further information is needed by participants?

B. What types of situations, questions, problems, experiences will elicit statements of behaviors from competency team members? (e.g., common stimuli in the form of observations, tapes, written situations, or written questions).

Generally, the procedures for the two meetings were the same. The March 31, 1972 meeting was held on the campus of MSU at 1:30 p.m., and was attended by six individuals representing the areas of applied behavioral science, evaluation and research, and mathematics education. The April 4, 1972 meeting was held in a private home and was attended by seven individuals representing mathematics content, applied behavioral science and mathematics education.

The meetings were begun by the discussion leader recalling that the major task for individuals present was to decide whether a MSU mathematics competency team should be established. If the establishment of a competency team was deemed desirable and feasible, individuals then needed to decide if they personally wished to participate.

At this point, there were verbal comments from those in attendance indicating they would be interested in some form of participation. However, as a group or as individuals the participants were not asked to make a firm commitment to the project at this time, but would be in the near future.

The following six items represent the topics actually discussed during the two meetings:

1. Statement of background information on what brought forth the perceived need for establishment and study of a competency team.
2. Suggestions of topics that appeared to necessitate consideration by competency team members.

3. Discussion of decision-making about individual participants and why they were considered as potential members of a MSU mathematics competency team.

4. Discussion of decision-making about the definition of membership of a mathematics competency team.

5. Discussion and selection of areas(s) within the discipline of mathematics for development.

6. Discussion and decision-making about how to initiate further discussion of possible roles of the team members selected for the competency team.

A More Detailed Description of Transactions

The discussion leader began each of these first two meetings by describing the results of the research discussion group meetings relative to the establishment of the mathematics competency team. Included in the description were the following points with an accompanying rationale: (1) University staff members were needed to undertake the task of systematically identifying professional teaching behaviors. (2) Teaching behaviors needed to be identified in context with a specific content area. (3) A competency team established for the purpose of identifying professional teaching behaviors should be "collaborative" in the sense that it needed to include members from a specific content discipline, applied behavioral sciences, and research and evaluation. (4) It was not known what the developmental task would encompass before completion. The discussion leader also included in her remarks the reasons for making public the above stated beliefs. These were: (1) to provide information to possible participants, (2) to initiate discussion, (3) to initiate questioning of positions, (4) to model willingness to share, discuss, and modify philosophical positions, and (5) to model a willingness to seek information or understanding of other philosophical positions.

Several times during each meeting the discussion leader reassured the group that individuals did not need to be in agreement with philosophical positions presented; in fact, diversity of opinion would be productive of more optimal decision-making in the long run. It was further stated that individuals representing the areas of mathematics content and mathematics education did not need to agree among themselves philosophically pertaining to mathematics or mathematics instruction. It was pointed out, however, that it was hoped that individuals indicating a desire to participate on a team would display a willingness to explore the philosophical and practical implications of competency-based teacher education.

The discussion leader described the major outcome (product) of a competency team in terms of instruments that could be used for observing teacher behaviors related to elementary mathematics instruction and instructional design. The discussion leader further described for the groups' information the historical development of instruments related to teacher behaviors (e.g., Hughes, Ryans, Flanders). It was felt that the form and content of needed instruments would emerge as the competency team's developmental work progressed.

Suggestions for Consideration by a Competency Team

The suggestion was made that a competency team might want to consider the importance of studying professional teacher behavior in terms of an ongoing decision process (sequence) and decision(s).

It was further suggested that the "Tasks of Teaching" model could be used as the organizational basis for describing teacher behaviors and the teacher decision process.

The following description of mathematics competency was proposed for future consideration. A mathematics competency should incorporate (a) knowledge, (b) performance, and (c) changes in learner behavior.

Individual Commitment to Task

As a result of the March 31 and April 4, 1972 meetings, two individuals from the area of applied behavioral science, four from research and evaluation, one person from the Department of Mathematics and six from the area of mathematics education expressed and indicated a commitment to and/or interest in participating in a mathematics competency development team.

The question was raised as to how much time and manpower would be necessary to develop one or two mathematical areas, as yet not defined. It was decided by the competency team that the answer to this question could only be determined as involvement in the development task was undertaken. Individual members of the team at no point indicated that time was or would be a factor in their decision to participate.

Definition of Competency Team Membership

Those people attending the competency exploratory meetings individually agreed with the recommendation and perceived need to establish a competency team whose membership included representatives from the areas of mathematics content, mathematics education applied behavioral sciences, and education research and evaluation.

During the April 4, 1972 meeting the following decisions relative to the selection of participants for a MSU mathematics competency development team were made:

1. The area of mathematics would be represented by two professors. The individual who had represented the area of mathematics during the exploratory meetings would be responsible for recruiting the second representative.
2. The area of mathematics education would be represented by six individuals.
3. The area of applied behavioral science would be represented by two individuals. The two individuals were this researcher and the discussion leader. The decision to select only two people from this area was based on the feelings of the discussion leader. She felt that two individuals would contribute the appropriate balance for collaborative team development since there were only two from mathematics.
4. Four individuals were identified from the area of research and evaluation and would act as resource people for the competency team.

Thus, the MSU mathematics competency development team was composed of ten regular team members and four resource people.

Identification of Content Area to be Developed

At both of the second exploratory meetings individuals from the areas of mathematics content and mathematics education explained that in the discipline of mathematics there is not a universal definition of what is or is not included in specific areas. It was decided that the area of "whole numbers" would be the first area developed.

Whole numbers was the area selected because it appeared to be a "fairly specified" area nad it is the area most intensely taught in schools, grades K-8. Therefore, the investment made in terms of development by the competency team could have practical application for the mathematics content and mathematics education personnel in that the materials developed relating to whole numbers could be used in mathematics content and mathematics education courses.

Definition of mathematical terms was identified as a task which would be necessary to help reduce future criticism of the materials developed. At this time, the competency team agreed that whole numbers would include: counting, classifying, ordering, matching, numeration, properties and operations, and number theory.

Discussion and Decisions on How to Begin

The question, "What do we do now?" was posed to the group meeting on the night of April 4, 1972. To facilitate understanding of the manner in which this question was ultimately answered, it appears pertinent to supply the reader with some background information.

In the State of Michigan, one of the primary areas which citizens and school personnel have identified as important for school learners is "mathematics" (The Common Goals of Michigan Education, 1971). The Board of Education for the State of Michigan appointed a task force, composed of educators, students and lay citizens from throughout the state to identify educational goals for Michigan school children. These "goals" were specified and eventually approved by the collective State Board members. For the area of mathematics, another task force was also subsequently selected. This task force was composed of school teachers, administrators, mathematicians, and mathematics educators from throughout the state of Michigan. It was the responsibility of the mathematics task force to identify performance objectives for Michigan's elementary school children. This task was carried out and a document, entitled Minimal Objectives for Mathematics Education in Michigan, was printed in 1972. It is important to note that five of the members of the MSU mathematics competency development team served on this mathematics task force.

In addition, to better understand the decision-making regarding the "where should we begin?" question, it should be noted that the group began by recalling certain "biases" that were expressed and supported at previous discussions. These statements appeared to have influenced the group's decisions as to where and how they should begin the developmental task.

1. Individuals present at the first exploratory meeting remembered that as they discussed valued teacher behaviors, they consistently first thought about "What learners should be able to do."
2. Individual team members generally felt that it was not logical to identify, discuss, clarify, and/or verbally describe teacher behavior in isolation from pupil outcomes.
3. Team members generally agreed that teacher education has only a limited amount of time to train teachers and that time is better spent, therefore, training for teacher behaviors which are related to "valued" pupil behaviors.

One of the decisions made at this April 4 meeting, therefore, included one to review the State's list of minimum mathematics objectives. To avoid singularity of view, however, they also decided to review the performance objectives stated in the <u>Brevard County Mathematics Continuum</u>. Based on review of these two suggested lists of pupil outcomes, the objectives which belonged in the area of whole numbers (as defined by the mathematics competency team) would then be identified. Following the identification of objectives related to the area of whole numbers, redundant objectives were to be discarded. Finally, the collapsed and non-redundant list of whole number objectives would be printed. Team members representing the areas of mathematics content and mathematics education would then be provided the list of objectives and would individually rate the objectives in terms of perceived value of pupil outcome from his/her own point-of-view.

A numerical rating scale ranging from a low of one to a high of five was recommended.

Role of Mathematics Competency Development Team

The competency team decided that at this time they did not want to research further any previously identified teacher behaviors or instruments. The participants from the mathematics areas felt they should be free to use individually whatever resources they wished, but that decisions should not be made by previously developed instruments or tests. Therefore, the validity of the recommended teacher knowledge and performance behaviors and the developed evaluation instruments would be determined on the basis of the "professional consensus" of the competency team, until such time as correlative research on pupil growth could be undertaken.

Role of Individuals

This researcher in the role of a team member was assigned the tasks of (a) synthesizing the two lists of mathematics objectives, (b) collaborating with the team's discussion leader to determine a format and system for obtaining data relative to preferred learner outcomes, and (c) distributing the list of objectives to the mathematics content and mathematics education participants.

April 7, 1972 Through the Morning of April 27, 1972

The activities which occurred from April 7 through April 27, 1972, were many and varied. This section provides a description of those activities. The tasks which needed to be accomplished included

(a) development of mathematics objectives instrument, (b) participants responding to mathematics objectives instrument, (c) tallying and analysis of responses, and (d) planning for the competency team's April 27, 1972 afternoon meeting.

By April 13, 1972, it became apparent that this researcher would not be able, on her own, to synthesize the Minimal Program Objectives for Mathematics Education in Michigan with the Brevard County Mathematics Continuum. Given what seemed to be the same mathematics content, the lists appeared to differ in terms of expected pupil behaviors (e.g., pupil manipulation of concrete objects versus a paper/pencil task). Therefore, it was felt that the value decisions concerning inclusion or exclusion of objectives from the two lists should be made by the mathematics content or mathematics education personnel.

This researcher met with the participant from the Department of Mathematics on April 13, 1972. Through an analysis of the mathematics content included in both lists of objectives, it was determined that the content of the Brevard County Mathematics Continuum related to whole numbers was adequately covered by the Minimal Program Objectives for Mathematics Education in Michigan. It was further acknowledged that the Brevard County Mathematics Continuum was oriented toward a particular commercial mathematics textbook series and to paper/pencil tasks. It was, therefore, decided that the Brevard County Mathematics Continuum would not be used and the Minimal Program Objectives for Mathematics Education in Michigan (in working form, 1972) was copied and distributed to the appropriate people. Thus, the developmental activities were underway and the initiation, establishment, and organizational procedures used to bring about the MSU mathematics competency development team's work were terminated.

Competency team members representing the areas of mathematics content and mathematics education would, individually and without communicating with one another, respond to the mathematics objectives instrument (see Appendix A).

The members of the competency team also agreed to individually respond to three data gathering instruments: (1) a biographical form, (2) a semantic differential instrument, and (3) an instrument assessing each participant's interest and value of competency/performance-based teacher education. The data from these three instruments were to be used as part of this study to help describe the composition of this competency team.

Selection of date for next meeting. It was decided on April 4 that the next meeting of the competency development team would be April 27, 1972, at 1:00 p.m. This date was selected because various team members in mathematics content and mathematics education would be attending the annual conference of the National Council of Teachers of Mathematics in Chicago, Illinois. Also, time was needed to synthesize objectives, develop format and system for responses, reproduce the results of the State Minimum Objectives task force and to disseminate the copies. Further time was needed to allow for individuals to respond and the tallying of responses. In addition, the time provided would allow for the development of the three instruments needed to collect descriptive data concerning each team member.

Section III: Transactions and Objectives of the Developmental Process

Transactions Related to Determination and Role of Discussion Leader

This section describes the procedures utilized to determine the discussion leader and the nature of his/her role, the managerial and time needs, and the various stages of development.

The MSU mathematics competency team at no time formally selected a chairperson or discussion leader. The university staff person representing the area of applied behavioral science functioned as the discussion leader during the exploratory sessions. She also assumed and carried out the role of discussion leader for the competency team meetings held during the eleven months of development reported in this study.

The factors which appeared to have contributed to this particular person's emergence as the Mathematics competency development team's discussion leader, are as follows:

1. The mathematics education representative who had been present at the research-discussion sessions was fulfilling an overseas teaching assignment.
2. The person who became the discussion leader was one of the three faculty members of the research discussion group where

the initial idea to explore the possibility of establishing a competency team originated.

3. This particular person acted as the discussion leader for the exploratory sessions, held to determine whether or not a mathematics competency team should/would be established.
4. The university staff representative from the area of applied behavioral science (discussion leader during exploratory sessions) and this researcher was responsible for synthesizing the results of the rankings of objectives done by the mathematics content and mathematics education representatives. Therefore, prior to the April 27, 1972 competency team meeting, these two people met and developed a system for reporting the results of the mathematics content and mathematics education representatives rankings of the Minimal Objectives for Mathematics Education in Michigan (1972) for the area of whole numbers. Based on the analysis of responses the two applied behavioral science representatives also identified questions for discussion and a suggested format for the April 27, 1972 competency team meeting. The role of discussion leader was not a function appropriate for this researcher to assume as a participant-as-observer. Hence, the university faculty applied behavioral science representative accepted the responsibility (as temporary discussion leader) for presenting the synthesized results of the ranking of the objectives and suggested format for the team's meeting on April 27, 1972.

At the beginning of the April 27th meeting the temporary discussion leader asked the competency team members to express their suggestions for a different or modified system of analysis, set of discussion questions and/or discussion leader. The team accepted by group consensus the system for analysis, the suggested discussion questions and the discussion leader for the April 27, 1972, team meeting.

At the end of the April 27 meeting the team decided to continue their discussion concerning appropriateness of the objectives at the next team meeting. The temporary discussion leader asked if someone else would like to function as discussion leader during the next meeting. The team agreed that they would prefer to have the same discussion leader at least for the next session. Therefore, the discussion leader continued in that role. By the time the discussion topics changed, the team's developmental procedures had become established. Thus the temporary discussion leader continued in the role of discussion leader during the eleven months of development work reported in this study.

The manner in which the team preferred the discussion leader's role to be executed was determined in part by the team members' decisions relative to their roles. For example, the team agreed that (a) decisions would be reached by consensus rather than by majority rule (or some other way) and (b) each team member in fact had something to contribute to decisions. Hence, it was the responsibility of the discussion leader to (a) see that all positions were heard and (b) make sure that when decisions were made they were in fact based on the team's consensus agreement. For example, during the team's discussions relative to the desirability of specific objectives it was apparent that there was a wide diversity among the various positions held by team members. As each objective was discussed the discussion leader first made sure that each team member had expressed his/her particular position. The discussion leader through questioning, asking for specific example, and doubling on a speaker, also facilitated the team's ability to perceive the similarities and "real" differences in the various positions. These initial behaviors on the part of the discussion leader helped the team to center their discussions around the resolution of the "real" problem. Team members also began to exhibit questioning and clarification behaviors themselves during ensuing discussions.

At times it was necessary to leave a particular problem unresolved; however, the discussion leader would bring the topic up for further consideration at a later date. (Obtaining consensus relative to a specific problem sometimes took several weeks.)

The role of the discussion leader also involved the responsibility of helping the team to remain consistent in their decisions. For example, the team having reached agreement on a specific point might at a later date reach an agreement, on a related topic, which was not consistent (in conflict) with the first decision. At this time the discussion leader would recall for the team the first decision and point out its inconsistency with the second decision. The discussion leader facilitated a reconsideration of both decisions rather than simply a change in the second decision. During the course of development team members themselves became proficient at identifying inconsistencies in their development work. At times the team revised their first decision to be consistent with their new position. At other times the team resolved the conflict by changing the second decision. There were times when the team agreed that as a team they held conflicting positions. The team members would further agree that at that time they could not resolve them.

The conflicts left for later resolution were resolved in two ways. One way was that at a later date the discussion leader would present to the team members the two positions for further consideration. At these times one might hear such comments as, "I thought you'd forgotten about that." The second way which the conflicts that were "tabled" for later discussion were resolved was through the team's discussions of related topics. At times the team found that if it would go on to another topic it would "learn" something that contributed to their understanding of questions which they could not previously resolve.

The role of the discussion leader included questioning team members, synthesizing discussions and decisions, and recalling previous positions, decisions, and resolved questions.

Developmental Transactions

The competency team's general developmental procedures included the following. (a) The team identified similarities and differences in various philosophical positions during team meetings. (b) The team developed specific materials (e.g., objectives, instruments) either during team meetings or at subteam meetings held between developmental sessions. (c) The team at meetings reviewed, revised, or in general reacted to previously developed and printed materials. (d) The team, when possible, "tried" the materials in appropriate (e.g., assessment of pupil pre-number skills) contexts. (e) The team continued development, further reacted to, or revised materials.

The procedure of between-session development, followed by the team reacting to the materials continued until the team was satisfied for the present with the developed materials.

The MSU mathematics competency development team continuously explored the use of different types of developmental procedures. The following describes examples of the various developmental procedures used by the competency team.

In general, the team first discussed their various philosophical positions relative to a given discussion topic. The discussion leader and various team members played an active role in the clarification and identification of similarities and differences. Thus, philosophical discussions and resolution of identified differences were usually the first items tackled in any given area (e.g., "Why do we teach children patterning?"). When the team tried to proceed with development in a particular segment of the area of whole numbers, without first obtaining philosophical agreement, they were not usually able to advance successfully in their development work. If a philosophical question had not been previously discussed in a team meeting, it continued to arise causing a diversion from the specified task at hand.

Resolution of philosophical questions did not appear to result in the compromising of anyone's personal position. Positions which gained the team's consensus included the best ideas and/or points of the differing positions. Members were not willing to compromise for the "sake of argument," "to get on with the task at hand," or "because you have a higher rank and therefore know more." Therefore, some questions or problems were discussed over several weeks. These discussions did at times lead to a change in positions held by team members or the identification of a new position that would be consistent, and also compatible with both positions.

The competency team used common stimuli in all their developmental procedures. A common stimulus acted as a point of departure for a given team discussion. The common stimuli used by the team were printed materials, verbal questions or verbally described situations. Examples of printed common stimuli used by the competency team are (a) the original list of minimal objectives in mathematics, (b) synthesized lists of objectives, (c) tentatively developed pupil assessment instruments, (d) developed lesson plans, and (e) tentatively developed items for teacher behavior assessment instruments.

Based on observations it appeared that the printed common stimulus aided discussions and decision making among the competency team members. Team members appeared to realize this and most team sessions ended with an assignment of a specific task to individual(s) which were to be submitted for reaction at the next team meeting.

The team's practice of using printed materials whenever possible contributed to the resolution of certain types of problems.

For example, a tentative pupil assessment instrument appeared to contribute to the actual operationalizing of a previously verbal commitment to the assessment of pupil (a) knowledge, (b) skills, and (c) attitudes as related to mathematics. In another situation an outline provided team members, who were skeptical about the apparent lack of affective learning tasks and strategies included in the development work, with the evidence that affective concerns were being considered.

Printed stimuli were also used as a method to bring team members up-to-date as to the direction their decisions were taking them (e.g., lists of developed objectives based on consensus team decisions). On other occasions, the printed common stimulus appeared to help move the team off "dead-center" in discussions and advance the practical development work.

Examples of verbal questions which acted as common stimuli are as follows:

1. How are the following mathematical terms defined: whole numbers, pre-number, classification, patterns, ordering, numeration, cardinality and place value?
2. Why do we teach children classification, patterning, ordering, cardinality and place value skills and concepts?
3. What are the different types of patterns children should be able to construct?
4. If a teacher determines a child cannot construct a given type of pattern, why is it important for her to teach the child the skill?

5. What type of learning is involved in the classification, ordering, patterns, cardinality, place value objectives?
6. Should the technique used for teaching a child be directly related in any way to the type of learning found in a given objective?
7. Should both convergent and divergent tasks be included in objectives?
8. When is it appropriate to use concrete, symbolic and abstract materials?
9. How does informal teaching differ from incidental teaching?
10. How do we differentiate between instructional and assessment questions?
11. What are the prerequisites for numeration?
12. Are there prerequisites for the prenumber objectives?
13. Should teachers assess a child's mathematics related knowledge and skills?
14. Should a teacher assess a child's feelings and attitudes toward mathematics and mathematics related activities?
15. How much do teachers need to know about a given component? For example, does a teacher need to know all the objectives related to whole numbers?
16. Does the concept of the "Tasks of Teaching" (assessment, goals/objectives, strategies, evaluation) seem to be a realistic (philosophically and practically) way of organizing our thinking concerning teacher behaviors?

17. At what point is a skill or concept broken down to a point that a child will have a problem applying the superordinate concept or skill?

The team members did not usually work on the development of new materials during regular team meetings. It was the team's general procedure for subteams to work on the development of new materials at specially scheduled between-meeting work sessions. Thus, the team's procedures for team meetings were discussion and reaction to previously developed materials.

One of the initial problems for which the team had to develop procedures was for handling differences in language. Differences in education-related vocabulary among the clusters comprising the team were observed. The differences in education-related vocabulary between the representative from the area of mathematics content and those people in the applied behavioral science cluster appeared to be more bothersome than the other combinations. For example, for several weeks the words "informal" and "incidental" teaching were used in ways that appeared to be interpreted synonymously by some participants. Finally, when someone asked various team members to explain what each of the words meant, it was apparent that different meanings did exist. Some people perceived the two words as having distinct meanings as teaching techniques, others saw them as having an incidental association with learning but not a teaching technique and others thought they were synonymous.

As a result of these differences in meanings brought to educational-related vocabulary by various team members, a frequent request was, "Give an example of what you mean by that." Other ways by which team members demonstrated a realization of the importance of not assuming understanding of either frequently or infrequently used terms was through doubling on a speaker and/or by giving analogies of a given speaker's statement.

The differences among the type of background, content knowledge, and experiences among team members appeared to contribute to both broad discussions and frustration. Therefore, another of the team's activities included direct instruction. For example, the people representing the area of applied behavioral science were on a number of occasions "taught" the mathematics skill or concept under discussion. On other occasions the representative from the applied behavior science "taught" concepts such as "Tasks of Teaching" and "types of learning" to the other team members.

Problems related to the study of a university competency team whose membership included members of the researcher's doctoral committee did not arise. During the course of the investigation neither this researcher nor any of the members of her doctoral committee were aware of or expressed concerns relative to the emergence of personal and/or professional problems as previously discussed might occur.

No team meetings were held unless one of the representatives from the area of applied behavioral science was in attendance. One meeting was cancelled due to the fact that neither this researcher or the other representative from the area of applied behavioral science would have been able to attend.

Managerial and Time Transactions

This section describes the procedures used by the MSU mathematics competency development team relative to time, notification, frequency and duration of team meetings and subteam work sessions. Table 9 describes the data relative to team meetings. Table 10 describes subteam developmental sessions.

Team Meetings

Twenty-one competency team meetings were held between March 24, 1972 and December 6, 1972. Two of the 21 sessions were organizational in purpose while 19 of the meetings were developmental working sessions.

At the end of each session the date, time and place for the next meeting was determined through consensus agreement by the team members. Team members took into consideration: (1) the time it would take individuals or team subgroups to finish assigned development tasks, completion of which were necessary for the next team meeting, and (2) team members available for sessions. An unspoken rule observed operating was, "It was more desirable to have all three areas represented at team meetings than 100% representation from any one area."

The area of mathematics content was not represented at two working sessions. After both of these sessions this researcher, acting in the role of liaison, met with one of the representatives from the area of mathematics content. The representative was asked to react to the direction the team had taken at its last meeting. This researcher, again acting in the role of a liaison person, then

Table 9

Team Meetings

DATE	MATH CONT.	MATH ED	APPLIED BEH SCIENCE	RESEARCH AND EVAL	TIME NO. HRS. PER SESSION	PLACE
March 24	1	2	2		4.0	E/H
31		1	2	3	1.5	A/C
April 4	1	3	2	1*	2.5	E/H
27	2	3	2	2*	2.0	A/C
May 4	2	5	2	2	2.0	A/C
11	1	3	2	1*	1.75	A/C
17	2	3	2	1*	2.0	A/C
17	1	3	2	0	5.0	E/H
June 1	1	2	1	0	1.25	A/C
8	1	3	2	1	1.00	A/C
14	1	3	2		4.5	E/H
22	1	3	2	*	3.0	E/H
29	1	4	2		4.0	E/H
July 13	1	4	2	*	4.0	E/H
20	1	2	1		3.0	E/H
Oct. 11	1	2	2		4.5	E/H
18	1	3	1	*	2.0	E/H
25	1	2	2		3.0	E/H
Nov. 1		3	2		3.5	E/H
15	0	3	2		3.0	E/H
Dec. 6	1	4	2		1.0	E/H
Total 142 =	21	61	39	11	58.5	

average time
21 sessions, 7 on campus, afternoons = 1.64 hrs.
14 at home = 3.36

7722 in total session man hours

NUMBER OF REPRESENTATIVES

Math = 2
Math Education = 6
Applied Behavioral Science = 2
Research and Evaluation = 4

* VISITORS

Place
C = On Campus
H = Member's home
Time
A = Afternoon
E = Evening

Table 10

Sub-Team Work Sessions: Attendance of Participants

Month	Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.		Jan.	
No. Sub-Team Meetings	1		16		7		3		1		3		0		7		3		3+		4	
REPRESENTATIVES	p*	h**	p*	h**	p*	h**	p*	h**	p*	h**	p*	h**	p*	h**	p*	h**	p*	h**	p*	h**	p*	h**
MATH BASIC CONTENT REPS			1	1							1	.5					1	1.0				
MATH ED REPS			1	1			2	4.0	1	1.25	1	5.0			2	16.34	1	1.5	1	2	1	10
APPLIED BEH. SCIENCE REPS	2	3.5	2	48.5	2	48.25	2	8.0	2	2.50	2	12.5			2	17.25	2	7.5	2	58+	1	10
RESEARCH AND EVALUATION REPS	1	3.5			1	1.00																
TOTALS	3	7.0	4	50.5	3	49.25	4	12	3	3.75	4	18.0			4	33.59	4	10	3	60	2	20

p* = Total number of participants attending sessions.
h** = Total number of hours per session.

communicated the reactions of the mathematics content representative to the remaining team members who had been assigned development tasks between sessions. The area of mathematics education was represented at all team meetings.

Notification of Team Meetings

This researcher had the responsibility for reminding team members of a scheduled team meeting. Team members received either a telephone call or memorandum one or two days prior to a scheduled team meeting, reminding them of the date, time, and place of the session (see Appendix F).

Number of Sessions and Time Involved

Of the 21 team meetings, 7 were held on campus during the afternoon. These sessions lasted from 1 to 2 hours with an average time spent of 1.64 hours. The 14 competency team meetings held in the evening ranged in length from 1 to 5 hours, the average working time being 3.36 hours. The combined time for afternoon and evening meetings totaled 58.5 hours (Table 9).

In addition to the team meetings, approximately 48 sub-team developmental work sessions were held during the 11 months of development included in this investigation. Approximately 264 hours were spent in sub-team development tasks (Table 10).

Attendance

The team members readily agreed that due to the age of the discussion leader's children, they would be willing to hold all evening meetings in the home of the discussion leader. On other occasions, several of the participants also brought their children to the meetings. They either played with the other children or served as "guinea pigs" for some of the assessment or strategy activities being worked on at the time. On a number of occasions, various team members volunteered to have a meeting in their home if the discussion leader was finding it a hardship to have all the meetings at her house. Evening sessions, at which the discussion leader was present, were held in her home. These sessions usually began with coffee and tea being served and since the meetings went until late, nightcaps were served late in the evening. (Numerous bottles of brandy were served over a period of time.)

Campus meetings were held in the mathematics building unless space was not available. When space was not available in the math building, the team met in the education building.

The attendance at evening sessions ranged from 5 to 7 members present, averaging 6 people per session. The average attendance was 7 people (correct to the nearest whole person) attending afternoon sessions with a range of from 5 to 11 members present.

Activities Engaged in During the Various Stages of Development

The following subsection of this chapter describes the five developmental stages and transactions which evolved during the first 11 months of the MSU mathematics competency development team's developmental work.

An Overview

An analysis of this researcher's notes relative to the procedures used by the MSU mathematics competency development team revealed that the team's major concerns centered around several major questions or issues. These were identified as this researcher attempted to organize her notes around central issues, rather than simply in chronological order. It was reassuring to this researcher to find that a theoretical paper that was independently prepared by her chairman and dissertation director cited and labeled five necessary stages of instructional development that coincided and proved to be directly compatible with the data organizing categories of this researcher. This finding reassured this researcher that her empirical observations were reliable in that they were verified by the conceptual "observations" of other participants in this project. The labels and descriptive titles ascribed to the stages herein discussed were, therefore, adapted to fit those identified by Lanier and Henderson (1973) to assure compatibility and understanding within the larger framework of which the research study is a part.

In seeking solutions to the questions, "What should we teach pre-service teachers in the area of mathematics?" and "How shall we teach this to teachers-in-training?", the competency team followed what appeared at the time to be expeditious development patterns but which in the final analysis turned out to be overall logically sequential in nature.

As previously described in section two of this chapter, the initial two points on which the competency team reached consensus agreement were (1) to begin their development work with the study of pupil outcomes and (2) to then proceed with the identification of appropriate related teacher behaviors. In fact, these two decisions provided the direction in which the MSU mathematics competency team's development work progressed. Essentially, it was from the team's original two decisions that the five major developmental stages emerged. A description of the five stages through which the team progressed during their developmental work is presented next.

Stage One

In general, stage one included the identification of the recommended behavioral outcomes for pupils relative to the area of whole numbers. (This study includes a description of the development of the pre-number and numeration objectives only.)

In the first stage of the development of a mathematics competency, the team members became intensely involved in the study and analysis of the Minimal Objectives for Mathematics Education in Michigan (1972). In other words, the team first focused on identifying the preferred pupil outcomes, related to the area of whole numbers, that they expect teachers to be responsible for effecting in pupils.

The team's study and analysis of pupil outcomes thus began with the rating of the objectives for the area of whole numbers taken from the Minimal Objectives for Mathematics Education in Michigan (1972). In rating the objectives, the following 5-point scale was developed, printed as an appendage to the original list of objectives and distributed to the mathematics content and mathematics education team members.

1. Essential: I would continue teaching this objective until it was mastered.
2. Very Important: I would re-teach this objective at least three times if not mastered during initial instruction.
3. Important: I would re-teach this objective at least twice if not mastered during initial instruction.
4. Of Little Importance: I would teach one lesson on this, but if it was not mastered by the learner, I would not bother to re-teach.
5. Not Important: I would not have this as a purposefully planned part of my instruction.

Return, tallying, and analysis of responses. On April 24, 25, and 26, 1972, six individuals returned the lists of objectives on which they had indicated their responses. A seventh individual returned his ranking on May 14. This delay is attributed to the fact that the list of objectives was sent to the mathematics education person who was on an overseas teaching assignment. One member never returned the list of objectives and responses.

As individuals returned the lists of objectives, the responses were recorded. A copy of the objectives as given to the mathematics content and mathematics education participants was used in recording the responses for each objective. However, the above system was found to be unmanageable and not useful for the purpose of analysis. This was due to the fact that sub-areas (e.g., pre-number) were spread over many pages with only a few objectives on a single page. Therefore, when the two applied behavioral science representatives met on April 26, 1972, a new recording format was devised.

To employ this new recording format, the major breakdowns of the content area provided in the Minimal Program Objectives for Mathematics Education in Michigan were first identified (pre-number, numeration, addition, subtraction, multiplication, and division). Each category, followed by a column of numerals representing the number of the objectives in that category, were listed on the left side of a sheet of paper. Six columns, one for each respondent, were then placed across the page. At the top of each column was the name of a respondent. The rankings given by the named respondent, corresponding to the objective number, was then placed in the column. The six ratings for each objective were summed. The seventh member's responses were added at a later date (see Appendix E).

The compiled responses were then analyzed. Based on the review of the objectives, the following system was used to code objectives and the related discussion decision rules were developed for consideration by the competency team.

Each objective was rated on a 5-point scale with a rating of "one" indicating the objective was essential and a rating of "five" indicating the objective was unnecessary. Thus, with six team members responding, a total score of six would always mean that there was high agreement among the respondents and the agreement meant that the objective was perceived as essential (by everyone). Likewise, a total of 30 would always mean that there was high agreement and the agreement meant that the objective was perceived as unnecessary (by everyone).

Ratings of objectives which showed a consistent lack of agreement were identified for discussion purposes, as they indicated a diversity of opinion among team members. The diversity in opinion among team members contributed to the initial group discussion and helped to identify and draw on the rich plurality of views that existed.

These "low agreement" objectives were identified as those rated essential or very important by most, but with at least one person rating the objective as only important, or as having been rated with a variance of at least three points (e.g., scores of both two and five or one and four occurring).

Copies of the compiled ratings were made available to all competency team members at the April 27, 1972 meeting (see Appendix E). The original copies of the objectives responded to by each mathematics content and mathematics education participant were also made available. At the meeting the above two instruments acted as common stimulus materials for the purpose of discussion.

One participant representing the area of mathematics education, at a later date, indicated that he felt uncomfortable with the request to rate the objectives. He felt that his responses would be viewed as those of a novice due to his limited experience in elementary mathematics. He assumed his responses would lack credibility with other competency team members and, therefore, felt his contribution would not be viewed as meaningful. While he also felt that his rationale for any given rating would probably not be agreed with by other team members, he did feel that his ratings were as legitimate as anyone else's.

The reason given by this team member for returning his responses for compilation was the commitment he had made to participate as a team member. He indicated that the reason for returning his responses was based on his commitment and personal interest in learning about competency-based teacher education.

The development work continued with study of the pre-number (see Appendix G for first synthesized list of pre-number objectives), numeration, and operation objectives for redundancy and incompleteness. In addition, the specific content of individual objectives (e.g., rote counting) was discussed and decisions to include or exclude the objectives were made. Early in the study and analysis of the objectives, the team decided to restrict itself to investigating one section (e.g., pre-number) at a time. Thus, the team's initial focus on the area of whole numbers changed to a focus on a much smaller segment (subsequently referred to as a module cluster), that of <u>pre-number knowledge and skills</u>. As a result, the team began to deal (a) with the relationships between and among the pre-number objectives and (b) with definitions and/or descriptions of "pre-number" categories.

During the study of pupil outcomes, one of the major questions which the team members continuously asked was, "Why would we want a pupil to be able to do this?" Examples of answers to the question heard typically during the early stages of development are as follows: "It's a good experience for children." "All children should know how to do that." "Children like to do that." "Later on they'll have to know that." "Because God told me they should." (After working together for almost a year, the team members discovered that the last statement was made in reference to an expert in mathematics. This was as close as the team came to using authority figures to escape dealing with a difficult question and it was in jest.)

Examples of the team's responses as they continued to try to answer the "Why" question relative to pupil outcomes are as follows: "We don't know, that is a good research question." "That is a prerequisite skill for a more advanced pupil behavior which we have identified." "The later behavior will contribute to a child's ability to deal with his world." "Because God told me so!"

The team agreed that some pupil behaviors they identified as desired pupil outcomes were desired only because they were behaviors which were prerequisite to later objectives.

The result of the team's effort to answer the "Why question was that in the area of pre-number (a) the tasks of classifying and ordering by quantity were identified as prerequisite behaviors for the numeration unit, (b) classification and ordering by additional single and multiple attributes were identified as desired extension activities, and (c) patterning was identified as desired extension activities and a research project relative to pupil transfer of patterning skills and concepts should be developed and carried out.

When the team agreed that they were satisfied, at least for the present, with the list of pre-number pupil outcomes, they began to study and analyze the numeration section. In the course of analyzing the numeration objectives (see Appendix H for first synthesized list of numeration objectives), the team began to deal with the sequence of objectives not only within a subsection (e.g., cardinality) but also among subsections (e.g., ordering and place value).

The team's analysis of the numeration section led them to consider again the continuing question of "Why was a particular pupil behavior identified by the team as a desired pupil outcome?" In this situation the question was considered again because the team in the process of analyzing the numeration objectives began to reconsider behaviors which would be prerequisite to the numeration objectives. Hence, the team identified the discrimination task of "classifying by quantity" and the task of "ordering by quantity" as essential numeration prerequisites. In other words, those two pupil outcomes were desired because they were prerequisites to later desired pupil outcomes.

Having identified prerequisites for the numeration objective, the team then returned to further analyze the pre-number list of objectives, which resulted in a thorough reorganization of the pre-number section. Definitions, specifically of pre-number and numeration, having become operationalized, necessitated the team's further deletion and/or reclassification of objectives, which had been incorrectly classified as pre-number concepts or skills.

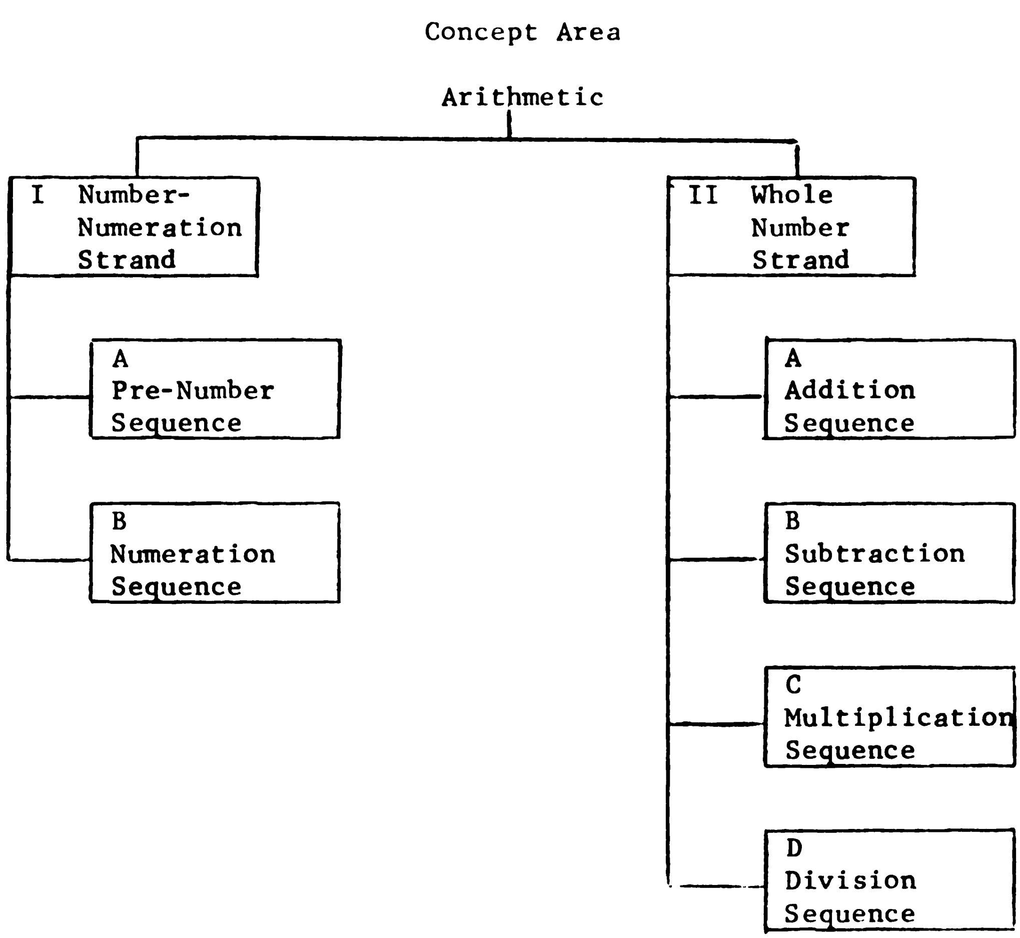
The competency team's study and analysis of the original objectives led to the development of a modified list of desired pupil outcomes. This modification included (a) the deletion of some objectives, (b) the combination of overlapping and like objectives, (c) the addition of some divergent-production task objectives, and (d) the hierarchical classification and organization of objectives in terms of the subordinate and superordinate tasks.

The competency team identified rules for the deletion of objectives. Objectives were deleted based on the following rules: (a) the objective was redundant, (b) the objective's purpose was teacher behavior rather than pupil behavior, (c) the objective's content was not related directly to the notion of mathematics (e.g., pupil knowledge of words such as; on, off, up, down, right, left) and (d) the objectives content was not a pupil outcome desired by the competency team (e.g., rote counting).

The initial study and analysis of the objectives by the competency team began in April of 1972. The competency team reached consensus on the pre-number and numeration objectives (which appear in Appendices G and H) in October of 1972. Development in the other stages began, however, before final consensus was reached on October, 1972. Developmental experience in each stage provided the competency team with additional insight which provoked the consequent refinement of previous "agreed upon" objectives. Consequently, the team continuously up-dated and checked the objectives for consistency.

A positive consequence of the competency team's study and analysis of the objectives related to whole numbers enhanced their ability to better conceptualize or see what it was they wanted teachers to be able to teach pupils. The improvement in the team's conceptualization of the desired pupil outcomes became evident in the next developmental stages.

Stage one summary. The classification of the whole numbers objectives as organized by the task force for the State of Michigan was as follows:

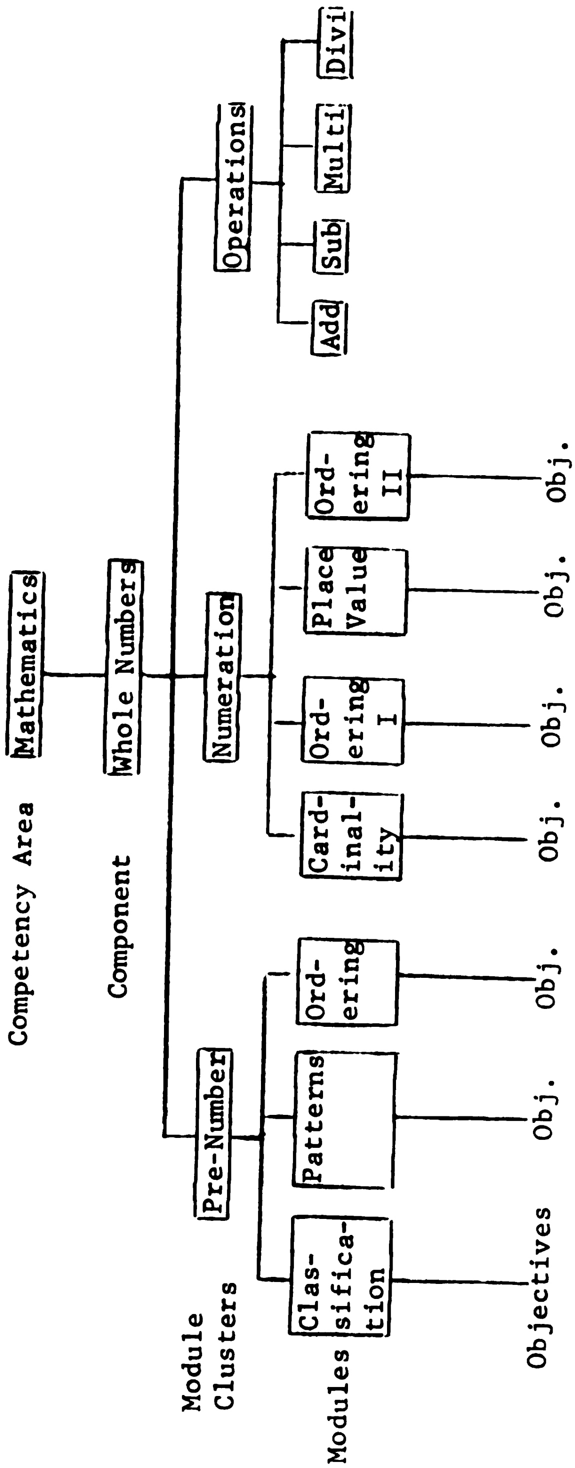


The team members rated the objectives (40 pre-number, 91 numeration, 27 addition, 21 subtraction, 27 multiplication and 20 division). The discussion leader and this researcher reported the results of the team's ratings by the following categories: (a) pre-number, (b) numeration, (c) addition, (d) subtraction, (e) multiplication, and (f) division.

The result of the MSU mathematics competency development team's study and analysis of pupil outcomes relative to the area of whole numbers is shown in the following hierarchical diagram (see Appendices G and H).

The section of the whole numbers area identified by the competency team as "operations" included addition, subtraction, multiplication, and division. During the third team session, the team members agreed to set aside the operations section until the developmental work (whatever that might turn out to include) related to pre-number and numeration were completed. The team had not returned to the operations section during the time the data for this investigation was collected.

The team's problems in communicating with each other about the various aspects of the structure they were developing required a search for appropriate vocabulary (e.g., competency, component, module clusters, modules) for effective team communication. See Lanier and Henderson (1973) for a discussion of the related concepts. Thus, one additional outcome of the team developmental work was the clarification of the concept of a "competency."


Competency Area
Mathematics
Component
Whole Numbers
Module Clusters
Pre-Number
Numeration
Operations
Modules
Clas-
sifica-
tion
Patterns
Ord-
ering
Card-
inal-
ity
Ord-
ering
I
Place
Value
Ord-
ering
II
Add
Sub
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Objectives
Obj.
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Stage Two

Stage two included the identification of instructional tasks from which the pre-service teacher's knowledge and/or skills, relative to the content of the pupil outcomes identified in stage one, could be determined. In other words the competency team wanted to find a way to determine whether a pre-service teacher actually knew the content he/she would be expected to teach to children.

The team quickly reached consensus agreement that because of the extremely "elementary" nature of the pre-number and numeration content they would assume pre-service teachers would have already acquired the needed knowledge and skill in these areas. (They probably wouldn't have made it into college if they hadn't.)

Stage Three

Stage three included the identification of instructional tasks, by the competency team, that would enable them to determine whether or not pre-service teachers could apply the knowledge and skills identified in stage two. (Knowledge and skills related directly to pupil behaviors identified in stage one.)

In this stage the MSU mathematics competency development team once again agreed that they would assume pre-service teachers were able to employ the pre-number and numeration knowledge and skills (e.g., if the pre-service teacher had not already acquired the concept of 1-1 correspondence, they would not be able to do such things as set the table, or buy the correct number of stamps for their Christmas cards.)

Stage Four

The mathematics competency development team in stage four identified what it is a pre-service teacher needs to know in order to do what is necessary to bring about the desired behaviors in pupils (identified in stage one).

During the initial developmental process in stage four the competency team reached consensus that they would first identify the teacher behaviors and related instructional materials that a pre-service teacher should know about for instruction of pre-number and numeration concepts and skills. The team agreed that they would then proceed to work on the identification of instruments (stage five) to be used for the assessment of teacher performances. Thus the team members committed themselves to the complete development of one segment of the whole number area. The members of the team agreed that by developing one segment they would then be able to make use of the procedures which proved to be successful, in developing the rest of the whole numbers area.

The competency team returned to the list of pre-number objectives to identify the methods a pre-service teacher would need to know in order to instruct children in the pre-number objectives. The question of "how to identify the appropriate teacher behaviors" presented a tremendous problem. The point of departure from which development should proceed was difficult to determine. Two lines of thought concerning the team's direction were evident among the team members. One group of the team members thought that the teacher behaviors which should be identified next were the specific strategies or techniques a pre-service teacher would use to teach the pre-number objectives. A second group of team members thought that the teacher behaviors which should be identified next were those related specifically to the assessment and diagnosis of pupil needs. This division among the team members occurred in spite of the fact that all team members had verbally agreed, during the team's initial meetings to follow the organization of the "tasks of teaching" model (which begins with assessment, and then moves to objective selection, strategies, and evaluation). The first group of team members did not verbally express a change of attitude toward the "tasks of teaching" model itself, but their behavior was indicating that they had not internalized the verbally expressed value. Apparently at this point various team members had simply returned to their "old" patterns of behaving. At meetings held while the team held diversified opinions as to the teacher behaviors to be identified next, this researcher observed the team dealing with the topic in a very general nature (e.g., "Teachers should use whatever they have at hand to teach classification.").

The discussion leader contributed to the team's unification in terms of the direction for development. For example, during this time when the team was working on the identification of teacher behaviors the discussion leader pressed team members for explicit statements and examples. She would describe several situations to which team members were asked to respond (e.g., "You're teaching kindergarten children. How would you decide which of the pre-number objectives you would teach?" and "How would you determine that a child was 'ready' for the objective?"). After several very frustrating sessions the team members decided that the first teacher behavior they wished to identify and describe was that of "assessment." The team had verbally ascribed, at an early date, to the importance of the "tasks of teaching" behaviors which included assessment. The team decided that it was necessary to identify the specific assessment questions a teacher would need to ask in determining whether or not a child possessed the pre-number skills. The decision to identify pre-number assessment questions resolved the problem of where to begin the next step of development. The question of "How?" was yet to be resolved. This decision, to identify assessment tasks, when acted upon by the mathematics competency team was in effect the team's first indication of "real" acceptance of the organization of teacher behaviors provided by the "tasks of teaching" teaching model.

In attempting to answer the question of "How do you identify pupil assessment questions of tasks?" several unsuccessful techniques were used by the competency team. These unsuccessful techniques included team members using the pre-number objectives as a common stimulus for pupil assessment discussions, team members role playing pre-number instructional assessment lessons, team members audio taping their role playing of pre-number assessment lessons, and team members bringing children to team meetings and teaching assessment lessons. The major problem which emerged during the above experiences was the team members' inability to distinguish between assessment and instructional questions or tasks. Thus, the team asked one of the representatives from the area of mathematics content to develop a "strawman" assessment instrument which the team could use as a common stimulus in an effort to further their progress. The "strawman" assessment instrument developed by the mathematics content representative contributed to the team's ability to specify exactly what pupil behaviors they wished to assess and what type of assessment tasks (e.g., verbal, paper/pencil, or manipulative) were desirable. The team members agreed to use manipulative tasks incorporating the use of concrete objects for the assessment of the pre-number objectives.

The team members then assigned the responsibility of identifying pre-number assessment questions/tasks to a representative from the area of mathematics education and this researcher. Hence, pre-number assessment tasks and an instrument were developed and eventually pilot tested for reliability and validity on kindergarten and first grade children. The instruments were then taken to a competency team meeting at which time they were revised, based on the feedback from the results of testing and input from team members (see Appendix I for sample pupil assessment instruments).

The identification of the numeration assessment questions/tasks began with the responsibility being given directly to two of the competency team members. The two team members identified assessment tasks related to the area of numeration. The tasks were organized into an assessment instrument and tested for validity. The instrument was then taken to the team for their reactions and further revision (see Appendix J).

In conjunction with the identification of the pre-number pupil assessment tasks, the competency team organized the tasks into an assessment instrument that could be used by teachers. At this point, the team began once again to consider specific strategies they would use for helping learners acquire the pre-number objectives.

Examples of techniques used by the competency team to identify specific instruction/strategies for the pre-number objectives included (a) team discussions, (b) team role playing of "instructional" lessons, and (c) individual team members' development of instructional designs. During the course of development in stage four, various team members collected three-dimensional concrete and symbolic materials. These materials and materials related to mathematics were used in the role playing situations.

The instructional design development experience contributed to the team's clarification of the task of teaching identified as "strategies." The instructional designs produced by the team members included considerations for the human, environmental and curriculum variables. Therefore, the competency team broadened their discussion of preferred teacher instructional behavior from only those specifically related to curriculum to include all three variables.

The competency team found that in order to make any progress in the identification of appropriate strategies they needed to consider not only the mathematics content but also the human and environmental factors. The team, therefore, considered such topics as (a) the nature of the learner (e.g., readiness, attitudes and feelings), (b) the appropriate length of instructional time, availability of supplies, materials equipment and their appropriateness to the specified curriculum content, and (c) the organization and management of instruction.

In this stage, the team reached consensus that a pre-service teacher would receive continuing instruction in the knowledge of the "tasks of teaching" model; that is to say, this should/would not be a prospective teacher's first encounter with the task-of-teaching model. Therefore, the developers of the mathematics competency considered themselves to be responsible for knowledge of the application of the model to mathematics related content, as it would be implemented in the instructional design and instruction of mathematics. The mathematics educators would then accept the responsibility of instructing pre-service teachers in specific mathematics related assessment, objective setting, strategies, and evaluation behaviors.

Included in the instructional design responsibilities of the team was the development of a method of evaluating the pre-service teacher's knowledge of the specific assessment, objective setting, strategies and evaluation behaviors needed for successful teaching of the mathematics units. The team agreed that the method of evaluation would have to include measures of the pre-service teacher's knowledge of the human and environmental factors as well as the curriculum knowledge. That is to say, a teacher would need to know human factors (e.g., a child's attitudes, prerequisite skills, and abilities, stage of intellectual development) and environmental factors (e.g., appropriate materials, time, scheduling issues) as well as the curricular factors (e.g., knowledge of content sequence, purpose and structure).

Through the team's discussions it became obvious to the members that knowledge could only be evaluated verbally (e.g., paper/pencil, interviews). The team agreed that if they used only observations of the pre-service teacher's performance during instruction, they would only be able to infer related knowledge (e.g., the discussion leader explained this with the following example: "If someone had observed me while I was teaching in an elementary school, they would have said that I "knew" a lot about positive reinforcement. The fact is that I used positive reinforcement, but I didn't actually know or understand the concept.).

The team agreed that assessment of teacher performance in a classroom setting should include observation of instruction, evaluation of prepared instructional designs, and interview information (Stage Five). However, the team wanted to be able to assess and evaluate a prospective teacher's knowledge of the mathematics related assessment, goals/objectives, strategies, and evaluation behaviors. The team members discussed their desire to be able to assess and evaluate the prospective teacher's knowledge prior to his/her application of this knowledge in a classroom setting.

The MSU mathematics competency development team thus began the development of an evaluation instrument. The team found that questions related to instructional design tasks could serve as a tool from which the pre-service teacher's knowledge of behaviors could be evaluated in terms of the recommended mathematics related teacher behaviors.

Questions relative to the tasks of teaching and related specifically to the area of mathematics were developed and administered to a group of pre-service teachers. (See Appendix K for revised instructional design assessment tool.) The pre-service teachers had had prior instruction in mathematics education and the tasks of teaching. A technique for scoring had been developed from the instructional designs developed by the competency team members. The pre-service teachers' responses to the questions, the instructional design instrument was revised. The revised instrument was then administered to another group of pre-service teacher education students. This group of students had previously received instruction in the "tasks of teaching" model. The instrument was administered to this group during the first session of their mathematics education class. At the time the tests were to be scored, the following two items became apparent: (1) The scoring tool needed to be refined (see Appendix L for scoring tool). (2) The instructional design questions appeared to indicate those students possessing the mathematics education knowledge desired by the mathematics competency team members. At the termination of the data collection period for this investigation, the instructional design instrument and related scoring tool were still in the development process.

The competency team's developmental work on an evaluation of knowledge instrument took them directly to the problem of finding ways to evaluate a pre-service teacher's ability to apply the knowledge and skills identified by the team in stage four, that is, it took them to the stage of developing a means of evaluating performance (instructional behavior).

Stage Five

Stage five includes those activities in which the MSU mathematics competency team was engaged in while pursuing the question of how to reliably describe a pre-service teacher's ability in a classroom setting to (1) actually produce a plan for the learners based on the knowledge identified by the team in stage four and (2) actually carry out the plan. The competency team, therefore, began to work on instruments for observing pre-service teachers in a classroom setting.

The competency team agreed that the two applied behavioral science representatives who had previously developed and worked with descriptive instructional behavior instruments should initiate the "strawmen" in this area. The purpose for developing their instruments was to provide a means for assessing and evaluating a perspective teacher's performance in a classroom setting.

At an earlier stage in development, the team became aware that it was important to evaluate a pre-service teacher's ability to actually carry out instructional design procedures as well as implementation of the design (instruction). That is, they should not only know how to do instructional design, but they should actually do it as they teach. The team agreed that the evaluation of a pre-service teacher in a classroom setting would, therefore, be incomplete if only actual instruction was evaluated. Hence, they decided that the developmental effort would focus both on the assessment of a pre-service teacher's ability to design lessons as well as to successfully engage in actual instruction.

The two representatives from the area of applied behavioral science thus began the development of such instruments. A preliminary instrument was in the process of development at the termination of the collection of data for this investigation.

Summary

The development team, while beginning their work in stage one, did not then progress distinctly from stage to stage. The team could be found at times operating in two stages and going, for example, from stage four to stage three. Analysis of the decisions which took the team from one stage to another indicates that this may have occurred because the team needed to "discover" each major issue and explore the ramifications of decisions. At times, decisions made by the team contributed to lengthy blocks of time which appeared to be nonproductive. However, during these times, additional information and experiences were gained by the team members providing them with additional "insight." The team members were able to make use of the additional experience and knowledge in up-dating previous decisions and/or developmental directions. Frustrating as it was at times to travel on "dead-end" roads, the competency team members maintained an optimistic outlook. A plea of "We'll never be able to do it, let's send back the money!" (participants received no remuneration) was generally followed by a statement such as "Well, at least we know that's not the way to do it!"

CHAPTER V

DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

In this final chapter the implications of the findings reported in Chapter IV are presented. In addition, the implications and decisions which administrators, university faculties, and other professionals should be cognizant of in establishing competency development teams are presented in the form of two open letters. These letters are addressed to (1) university administrators interested in establishing program development teams for competency-based instruction and (2) interested "others" who might become or are active participants in competency development teams. Suggestions for further research in establishing competency development teams conclude this chapter and the dissertation.

Findings and Conclusions

The first section of this chapter discusses the implications of the findings reported in Chapter IV relative to the team's composition, initiation and establishment, and transactions and outcomes. Many of the implications and discussions of the findings which follow may be categorized as assumed, expected, or important ingredients for any collection of individuals joined together to accomplish a given task. Therefore, in reporting many of the findings, the results in and of themselves are not necessarily as significant as the fact that they did occur within the MSU mathematics competency development team. It has been this writer's experience that the characteristics of a developmental team's composition include common and diverse experiences, interest in the area of development, and respect for self and others. These are certainly highly valued characteristics in the establishment of any team. In reporting the findings of the MSU mathematics competency development team, the previously stated highly valued characteristics were apparent at the team's inception and were maintained throughout the duration of this study.

Composition of the Competency Team

Examination of the biographical data collected and presented in Chapter IV indicated that the team possessed both a set of relatively common background experiences and a set of diverse background experiences. The relatively common background experiences included K-12 teaching experience, a history of working together on somewhat similar developmental tasks and a history of university experience in teacher education. Of the fourteen competency team members, for example, thirteen individuals had previously had experience in K-12 teaching. The data indicated that the previous teaching experience included a broad background of K-12 teaching situations. Also at the outset of the study all ten of the regular team members were working on at least one other project which provided them the opportunity to work in public schools with classroom teachers. These experiences suggest that the team was unlike the stereo-type teacher education professors who have "seldom been in a classroom" and who deserve the descriptive "Ivory Tower" label.

Various sets of the team members also indicated a previously established working relationship. It was not true, however, that every member of the team had worked with each of the other members in a prior capacity. Hence, the membership of the competency team was not composed of a group of people who were "strangers" or of individuals who had not previously worked with at least two or three of the other team members.

Another common experience held by team members was their previous university teaching experiences in teacher education. All team members reported having worked in some capacity with prospective teachers at the university level. The experiences reported ranged from supervision of pre-service teachers in classroom settings to the teaching content courses to prospective teachers in campus settings.

The diversity among the team members experiences can be categorized into three areas: (1) a variety of universities attended by the team members, (2) a variety of professional organizations in which team members participate and (3) a variety of "academic" areas in which the team members hold "expertise."

The team members reported that they attended 21 different universities while acquiring their higher educations. Thus the team members brought by virtue perhaps of these diversified educational experiences, a variety of points-of-view. The differences in experiences and resulting differences in the various positions held by team members may well have contributed to the wide range of positions that emerged in team discussions.

The second difference among the team members indicated in the analysis of the biographical data, was the diverseness of the professional organizations in which the team members held memberships and actively participated. The number of professional organizations to which the team members belong and the degree to which they are active and regularly attend conferences in the organizations, suggest that team members value or enjoy communicating with other professionals. Thus, the team's "behavior" in terms of seeking relationships with persons whose backgrounds differ from theirs may indicate that the team members valued "give and take" discussion on professional issues.

The third category of diversity was in the "academic" areas represented. Various team members possessed expertise in mathematics content, mathematics education, applied behavioral science or educational research and evaluation. The composition of the team's membership reflected knowledge in learning, clinical field work, mathematics content, mathematics instructional methods and research and evaluation. Thus a diversity in "expert" knowledge was represented rather than expert knowledge in one area (e.g., a competency team composed only of mathematics education representatives).

The findings reported in Chapter IV indicate that the competency team was composed of members who expressed an openness to learn and a willingness to explore the concept of competency-based teacher education. An analysis of the data collected by Instrument

II--Attitudes toward competency-based teacher education indicated that the team members were cognizant of and willing to admit that they could learn more about competency-based teacher education. While the data indicated a diversity in how much various members felt they knew about competency-based teacher education, none of the members indicated they "knew the answers" about the best ways to proceed. Thus the composition of the team reflected not only an openness to learning but also a willingness to participate in the exploration of a segment of a competency-based teacher education program.

The findings described in Chapter IV, relative to Instrument III--Semantic Differential, indicated that the team members held an attitude of respect for themselves and other team members. For example, the results of the analysis of the semantic differential data indicated that team members generally both perceived others and were perceived by others as good, valuable, fair, gentle, lenient, weak, safe, fast, easy, active and moving rather than unpleasant, bad, worthless, unfair, violent, severe, strong, dangerous, slow, labored, passive and still. The MSU faculty representatives' responses were also reviewed by cluster membership. This review included an analysis of the faculties' attitudes (in terms of evaluative, potency, and activity factors) towards the graduate student members of each cluster. This analysis indicated that there was little difference between how university faculty members perceived graduate student members and how they perceived other faculty team members. The analysis of the collected data appeared to indicate also that team members viewed each other as nonthreatening.

Thus, there was not only a diversity in the competency team's academic background as indicated by their attendance at 21 different universities and in the variety of professional organizations and committees in which they were involved but also an indication of initial respect and trust. These factors may well have contributed to the team's apparent willingness to participate in the professional discussions among the competency team members.

The findings that the team valued professional "give and take" discussions with persons of diverse backgrounds may indicate why the team appeared to function so well together. By "function well" this author means that there was amicability, cooperation, and a lack of hostility among team members whether they were together in (a) team meetings, (b) sub-team developmental sessions, (c) other professional tasks, or (d) social situations. For example, during team meetings and subteam developmental sessions, the various team members exhibited a persistence in the resolution of differences among the various philosophical positions. They asked and answered clarifying questions in an effort to understand and to be understood. Even though these discussions were often very frustrating to the team members, they continued to attend the meetings. Thus, the team members did not suspend their affiliation as a competency team member in the face of differences in opinion and hard-to-solve problems but instead, they continued to initiate and participate in the resolution of these problems.

Similarly, the findings that competency team members possessed an openness to the study and exploration of competency-based teacher education may also help explain the team's continuing participation in the competency team's developmental tasks.

The broad background of relatively common prior K-12 teaching experience possessed by the team members may also explain the team members' empathic responses to the examples of teaching situations used by various team members. Thus, common knowledge of "real" potential teacher or pupil responses to problems or materials may have contributed to the team's ability to clearly communicate and identify developmental problems (e.g., the need for pupil profile sheets on which teacher's could record assessment data).

The findings that suggested that the competency team members respected themselves and others and were not threatened or perceived as threatening by others may help explain the team's ability to share and question contrary opinions. This could also help explain the team's willingness to become involved in an ambiguous task (exploratory in nature) in which, from the beginning, no one knew how "to accomplish" it or how to proceed.

While one frequently hears the values of openness and acceptance espoused as being important for productive team work, it is the experience of this writer that frequently the verbally stated value is not actualized in behavior, as it was for this team.

Administrative mandates that require an entire department to modify their instruction to a competency-based model, or decisions made by majority vote that all should move to competency-based instruction are examples of behavior that runs contrary to what we believe to be important attitudes. Therefore, this writer re-emphasizes the importance of acting on these values by recommending that the decision to participate in program development be left to individuals.

Initiation and Establishment of Competency Team

The findings reported in this study indicated that the MSU mathematics competency development team was established through the initial efforts of MSU faculty and graduate students. This implies that the movement toward this competency-based teacher education program was begun as a "grassroots" movement rather than as an administrative dictate or mandate. Likewise, individual as well as team goals and developmental time commitments were identified and set by the team members without an outside or administrative influence.

The findings indicate that the team members were not requested to commit themselves for a specific period of time or until "previously" specified amounts of development work had been accomplished. It was also noted that team members agreed to participate as often and as long as they could. It was found that the team did not assign long range deadlines for themselves. For example, they did not say, "In two weeks we will have the pre-number pupil outcomes identified." The findings indicated that, from the beginning, the team assigned developmental tasks to subteams who accomplished what they could in an "informally" suggested time limit (e.g., development of pupil assessment instruments took longer than initially planned).

Finally, to the initiation and establishment of the competency team, are the findings reported in Chapter IV which may indicate that the role of the competency team discussion leader during the initiation and establishment of the MSU competency team may have strongly contributed to the procedures actually established by the competency team. For example, the "developmental skills" of questioning, clarifying, and explaining modeled by the discussion leader may have contributed to the team's actual exhibiting of questioning, clarifying, and explaining behaviors.

The observed lack of imposed (before the fact) task and/or times deadline may account for the fact that subteams felt free to ask that team meetings be postponed at times, because developmental work involved more time than expected. Likewise this may be one reason that subteams felt free to ask the total team to meet as they needed additional input. At times when the team members initiated and volunteered to do a task, they found that they could not really complete the task which everyone thought could be done in a couple of hours. This resulted in the members taking the time necessary to do the task in the way which they were comfortable and satisfied with outcomes rather than completing "something" to meet a deadline. Thus, in this writer's opinion the grassroots initiation and lack of imposed time schedules contributed to the quantity and quality of the team's developmental work.

The absence of imposed deadlines may account for the team member's willingness to accept the responsibility for continuing progress in developmental work. For example, on no more than two occasions did a team member "forget" to work on an assigned task.

Similarly this writer feels that the team's apparent flexibility in this exploratory situation may be accounted for by the findings that there was an absence of factors being imposed on the team by administrative or other outside forces. It appeared to this writer that the team's ability to remain flexible in this developmental situation resulted in a built-in system for self-correction. For example, a discovery three months into the development work which required a change in materials developed earlier caused team members to systematically find out what implication their new decision had. The team would then review previous discussions and make necessary changes. This writer feels that the team's ability to continuously review and make necessary changes was very possibly facilitated by the presence of flexibility in terms of time and task demands.

This writer also believes that the discussion leader's ability to function in that role without imposing her leadership, goals, or time commitment on the team members (that is, they were allowed a choice in these matters) may have also contributed to the flexibility and the members' self-acceptance of responsibility.

In addition, the acceptance of responsibility by team members may also have been due to the observed sharing of leadership. That is to say, there was not a <u>single</u> person who functioned as <u>the</u> leader for the various aspects of development. For example, during the discussions and decision-making relative to pupil outcomes, the discussion leader continued to help in facilitating the discussions, but at the same time the various team members from the areas of mathematics content and mathematics education assumed the leadership for determining valued pupil outcomes. The leadership of the team was thus shared from the beginning.

Transactions and Outcomes

The findings as reported in Chapter IV indicated that the competency team's developmental efforts included work on five central tasks. The findings further indicated that the team members actually followed a number of non-productive paths while pursuing the developmental tasks. As a result, the team did not progress systematically through "previously" identified stages but because of the efforts to continuously answer specific major questions, the process eventually emerged as one which necessarily included the five stages described by Lanier and Henderson (1973).

Movement through the developmental states was most difficult, in terms of taking non-productive paths before the necessary stages became "obvious." The data most supportive of this generalization was the factor of developmental time. The observations indicated that the time it took team members to accomplish a task was greatly reduced the second time the team members dealt with a given task (e.g., development of pre-number objectives then development of numeration objectives). It is this writer's opinion that the team's having had to "discover" their way through a stage by identifying the major developmental questions and related developmental procedures for finding answers may account for the difference in developmental time needed between the first and second assumption and completion of a major task. This writer now believes that the MSU mathematics competency team could at this date, based on their common "exploratory" experiences systematically plan and implement a development task that would include "deadlines." In other words, with direction in how development should proceed as indicated by the "developmental stages," and having already had the opportunity to "freely" explore the team would now become more "efficient," in terms of needed time.

As indicated in the findings reported in Chapter IV the MSU mathematics competency development team agreed to and actually did arrive at final decisions through consensus. When discussion continued to the point that the team was divided in that they held at least two positions on appropriate teacher or pupil behavior (either based on conflicting research data or an absence of research evidence) the team agreed to accept and teach both positions as acceptable teacher behavior. In addition, the team then planned to study both positions. The team members also agreed to base future decisions on the outcomes of the research. The team's willingness to make decisions in this manner may indicate their respect for empirical study and commitment to gather additional evidence for optimal decision making.

Another observation relative to the team's transactions concerns the continuing informal nature of their sessions. The findings as reported in Chapter IV, indicate that from the outset of the team's establishment the characteristic of informality could be associated with the team's transactions. For example, the team held the majority of their team meetings during the evenings in the home of one of the participants. While sitting around on the floor during the early stages of the meetings participants drank coffee. Meetings usually ended with some members stretched out on the floor relaxing, carrying on informal discussions concerning "non-academic" subjects, and having a drink. During the sessions, team members did not make formal motions or take formalized votes relative to their developmental decisions. While the team tended to continue to pursue their tasks it was observed that they were able to break away from the topic at hand and deal with things that were tangentially related. This did not appear to distract or undermine the developmental outcomes. Rather it seemed that team members returned to the topic less frustrated and with renewed energy (e.g., As an extreme example, it should be noted that on one occasion the team members took a break from their developmental discussion and unloaded and stacked two cords of wood for the fireplace. The warmth of the fire was always enjoyed. As might be expected, good natured grumbling and kidding took place.).

The team members' relatively common, positive attitudes toward themselves, others, and the developmental task may have in part contributed to the informal nature of the team's relationships. The informal nature of the sessions may have contributed to the team's continued ability to function well together. For example, this writer observed that humor was frequently used to relieve frustration.

The observed skill of the members to deal with frustration may have contributed in part to their ability to continue, over a long period of time, to disagree with one another on task related issues and not on a personal basis. Likewise, the team's ability to continue to take issue with ideas rather than personalities may have contributed to the continuing informality of the team's sessions.

An observation relative to the team's outcomes concerns the continued tentativeness with which the outcomes were viewed by team members. The findings reported in Chapter IV may indicate that the team members believed it was alright to make mistakes. The ability of the team to make developmental decisions necessary for the team's progress may in part be due to the attitude held by members that it was alright to make errors. Associated with the members' feeling that it was alright to make mistakes was the observation that the team continuously reviewed and up-dated their decisions and the related materials that were developed. The sample instruments included in the appendix, for example, are even at the present time considered to be <u>tentative</u> drafts.

Open Letters

The second section of this chapter contains two open letters which include recommendations for (1) administrators interested in the establishment of competency or other program development teams and (2) "other professional educators" interested in the establishment of competency or other program development teams.

To: Education Administrators Interested in the Establishment of Competency-Based Program Development Teams

From: A Researcher Who Was Involved in a Participant Observation Study of a Competency Team

I am writing to you to share my thoughts relative to contributions you might make in helping your staff develop and implement a competency teacher education program. The thoughts and feelings I wish to share are based on a study which I have just completed, of the composition, establishment, transactions and outcomes of a mathematics competency development team. The results of this study indicated to me the importance of the role which you might play in the success of the developmental efforts of a competency teacher education program.

As an administrator you may not actually be involved as an active member of a development team but there are other contributions you can make which will very likely effect the degree of the team's success. These contributions might be thought of as administrative support factors. Administrators who value development of competency-based programs can demonstrate this value by offering support to staff members who indicate an interest in developing such programs.

The first kind of administrative support to be considered is that of "time." Presently in a large number of colleges and universities a faculty member's responsibilities are administratively assigned based on "course credit hours." Time thus, becomes an important administrative factor initially in terms of "developmental" activity and later as new programs are implemented in terms of "new roles" for faculty members.

First, let us consider the administrative support factor of faculty development time. The competency team members which I studied volunteered to spend the numerous hours above and beyond their university assigned tasks and other professional commitments. It is my opinion that these faculty members or others could not reasonably be expected to carry on the immense program developmental tasks that were demanded without some extrensic rewards, in addition to their own intrinsic rewards. That is, I doubt if they would have continued much longer without some support, such as released time from their normal teaching or advisement responsibilities, overload compensation, or other such "special" considerations. The magnitude of the developmental task appears to necessitate the assistance of an administrator who will also contribute to the new programs by helping make it possible for faculty members to begin and continue development.

I would recommend that once development teams are established, they first be allowed to proceed without development deadlines through the time it takes for the team to completely develop one segment of a given area (e.g., pre-number; identification of pupil outcomes, prospective teacher knowledge and performances). The team should then be allowed to develop without deadlines an entire second area using the refined developmental techniques which they found successful in the development of the first segment of an area. Then, based on the results of the team's development of the two segments you might encourage the team to establish deadlines for their future development in the area.

Another implication relative to the administrative support factor of time is that of "faculty-student" time. Consider, for example, that traditionally one faculty member teaches a three credit hour mathematics course, to approximately 30 students which requires about three hours a week of class contact, time for preparation, time for student conferences, and time for review of student's written work. Based on the team member's experiences, discussions, and developed materials, that I worked with, it appears that the activities in which students would be involved during class time may require the presence of more than one staff person. Another factor which may emerge is faculty observation of students in classroom settings. It is conceivable that in addition to the faculty member's traditional responsibilities encountered when teaching a three credit course, that there may be nine or more hours a week required for observations of students in classrooms. Even if specially trained observers did the in-school observations for on-campus instructors, the instructors would still need time for conferences with the observers. Competency-based instruction appears to necessitate more actual teaching time. Thus, as an education administrator you could demonstrate your value for new education programs by redesigning systems typically used for the assignment of faculty responsibilities.

The administrative support factor of additional time cannot be considered, of course, independent of the monetary factor. I would urge that you offer support for faculty development of new programs both through program budgets and personal remuneration. Budgets for experimental programs and for implementation and continuing revision of programs can offer support to faculty members involved in new program development. It seems to me that faculty members involved in program development would lose their commitment to development if they could see no way that money can be provided so the program could be tried. It also would appear that a budget for the implementation of new programs would encourage other faculty members to initiate new program development. In addition, persons engaged in development cannot get feedback on the worthwhileness of their ideas and products unless provided the opportunity to work with actual students. Thus, experimental programs need to be available for testing the outcomes of developmental efforts.

The second monetary support factor involves personal remuneration. I would encourage you to consider a program development factor in the determination of faculty members' promotions and salaries. Thus, as an administrator you could demonstrate your value for faculty member involvement in the development of new programs by rewarding those who assume added responsibilities that require risk taking, ambiguity, and continuous growth.

Within the discussions relative to administrative support for new programs through the factors of time and money, a third general administrative support factor has been implied. The third factor involves administrative support for a "variety" of programs. It would seem to me that one strength of the development of a variety of new programs is that opportunities for various questions to be researched will arise. I further believe that no one program can realistically be expected to develop the necessary counter programs in order to research important questions. I think that faculty members committed to a given philosophical approach should be able to develop and research that program. These same faculty members while being aware of the critical questions should not also be expected to develop other programs so that comparative research necessary can be completed. Thus as an administrator who has supported the development of more than one program you can eventually get empirical evidence for use in decision making. As a final recommendation, I would suggest that you furnish interested persons with thought-provoking materials with descriptions and prescriptions relative to how other competency development teams have proceeded in their developmental work. The trial and error effort is most difficult and learning from the experiences of others will be helpful.

The competency-based movement and the excitement it can generate appears to me to be a powerful stimulant for identifying means to improve existing teacher education programs. I hope you will provide stimulation and support for those faculty who are interested.

To: Professional Educators Interested in Establishing and Actively Participating in Competency Development Teams

From: A Researcher Who Was Involved in a Participant Observation Study of a Competency Team

I am writing to you in order to share with you some thoughts relative to competency-based program development. The thoughts and feelings I wish to share with you are based on the study of a competency team which I have just completed.

You may find the following recommendations helpful if you are an educator interested in actively participating in the development of new teacher education programs. As a professional educator actively involved in new program development you may find yourself considering questions such as "How do I initiate and establish a competency development team?" "What do others suggest relative to the composition of such a team?" "What transactions and outcomes can be expected?" "What would others who have been involved as competency development team participants recommend?" Thus, the following recommendations concerning factors relative to establishment and composition, transactions and outcomes are presented for your consideration. Let us first consider the factors involved in the establishment of a team and the related leadership factors.

I would recommend that if you are responsible for the future establishment of a competency team that you initiate procedures through the use of informal discussion sessions. At these meetings it is recommended that you describe for potential participants the exploratory nature of the developmental task and the various roles which might be necessary in order for development to proceed. I would further recommend that during initial discussion meetings you frequently request feedback relative to all proposals and suggested roles. It is important that as a leader you use skills which will not only elicit responses but also will demonstrate an acceptance and interest in the feedback received.

I strongly urge that from the time of your initial contact with potential participants, you also demonstrate those skills you would wish to see the future competency team members use. For example, if you as a leader of a potential competency team value openness and acceptance of diverse ideas and/or people you need to make this known to others. Likewise, if you value outcomes which have been reached through consensus agreement rather than majority rule, you need to demonstrate collaborative behaviors from the start.

In conjunction with the leadership role, I would suggest that while team members may decide to have a single discussion leader throughout the duration of their developmental work, discussion leaders should encourage various team members to assume other developmental leadership roles. That is, as various aspects of development arise, members having a related expertise should be encouraged to assume leadership.

Another factor which you as a competency team participant may want to consider is that of "deadlines." Based on my experience with the mathematics competency team I would recommend that during the initiation of a competency development team the issue of developmental deadlines be considered, and that initially no long-range developmental deadlines be imposed by any team participant. I would strongly recommend that teams develop one entire module cluster (e.g., pre-number) without developmental deadlines. (This would include identifying factors relative to desired pupil outcomes, prospective teacher content knowledge and performances, knowledge of teaching performances and implementation of instructional design and instruction in classroom settings.) This would allow the team, from its inception, the freedom to explore, discuss, test materials and revise until they are satisfied with the developmental results. As a team member you may then possibly not feel the need to produce a product which lacks quality and depth just to have something produced by a given deadline. It will also help decrease anxiety. It is suggested that once the team has completed their development of the first segment they develop an entire second module cluster (e.g., numeration). Then, based on a team's previous two developmental experiences a team should then set developmental deadlines for their future development tasks. This procedure is recommended because it is simply not possible to set realistic deadlines before this time. How long any given task will take is dependent upon the knowledge and skill levels of expertise held by team members.

Factors regarding the selection of the initial team members should also be given serious consideration. While it may be assumed that most leaders would naturally value and consider the following factors, I wish to stress the importance for you as a potential leader to demonstrate your value for the characteristics. The first factor suggested for consideration is that of a team member's openness to exploring and learning about factors related to the development of competency-based programs. A second factor for consideration is a person's openness and respect for people with experiences and opinions which are diverse from their own. For example, this writer would recommend that people who display characteristics of openness and respect be encouraged to participate as team members.

I believe that there are a large number of problems related to the establishment and development of new teacher education programs (e.g., competency-based programs). It is essential that the people trying to establish and develop new teacher education programs at least begin their tasks with the support of those participating in the task. This is not to say that team members need to initially agree on philosophical or practical points, but rather that they agree to begin by sharing, identifying and attempting to find solutions that will capitalize on the differences. The support needed is encouragement to begin and to collaborate.

It would also be strongly urged that individuals from different "academic" areas join together in a developmental project (e.g., representatives from the areas of basic content, methods, applied behavioral science and research and evaluation). In addition, if the team members with diverse academic backgrounds have shared some previous relatively common experiences I feel they will have an easier time in establishing and maintaining communication. I believe that these mutual experiences (e.g., teaching experiences, working on other developmental tasks) help to provide respect and credibility between and among the team members I studied who had diverse academic expertise.

As a professional educator interested in establishing a competency team, you may wish to consider some additional recommendations relative to transactions and outcomes. I would recommend that educators involved in the development of competency-based programs first consider the philosophical questions relative to "what" competency-based teacher education means. Questions relative to the desirability of identifying pupil outcomes, related to prospective teacher content and performance knowledge, and related performances should be resolved. I feel that a team's development work will be facilitated if they initially discuss questions relative to their proposed outcomes. For example, a team may initially value identification of pupil outcomes, but a team may not know whether or not they wish to eventually consider pupil outcomes as part of the evaluation of a prospective teacher's competency. Yet, identifying what a team does value may contribute to the initiation of developmental work. The knowledge and experiences gained as a team works may in return contribute to the solution of unresolved questions. Thus, I would recommend that members of competency teams actually begin development work before all possible questions and problems are discussed. My experience with the mathematics competency team has led me to believe that a competency team can make progress without first resolving all problems. In fact, it has been my experience that some presupposed problems may not even become problems.

Relative to a team's transactions and outcomes, I would strongly recommend that you consider the five developmental stages I have described in my dissertation and which have been further described by Lanier and Henderson (1973). Consideration of the five developmental stages may at the very least help you and other members of your team clarify positions relative to competency-based programs. You may eventually find a useful framework from which to advance your developmental work.

As a member of a team you may wish to consider "consensus" as it relates to a development team's transactions and outcomes. By "consensus" I mean that a team's decisions are reached through agreement by all team members without members giving up their position just to continue developmental work. If positions are changed, it should be because one sincerely believes the change is an appropriate one to make. For example, as team members you will need to know all sides of an issue concerning either a philosophical or practical question. During the discussion of a particular topic or idea, various members may become aware of related factors which cause them to change their positions, resulting in members reaching common agreement. At the same time, team members may have at their disposal knowledge of research which may support two or more of the various positions held by the team members. Similarly team members may find that they are unable to find any evidence other than personal opinion to support their various positions. If this occurs, the best founded alternatives should be accepted and the problem cited as a needed research question. Thus, while developmental teams need to continuously inquire into the validity of both the identified desired pupil and prospective teacher behaviors they can agree to tentatively accept <u>both</u> positions while making special arrangements to collect more evidence relative to the "no best answer" topics. Thus, I would strongly recommend that competency teams use the process of reaching agreement by consensus rather than other means (e.g., majority rule).

Relative to a team's transactions, I would recommend that the leaders of competency teams consider recording a team's transactions and outcomes as they occur. The team I worked with found that such records contributed to the consistency in materials developed and to the clarification and resolution of problems.

A final recommendation I propose would encourage future competency teams to explore various organizational schemes for developmental tasks. For example, a sub-team consisting of two people may expedite a particular task which the total team cannot resolve. However, this does not imply that the total team should not react to a sub-team's conclusions and recommendations. Based on my experience, I would speculate that if the total team does not systematically react to all efforts produced by a sub-team, there may arise inconsistencies and/or lack of identification and resolution of diverse opinions.

Finally, I must share with you my conclusion based on the experience I had with the mathematics competency team, that as an active member of such you can expect a lot of hard work. While we were involved in all the extra work, however, we found that the interaction among members was both exciting and stimulating. You will probably find, as we did, that ideas you have held for a long time are questioned and challenged by others. Also throughout the course of development, you will undoubtedly discover a number of times that your course of development has taken you down a blind alley. While I know that the blind alleys and hard work will contribute to your discouragement at times, I am confident that you will be able to look back and see the vast amount you have learned. I found the growth to be worth the costs. I hope you do too.

Suggestions for Further Research

The scope and sequence of relationships appropriate to the composition, initiation and establishment, and transactions and outcomes of competency teacher education programs should be investigated continuously. No single "best way" will be devised for the development of competency-based programs for prospective teachers, but more efficient and effective ways can be developed by imaginative research. The following suggestions for additional investigations are offered as a result of this study.

1. The factors of trust, respect, and balance of diverse and common background experience be further operationalized and considered as potentially significant variables for future research. Further evidence of their contribution to the team members' ability to discuss diverse ideas while participating in ambiguous situations should be gathered.
2. Allowing competency team members the freedom to choose, diverse and explore, at the instigation of a competency team appears to contribute to the team members' future productivity in terms of being willing and able to proceed efficiently and effectively towards the development of qualitative competency-based programs. More study of this "hypothesis" is obviously needed.
3. Still other questions center around the nature of shared leadership. While it "appears" important to this writer, future research will be needed to better understand its relationship to "successful" collaboration.

4. Based upon the results of this study, the knowledge of the five developmental stages could provide a useful system of organization for development and thus assist others wishing to develop competency-based programs. Well-controlled comparative studies of the outcomes of teams which use the "competency stages" framework with those that do not, could provide additional evidence of the utility of the framework. In addition, future descriptive reports concerning the developmental activities of competency teams should provide useful information relative to useful transactions as well as outcomes.
5. Another variable that appears to be important to the success (continued effort and eventual outcomes) of a competency team is the member's openness and willingness to explore the concept of competency-based teacher education programs. It appears to this writer that the amount of actual knowledge about competency-based teacher education possessed by team members may not be as important as the willingness to explore and learn. Likewise, it is felt that the team members displaying a "I already know everything" attitude might well "turn-off" the open and exploring members. Similarly this writer feels that open hostility by team members toward the concept to be explored or other team members could make the developmental situation so unpleasant that participants would soon find that they were really "too busy to get involved." Perhaps in future studies of the outcomes and transactions of competency

teams which include "hostile" members will be reported. This type of data is, of course, needed if the presented hypothesis is to be tested and the findings generalized.

6. This writer concludes that an important contribution is made by a balance between relatively common and diverse background experiences to a team's transactions and final outcomes. Thus this writer believes that the factors involved in a balance between common and diverse experiences should receive further study.

When answers to some of the above questions and problems are discovered, a better understanding of the important roles and functions of a competency developmental team will result. Hopefully, answers to these questions will also help guide decisions on current and future research.

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APPENDICES

APPENDIX A

INSTRUCTIONS AND LIST OF MINIMAL OBJECTIVES

FOR MATHEMATICS EDUCATION IN MICHIGAN

APPENDIX A

INSTRUCTIONS AND LIST OF MINIMAL OBJECTIVES

FOR MATHEMATICS EDUCATION IN MICHIGAN

TO: Bill Fitzgerald, Lauren Woodby, Perry Lanier, Dave O'Neil, Paul Kacanek, Jackie Resh, Bill Cole, Bob Scrivens

FROM: Joyce Putnam

Enclosed are the objectives from the Minimal Program Objectives for Mathematics Education in Michigan, which relate to Whole Numbers, (counting, numeration, properties, operations, and number theory), as defined by the TTT Mathematics Competency team, during their meeting on April 4, 1972.

Your reaction to the desirability of these student behaviors would be appreciated at this time. Simply check the appropriate column. Please add any objectives or behaviors which you feel are not specified by the printed objectives but would be desirable.

Your responses will be compiled and based on the results we will develop the first common stimulus instrument. From this instrument, which you will receive at the April 27th meeting, we hope to begin to identify mathematics related teaching behaviors.

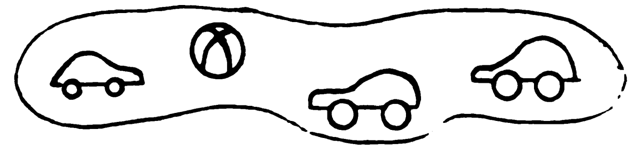
I would appreciate receiving your responses, if possible, before Monday, April 24, 1972.

Thanks for your help.

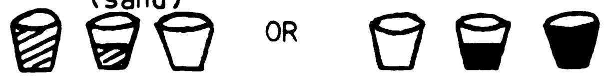
AN APPENDAGE

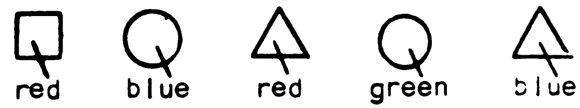
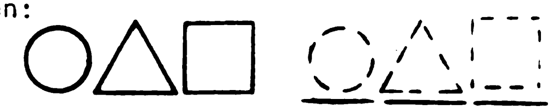
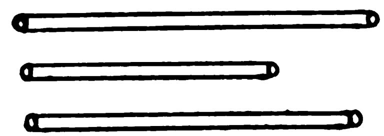
Please assign an importance rating to each objective by placing a number corresponding to the importance weight you believe the objective deserves in the right hand margin. The 1 to 5 scale is defined as follows:

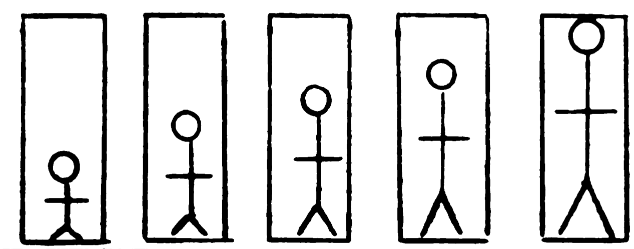
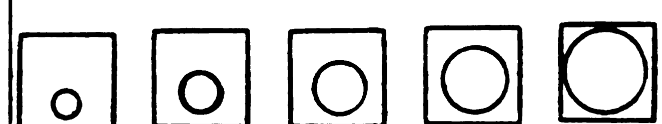
1. Essential: I would continue teaching this objective until it was mastered.
2. Very Important: I would re-teach this objective at least three times if not mastered during initial instruction.
3. Important: I would re-teach this objective as least twice if not mastered during initial instruction.
4. Of Little Importance: I would teach one lesson on this, but if it was not mastered by the learner, I would <u>not</u> bother to re-teach.
5. Not Important: I would not have this as a purposefully planned part of my instruction.

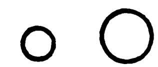
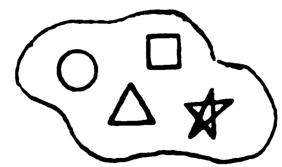
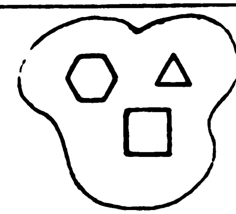
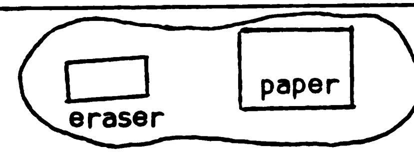
Topic	Program Objectives (K-3)	Examples and Comments
Class. Matching	1. Given a set of three to five objects, two of which are alike, the learner will pick up two that are alike.	
	2. Given a set of three to five objects, all but one of which are alike, the learner will pick up the different one.	
Class. Sorting	3. Using two kinds of objects in a large set, the learner will sort the objects into two sets according to characteristics.	Examples: 1. elbow and shell macaroni 2. bottle tops and checkers
Class. Attributes Color	4. Given a set of objects, the learner will recognize objects that are the same <u>color</u>.	Examples: 1. Red buttons 2. Blue buttons
Shape	5. Given a set of objects, the learner will recognize objects that are the same <u>shape</u>.	Examples: 1. Balls 2. Attricute blocks
Size	6. Given a set of objects, the learner will recognize objects that are the same <u>size</u>.	Examples: 1. Large beads 2. Small beads
	7. Given a set of objects of assorted colors, the learner, when shown an object of a specific color, will pick an object which is the same color from his set.	Teacher shows a red ball, the child picks red crayon from his set of crayons.

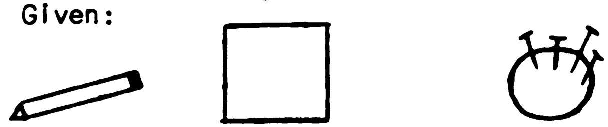
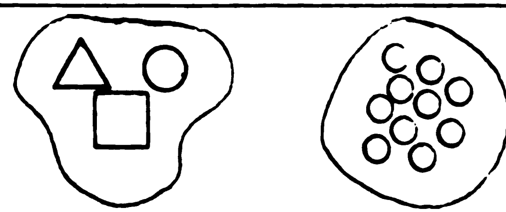
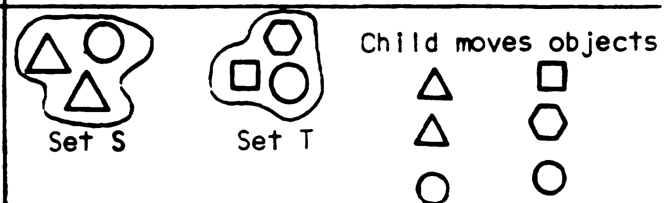
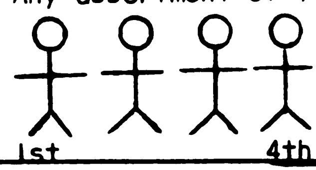
Topic	Program Objectives (K-3)	Examples and Comments
	8. Given a set of two or more (a) circle (b) triangle (c) square (d) rectangle shaped objects and shown an object of one of those specific shapes, the learner will pick up an object which is the same shape.	(a) ball (b) triangularly folded paper hat (c) box (d) book
Class. Position	9. Given an object, the learner will hold it up and put it down as requested.	Up above his head Down on the floor
	10. Given an object, the learner will place it in the following positions--over and under; in front of and in back of--in relation to a table or box as requested.	
Class. Size	11. Given two objects, the learner will pick up the one that is bigger or smaller as requested.	Big doll, Small doll
Class. Quantity	12. Given two sets of identical objects, one with many members and one with very few members, the learner will place the set having more in a box.	two strings of beads - or - two sets of jacks.
Class. Text	13. Given an object, (a) smooth (b) rough (c) soft (d) hard, the learner, choosing from his own set of objects, will select an object that is of the same texture of the given one.	(a) plastic (b) sand paper (c) cotton batting, velvet (d) rock, floor

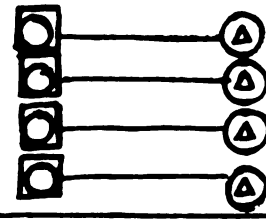
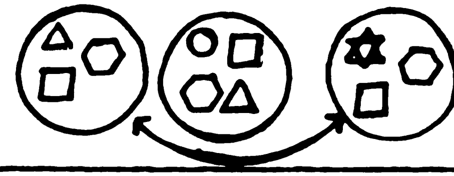
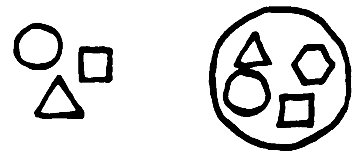
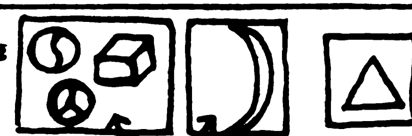
Topic	Program Objectives (K-3)	Examples and Comments
Class. Patterns	14. Given a pattern using two objects different in color, the learner will duplicate the pattern selecting from a set of cubical beads.	 blue bead red bead
	15. Given a pattern using two objects different in shape, the learner will duplicate the pattern selecting from a set of beads.	
Ordering:	16. Given a set of three clear plastic drinking glasses, one filled with sand; one empty; and one half filled with sand, the learner will arrange the glasses from "full to empty."	The "full to empty" can apply either to the sand or the air. (sand) 
Counting:	17. Given the directions "count to five," the learner will say the names of the numbers one through five in the proper order.	
Class. Money	18. Given a set of coins of a penny, nickel, dime, the learner will pick up and name each one.	
Class. Attributes	19. Given a set of ten objects assorted color and shape, the learner will pick out objectives having specific combinations of the two attributes.	Given: Colors: red, yellow, blue Shapes: squares, circles, triangles Possible Combinations: red circle shape, blue triangle shape, yellow square shape, etc.

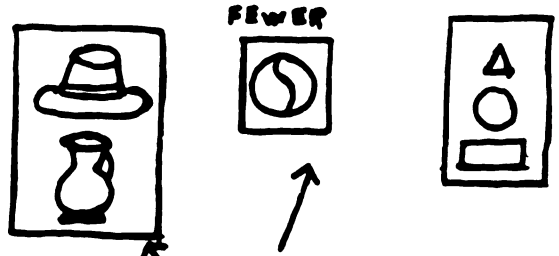
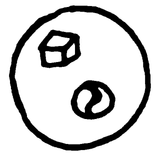
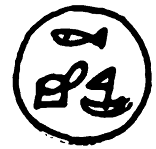
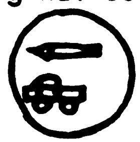
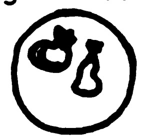
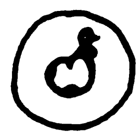
Topic	Program Objectives (K-3)	Examples and Comments
	20. Given a set of ten objects of assorted shape and texture, the learner will pick out objects having specific combinations of two attributes.	Given: Shapes: squares, circles, triangles Textures: rough, smooth Possible Combinations: rough triangle shape, smooth circle shape, etc.
Class. Patterns	21. Given a series of three to five objects arranged in a pattern by color and/or shape, the learner will duplicate the pattern.	
	22. Given one series of three objects arranged in a pattern by color and/or shape and the first object of the second series, the learner will complete the second pattern series.	Given: 
Ordering:	23. Given a collection of children of varying heights, the learner will choose the <u>tallest</u> or <u>shortest</u> child.	
	24. Given a collection of five objects of varying lengths, the learner will pick up the <u>longest</u> or the <u>shortest</u> as requested.	 straws

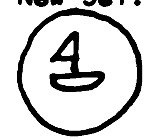
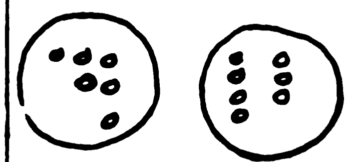
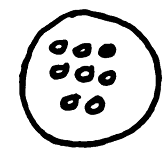
Topic	Program Objectives (K-3)	Examples and Comments
Class. Attributes Position	25. Given a small object such as a block, the learner will place the object <u>inside</u> a box.	
	26. Given a small object such as a block, the learner will place the object <u>outside</u> a box.	
	27. Given a small object such as a chalkboard eraser, the learner will place the object <u>on</u> a table or a shelf.	
	28. Given a small object such as a chalkboard eraser, the learner will take the object <u>off</u> the table or shelf.	
Ordering:	29. Given a set of five pictures of objects of various heights, the learner will arrange the pictures so that the objects are ordered from shortest to tallest.	
	30. Given a set of five pictures of objects of various heights, the learner will arrange the pictures so that the objects are ordered from smallest to largest.	

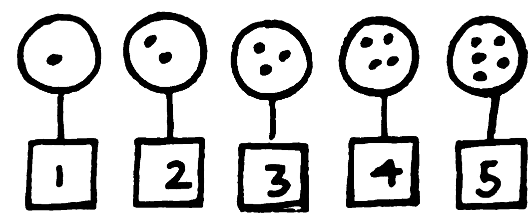
Topic	Program Objectives (K-3)	Examples and Comments
	31. Given two objects of decidedly different weights, the learner will lift the objects and hand to the teacher the one that is heavier or the one that is lighter as requested.	(different sizes)  same type of material (wood) same size container  different material
Number Meaning:	32. Given a collection of from one to nine small objects and a length of string or yarn, the learner will place all the objects inside the closed curve formed by the yarn.	
	33. Given a collection of from one to nine small objects and a length of yarn or string , the learner will place some of the objects inside the closed curve formed by the string.	 
Counting:	34. Given the directions "count to ten", the learner will recite the number names from one through ten in the usual order.	
Number Meaning:	35. Given classroom materials such as pencils, erasers, chalk, sheets of paper, the learner will assemble a set inside the string.	

Topic	Program Objectives (K-3)	Examples and Comments
	36. Given a set formed by the learner from objects found in the classroom, the learner will describe the characteristic(s) (attributes of the set) such as: color and shape.	Color and shape 1. Red triangle shapes or 2. Things in my desk
	37. Given an oral description of a set and a collection of objects, some of which belong to the set and some of which do not, the learner will pick up the objects that are members of the given set.	Set: My writing tools Given:  pencil paper pin cushion
	38. Given two sets, one set with one to three members and the other with eight to ten members the learner, using only visual inspection, will place his hand on the set with <u>more</u> members.	
	39. Given two equivalent sets of small objects (2 to 5 members), the learner will demonstrate a one-to-one matching by physically associating the objects of one set with the objects of the second set.	
Class. Attributes Position	40. Given five small toys, the learner will form a single line parade and then indicate the <u>first</u> toy and the <u>last</u> one.	Toy soldiers Toy cars Any assortment of little toy animals 

Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning:	1. Given pictures of sets having two to five members, the learner will draw lines, pair the members of one set with the members of the other set and then select those sets which are equivalent.	
	2. Given sets having one to five small objects as members, the learner will point to the sets that have the same number of objects.	
	3. Given two sets consisting of different numbers (2-5) of objects, the learner will place a length of yarn around the set with more members.	
	4. Given two sets consisting of different numbers (2-5) of objects, the learner will place a length of yarn around the set with fewer members.	
	5. Given pictures of sets, the learner will pick out pairs of sets whose members cannot be matched one-to-one (non-equivalent); and then tell which set has more members.	MORE  non-equivalent sets

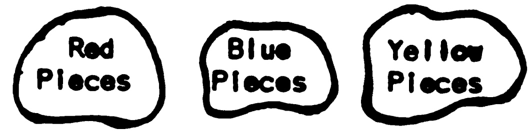
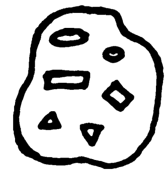
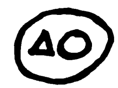
Topic	Program Objectives (K-3)	Examples and Comments
	6. Given pictures of sets, the learner will pick out pairs of sets whose members cannot be matched one-to-one (non-equivalent); and then tell which has fewer members.	 non-equivalent sets
	7. Given a set with less than ten objects the learner will make an equivalent set by using actual objects and then will draw a picture of the set.	
	8. Given a set of small objects, the learner (using his own collection of objects) will form another set that has exactly one more object than the original set.	Original Set:  New set: 
	9. Given a set of small objects, the learner will draw a set with exactly one more object than the original set.	Original Set:  New Set: 
	10. Given a set of small objects, the learner using his own collection of objects, will make a set with one fewer objects than the original set.	Original Set:  New Set: 

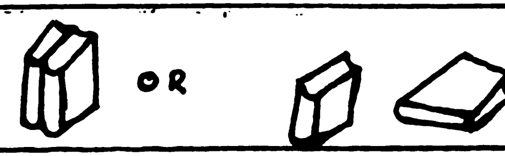
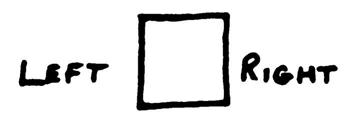
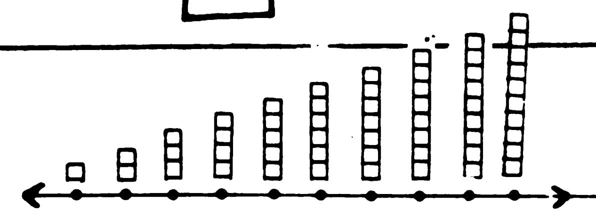
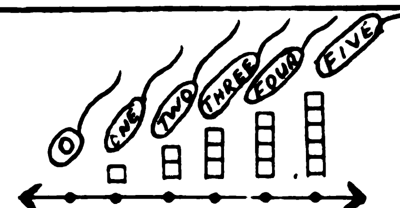
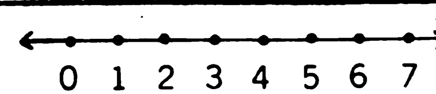
Topic	Program and Objectives (K-3)	Examples and Comments
	11. Given a set of small <u>objects</u>, the learner will draw a <u>picture</u> of a set with exactly <u>one fewer</u> object than the original set.	Original Set:  New Set: 
Ordering	12. Given two sequentially ordered sets of <u>objects</u>, one of which has one more or one less than the other, the learner will form the set that comes next in order.	Given:  Result: 
	13. Given <u>pictures</u> of any three sets having from one to five members, the learner will arrange the <u>pictures</u> in sequential order, fewest to most.	
	14. Given any three consecutive sets of <u>objects</u> consisting of one to five members, the learner will place a string around the set that has the <u>most</u> members.	
	15. Given any three consecutive sets of <u>objects</u> consisting of one to five members the learner will place a string or yarn around the set that has the <u>fewest</u> members.	

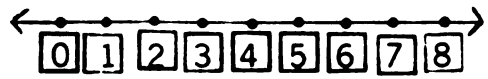
Topic	Program Objectives (K-3)	Examples and Comments
	16. Given any three consecutive sets of objects consisting of one to five members, the learner will place a loop of yarn around the set that is between the other two in the sequence.	
	17. Given cut out pictures of any three sets (from one to five members), the learner will place the pictures of the sets in order, from that set with the fewest members to that set with the most members; then he will order the set pictures from most to fewest.	
	18. Given four sets of objects consisting of one, two, three, four, and five members, the learner will place the sets in sequential order from the set with the fewest members to the set with the most members.	This is a pre-skill for for the number line.
	19. Given numeral cards 1 through 5 and five sets of objects consisting of one, two, three, four and five members, the learner will place the sets in sequential order from the set with the fewest to the set with the most and then will place the numeral cards in front of the set having the number of members named by the numeral.	

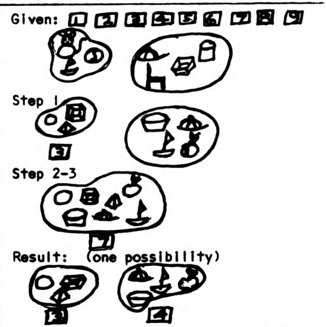
Topic	Program Objectives (K-3)	Examples and Comments
	20. Given pictures of sets consisting of one to five members, the learner will place the pictures in sequential order from the set with the fewest members to the set with the most members.	
Number Meaning	21. Given a set of numeral cards, 1 through 5 and the oral request for one of the numbers, the learner will pick out the proper numeral card.	Request: Three Response: Learner picks up $\boxed{3}$
Counting	22. Given a set of numeral cards, 1 through 5 and the request to "count to 5" the learner will pick out the proper numeral card as he says the numbers in sequential order.	
	23. Given a set of objects with 1-9 members, the learner will count the members of the set and state the cardinal number of that set.	
Ordering	24. Given pictures of sets from 1 - 9 in random order, the learner will arrange the sets in sequential order.	

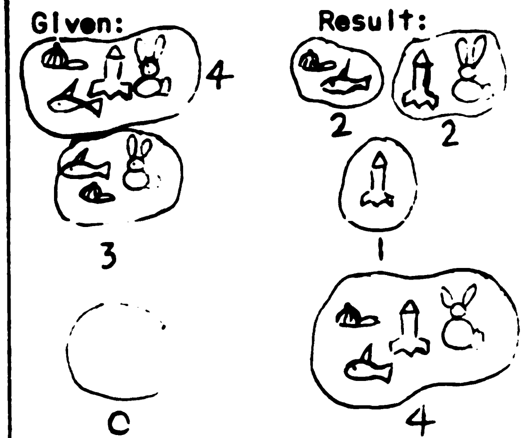
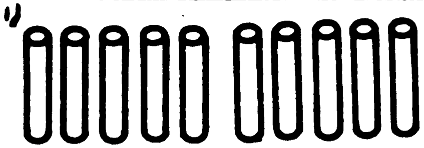
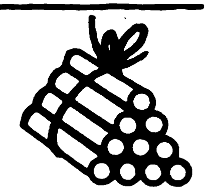
Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning	25. Given a collection of small objects and a loop of yarn, the learner will illustrate the empty set, and then draw or give an oral example, as requested.	Example: The set of pink elephants in the classroom.
	26. Given a loop of yarn containing no members (empty set) and felt or sandpaper numerals (0-9) the learner will pick out the numeral for the cardinal number of the set and will say the number name.	
	27. Given pictures of sets with 0-9 objects and number cards from 0-9 (using felt numerals, sandpaper numerals), the learner will match the right numeral with the picture of the set having the same of members.	
	28. Given several sets of 0-9 objects with duplicates or triplicates of certain sets the learner will place loops of the same color yarn around the sets that have the same cardinal number.	
Meaningful Counting	29. Given dot pattern cards showing sets of 0-10 dots, the learner will count while pointing to the appropriate dot card.	Example: The child points to the blank card and say "zero" and then points to the card with one dot and says "one."

Topic	Program Objectives (K-3)	Examples and Comments
Class. Attributes	30. Given an assorted set of ten <u>objects</u> of two to five colors or two to five different shapes, the learner will arrange the objects into subsets according to the various colors or shapes.	Given: Red, yellow and blue torn pieces of paper in the set. Result: 
Number Meaning	31. Given a set of 2 to 8 <u>objects</u>, the learner from his own group of objects will construct a set having <u>more members than</u> the original set.	Given:  Result:  OR 
	32. Given a set of 2 to 8 <u>objects</u>, the learner from his own group of objects will construct a set having fewer members than the original set.	Given:  Result:  OR 
	33. Given two written <u>numerals</u>, 9 or less, the learner will point to the number which is <u>greater in value than</u>, the other.	Given: $\boxed{9}$ $\boxed{7}$ Request: Which number is greater than the other? Child points to $\boxed{9}$

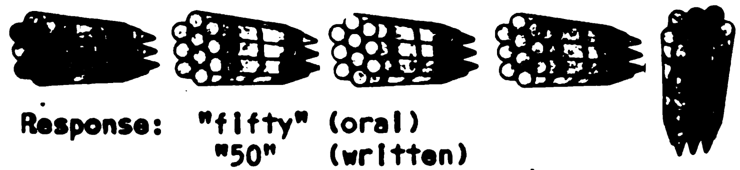
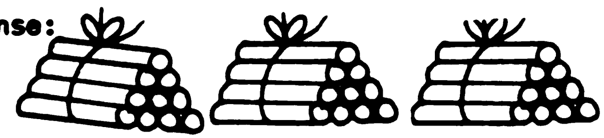
Topic	Program Objectives (K-3)	Examples and Comments
	34. Given two written <u>numerals</u>, 9 or less, the learner will point to the number which is <u>less in value than</u> the other.	Given $\boxed{5}$ $\boxed{8}$ Request: Which number is less than the other? Child points to $\boxed{5}$
Class. Attributes	35. Given a book, the learner will place this book beside another book.	
	36. Given a sheet of paper, the learner, facing the paper, will point to the <u>left</u> or <u>right</u> side of the paper, on request.	
Number Meaning	37. Given small blocks and a long line marked off in congruent segments of at least 3 inches, the learner will construct the sets with from zero to ten members and will place the sets in order on the line.	
	38. Given small blocks and a long line marked off in congruent segments of at least 3 inches, the learner will construct the sets with from one to ten members in increasing order on the line and will say, on request, the numbers represented by the sets.	
	39. Given a line marked with congruent segments and labeled from 0-10 the learner will touch any point, and say the number indicating that position on the number line.	

Topic	Program Objectives (K-3)	Examples and Comments
	40. Given a line marked with congruent segments and a set of numeral cards (0-10), the learner will place the appropriate numeral card below any point on the number line.	
Ordering	41. Given a line of five children, the learner will say the ordinal number for each child as he taps each child on the shoulder.	
	42. Given two ordinal numbers orally and a line of five children, the learner will touch the children who are in the positions named by the two ordinal numbers.	
Number Meaning	43. Given any three numbers, 0-10, the learner will tell which number is the greatest and which is the least, on request.	Given: 8, 3, 5 Result: 8 is the greatest or 3 is the least.
Ordering	44. Given two consecutive even or odd numbers 0-9, the learner will name the number that comes between the two given numbers.	
	45. Given a number from 1 to 8, the learner will name and write the numbers that come before and after the given number.	Step 1 — 3 6 — — 2 — Given: — 7 — Step 2 — 3 — — 6 — — 2 — Response: 6, 7, 8

Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning	46. Given two sets of small objects, each with less than six members, the learner will name the number associated with each set, then move the objects into a single set and say the number for the newly formed set.	
	47. Given a set of small <u>objects</u> with nine or fewer members, the learner <u>will</u> say the number for the given set, then form two subsets and say the number for each of the subsets.	
	48. Given <u>numeral cards</u>, 0-9, and two sets of <u>objects</u>, <u>each having</u> four or fewer members <u>the learner</u> will (1) place the appropriate numeral cards beside each set, (2) move the sets together forming a new set, (3) name the new set with a nemeral card, then (4) partition the new set into a pair of subsets and (5) associate the appropriate numeral cards with the pair of subsets.	

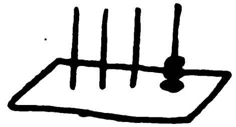
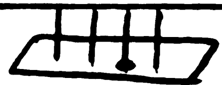
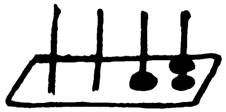
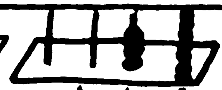
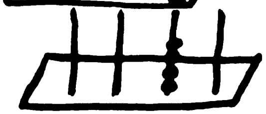
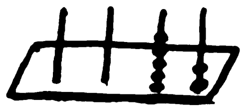
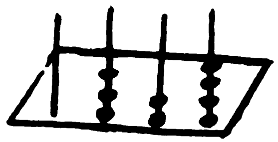
Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning	49. Given a set of nine or fewer small objects the learner will separate the given set into all possible pairs of subsets, say the number for each subset and then write the number for each subset.	
	50. Given a set of ten assorted objects, the learner will say the word "ten", while holding the collection in his hand and when he is asked "how many members in this set."	
	51. Given a set of 12 to 15 small objects, the learner will pick out ten objects on request.	
	52. Given ten identical objects spaced out on a table, the learner will collect the set of ten, place a rubber band or string around the set and tell orally how many tens and how many ones are in the bundle.	1)  2)  3) _____ tens _____ ones

Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning	53. Given written number words zero to ten, the learner will say the number word, while matching the written number word with its cardinal number.	Each child has two sets of colored numerals Envelope: cards 1 2 3. . . 10 Envelope: cards $\boxed{\text{one}}$ $\boxed{\text{two}}$ $\boxed{\text{three}}$. . . ten
	54. Given twenty, thirty, forty, up to ninety objects, the learner will form sets of ten and group and label sets of ten as 2 tens, 3 tens, 4 tens, ... 9 tens.	Straws, lollipops, sticks, beads, spoons
Counting	55. Given 10 bundles with ten straws in each bundle, the learner will count by 10's to 100, saying the number word while placing additional bundles of ten on the desk.	
	56. Given cards with the numerals 10, 20, 30, ..., 100, the learner will count by 10's to 100 saying the associated number word while picking up the proper number card.	
	57. Given the spoken words 10, 20, 30..., 100 in sequential order, the learner will write the given numerals.	

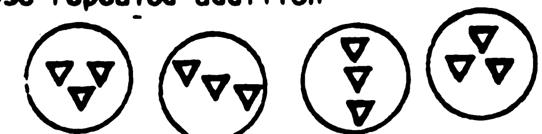
Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning	58. Given 100 identical objects, the learner will make 10 bundles, each containing 10 objects, on request.	
	59. Given a set of no more than ninety objects grouped by tens, the learner can say and write the numeral represented.	 Response: "fifty" (oral) "50" (written)
	60. Given a numeral from the set 10, 20, ...90 and a supply of objects, the learner will form a set representing the given number.	Given: 30 Response: 
Counting	61. Given orally any one of the following: 20, 30, 40,...90, the learner will say the counting sequence of the following nine numbers	Given: 30 Result: 31, 32, 33, 34, 35, 36, 37, 38, 39
Number Meaning	62. Given any number from the set 10, 11, 12..., 99 and a supply of counters, the learner will represent the number with the counters.	Use straws, spoons, beads, paper strips, pegs, tounge depressors, toothpicks.

Topic	Program Objectives (K-3)	Examples and Comments
	63. Given any number of objects greater than twenty and less than one hundred, the learner will form the objects into "tens" and "ones" and will label the results as "____tens" and "____ones".	
	64. Given a set of tens and ones representing a number less than 100, the learner will say and write the numeral.	
Ordering	65. Given a set of sequencially ordered whole numbers within a decade less that 100, such as 31, 32, ..., 40, printed on numeral cards the learner will pick out the number that comes immediately before or after a given number, as requested.	
Number Meaning: Expanded Notation	66. Given a two-digit numeral, the learner will be able to write it in expanded notation in two ways: as so many tens and so many ones, or as ___ + ___, representing the value of the tens place plus the value of the ones place.	Given: 35 Response: 3 tens and 5 ones OR 30 + 5
	67. Given two 2 digit numbers the learner will tell which number is greater and which number is less.	Given: 43 72 Student response: "43 is less" "72 is more"

Topic	Program Objectives (K-3)	Examples and Comments
Money	68. Given a set of dimes, one to nine, the learner will state the value.	
	69. Given two containers, one with pennies and one with dimes, the learner, when requested, will take out enough pennies and exchange the pennies for a dime.	
	70. Given a set of dimes and pennies valued between 11 and 99 cents (from one dime, one penny to 9 dimes, 9 pennies), the learner will state the value.	Given: 1 dime, 1 penny Response: 11¢ Given: 5 dimes, 2 pennies Response: 52¢ Given: 7 dimes, 9 pennies Response: 79¢
	71. Given dimes and a dollar, the learner will pick up enough dimes to exchange for one dollar.	Given: dimes and one dollar Response: pick up ten dimes to exchange for one dollar.
	72. Given a three-digit numeral, the learner will arrange counters grouped to represent the hundreds, tens and ones, of the numeral.	

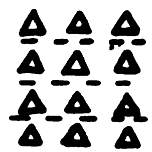
Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning: Abacus	73. Given an abacus, the learner will use counters on the right hand spindle to represent any one-digit numeral (1-9).	
	74. Given an abacus, the learner will use one counter on the tens spindle plus 0-9 on the ones spindle to represent numbers 10-19.	10  11  12  etc.
	75. Given an abacus the learner will move counters on the tens and ones spindle to illustrate counting through any two decades, i.e. 37 to 52.	37  40  52 
	76. Given an abacus, the learner will move counters on the hundreds, tens, and ones spindle to illustrate any three digit numeral dictated to him orally or in writing.	 "Show 324 on the abacus"

Topic	Program Objectives (K-3)	Examples and Comments
Equivalent Sets	77. Given 2 to 5 sets each with the same number of objects, the learner will join the sets and write the number that names the new set.	Use repeated addition



$3 + 3 + 3 + 3 = 12$

Arrange in rows and columns (array)

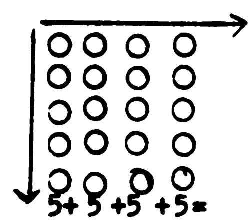


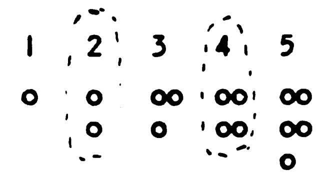
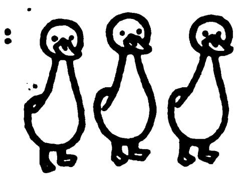
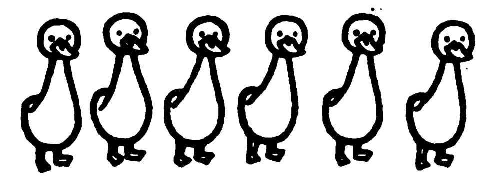
Each subset has 3 members

Topic	Program Objectives (K-3)	Examples and Comments
Ordering	78. Given a hundred chart with the first twenty numbers and multiples of 10, the learner will write in any portion of the chart as indicated by the teacher.	Use chart having 10 by 10 grid (100 chart) Need 10 charts

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20									
30									
40									
50									
60									
70									
80									
90									

Using this way the attention is drawn to the pattern of counting and place-value.

Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning: Expanded Notation	79. Given any 3-digit numeral, the learner will write expanded notation to 1000, first by using place value words and then by using numerals.	243 = 2 hundreds 4 tens 3 ones 200 + 40 + 3
Ordering	80. Given a random list of 2-digit numerals, the learner will arrange them in ascending order.	Given: 76, 42, 96, 34, 25 Result: 25, 34, 42, 76, 96
	81. Given a random list of 2 and 3 digit numerals, the learner will arrange them in ascending order.	Given: 123, 47, 91, 796. 31 Result: 31, 47, 91, 123, 796
Number Meaning: Comparison	82. Given two 3-digit numerals which have the same digits but in different positions, the learner will compare them to determine which is greater, which is less.	Given: 297 or 792 634 or 364
Arrays	83. Given equivalent sets, the learner will form arrays by arranging the members into rows and columns and will then determine the cardinal number of the array.	 4 4 4 4 + 4 20
Ordering	84. Given a counting sequence of two to four numbers the learner will tell and write the next number in the sequence.	2, 4, 6, 8, ____. 5, 10, 15, __ 4, 8, ____.

Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning	85. Given the counting numbers 1 - 10 the learner will indicate those that are multiples of 2.	
	86. Given a set of <u>objects</u>, the learner will make another set that will have twice as <u>many</u> objects.	Given:  Response: 
	87. Given any 4-digit number, the learner will give the number that is 100 or 1000 more or less than it is without using formal addition or subtraction.	Given: 4823 Response: 100 more is 4923 100 less is 4723 1000 more is 5823 1000 less is 3823
	88. Given a written Arabic numeral, the learner will read the number aloud.	Child sees: 7192 His oral response is "seven thousand one hundred ninety-two.

Topic	Program Objectives (K-3)	Examples and Comments
Number Meaning	89. Given a number orally, the learner will write the Arabic numeral.	The teacher says: "Six thousand four hundred seventy-two." The child writes: 6472
	90. Given any 4-digit numeral, the learner will write expanded notation, first by using place value words and then by using numerals.	7192 = 7 thousands 1 hundred(s) 9 tens 2 ones 7000 + 100 + 90 + 2
	91. Given any numeral from 100 to 9999999 the learner will locate and separate the periods with commas.	Given: 654321 | 1032 Response: 654,321 | 1,032

APPENDIX B

INSTRUCTIONS AND INSTRUMENT I--

BIOGRAPHICAL INFORMATION FORM

APPENDIX B

INSTRUCTIONS AND INSTRUMENT I: BIOGRAPHICAL INFORMATION FORM

TO: Henri Barns, Walt Brown, Joe Byers, Bruce Cheney, Bill Cole, Gerald Duffy, Bill Fitzgerald, Judy Henderson, Paul Kacanek, Perry Lanier, Dave O'Neil, Jackie Resh, Bob Scrivens, Bob Stone, and Lauren Woodby

Included in this packet are three instruments, which we hope will help us in describing the people that are or may be involved in some aspect of the development of the TTT Competency Based Teacher Education Program

In the future some of you may be asked to again respond. (For example: The people involved in the development of the mathematics competency criteria will be asked to respond to the same or similar instruments at the end of Spring term or during next Fall term.)

We appreciate your taking the time to respond and we will make every effort to fully use the information in a worthwhile manner. It is our hope that others interested in developing Competency Based Teacher Education Programs will benefit from our experiences.

You will find enclosed:

1.	Instrument I	Biographical Information Form
2.	Instrument II	Statements of concepts related to Competency Based Teacher Education Programs
3.	Instrument III	Scales and the names of people you are and/or may be working with during TTT program development.
4.	Return envelope	Mail the three above completed forms in the self-addressed envelope.

Thank you for your cooperation.

Joyce Putnam

Judith E. Henderson

INSTRUMENT I - BIOGRAPHICAL INFORMATION FORM

The first instrument is a Biographical Information form. It is the first in the series of three instruments, which we hope will help us in describing the people that are or may be involved in some aspect of the development of the TTT Competency Based Teacher Educatione Program.

We have gathered all the information available to us through the University. This information has been recorded on your form in an effort to diminish your task. If the recorded information is incorrect, please change it.

We would very much appreciate it if you would complete the form by providing the missing information.

BIOGRAPHICAL INFORMATION

The following questions are asked in an effort to determine what each individual is "bringing to" the TTT program development. This information will be used in the description of participants in a Competency Criteria Development team. (e.g., Mathematics)

If any of the information already entered on your form is incorrect, please change it. We would appreciate your providing the information where we have been unable to obtain it.

Name ______________________________ Date of Birth ________

1. Schools Attended: ____________________ Degree: __________

____________________ __________

____________________ __________

____________________ __________

2. What is your present University Rank? ____________________

3. What is your primary Department affiliations? ______________

4. What is your primary discipline affiliation? Please indicate the approximate percentage of time spent in this area ___________

____

(ANSWER ONLY IF DIFFERENT FROM DEPARTMENT AFFILIATION.)

5. Please indicate the approximate percentage of time you spend in the following:

   A. Teaching ______

   B. Research ______ (Brief description if possible) __________

   ____

   C. Service ______ (Brief description or examples, if possible) __

   ____

   ____

6. What courses do you most usually teach? ____________________________

____

7. What memberships in professional associations do you hold? ________

____

8. What is the total number of years of full time public school classroom teaching experience you have had? _____ Was any of this in secondary schools? ________ Was any of this experience in elementary schools? ________ Was any of this experience in junior high schools? ______

9. What was the termination date of your last full time public school classroom teaching experiences? ______

10. What is the total number of years of experience other than public school classroom teaching? _______ Please specify dates and nature of experiences. ______________________________________

____

____

APPENDIX C

INSTRUCTIONS AND INSTRUMENT II--ATTITUDES RELATIVE TO THE CONCEPT OF PERFORMANCE/ COMPETENCY-BASED TEACHER EDUCATION

APPENDIX C

INSTRUCTIONS AND INSTRUMENT II--ATTITUDES RELATIVE TO THE CONCEPT OF PERFORMANCE/ COMPETENCY-BASED TEACHER EDUCATION

INSTRUMENT II - ATTITUDES RELATIVE TO THE CONCEPT OF PERFORMANCE/ COMPETENCY-BASED TEACHER EDUCATION

INSTRUCTIONS: Included in this booklet is a series of statements related to Competency Based Teacher Education Programs and their development. The procedure we have chosen to measure your reactions to various concepts related to Competency Based Teacher Education Programs is to have you indicate the degree to which you agree or disagree with each of the statements.

HOW TO USE THE SCALE:

If your feelings about a statement are very closely related to one end of the scale, for example, if you strongly disagree or agree with the following statement, respond as follows:

I think Competency Criteria Teacher Education Program should be developed ■ 2 3 4 5 6 7

or

1 2 3 4 5 6 ■

If your feelings are quite closely related to one end of the scale, for example you disagree or agree with the statement, then you should respond as follows:

1 ■ 3 4 5 6 7

or

1 2 3 4 5 ■ 7

If your feelings are, however, only slightly related to one end of the scale respond accordinlgy:

1 2 ■ 4 5 6 7

or

1 2 3 4 ■ 6 7

If you are not sure or undecided how you feel about a statement, you should respond:

1 2 3 ■ 5 6 7

	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	UNDECIDED	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
1. I feel I understand the concept of Competency Based Criteria Teacher Education Programs.	1	2	3	4	5	6	7
2. I feel it is important that Competency Based Criteria Teacher Educations Programs be developed.	1	2	3	4	5	6	7
3. I feel I can contribute to the development of a Competency Based Teacher Education Program.	1	2	3	4	5	6	7
4. I think competency criteria for Professional Teaching Behaviors can be identified.	1	2	3	4	5	6	7
5. I think competency criteria for Professional Teaching Behaviors should be identified.	1	2	3	4	5	6	7
6. I think competency criteria for Professional Teaching Behaviors which cross content areas can be identified.	1	2	3	4	5	6	7
7. I think competency criteria for Professional Teaching Behaviors related to specific content areas can be identified. (e.g., mathematics, reading)	1	2	3	4	5	6	7
8. I think Professional Teaching Behaviors can be identified by teams of University faculty.	1	2	3	4	5	6	7
9. I think Professional Teaching Behavior should be identified by teams of University faculty.	1	2	3	4	5	6	7
10. I think Professional Teaching Behaviors, (related to math., reading) can be best identified by University teams composed of personnel specializing in the same content area.	1	2	3	4	5	6	7

		STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	UNDECIDED	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
11.	I think Professional Teaching Behaviors can be identified by University teams composed of personnel from one Department ment.	1	2	3	4	5	6	7
12.	I think Professional Teaching Behaviors can be identified by University teams composed of personnel from various University Departments. (e.g., English, Education, Math.)	1	2	3	4	5	6	7
13.	I think Professional Teaching Behaviors should be identified by University teams composed of personnel from various University Departments.	1	2	3	4	5	6	7
14.	I think Professional Teaching Behaviors can be identified by University teams composed of personnel from content related Departments, Teacher Education, and public school teachers.	1	2	3	4	5	6	7
15.	I think Professional Teaching Behaviors should be identified by University teams composed of personnel from content related Departments, Teacher Education, and public school teachers.	1	2	3	4	5	6	7
16.	I feel I can contribute to the identification of Professional Teaching Behaviors related to my content area.	1	2	3	4	5	6	7
17.	I am willing to contribute time to identify the Professional Teaching Behaviors related to my content area.	1	2	3	4	5	6	7

	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	UNDECIDED	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
18. I think that once Professional Teaching Behaviors have been identified, it will be possible for instruments to be developed.	1	2	3	4	5	6	7
19. I would use information about the actual teaching behaviors of my students.	1	2	3	4	5	6	7
20. I would use information about the actual teaching behaviors of my students as part of their evaluation for my class, if they had a concurrent teaching experience.	1	2	3	4	5	6	7
21. I would use information about the actual teaching behaviors of my students as part of the evaluation I make of my course.	1	2	3	4	5	6	7
22. I feel I understand the concepts of Assessment, Goal Setting, Objectives, Strategies, and Evaluation, which are currently being taught to MSU Teacher Education students.	1	2	3	4	5	6	7
23. I think teacher education students learn teaching behaviors through the example (model) I present as I teach them.	1	2	3	4	5	6	7
24. I feel it is important for Teacher Education faculty to model teaching behaviors they wish students to use.	1	2	3	4	5	6	7
25. I think I model the teaching behaviors I want my students to use when they are teaching.	1	2	3	4	5	6	7

	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	UNDECIDED	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
26. I am interested in learning more about the development of Competency Based Teacher Education Programs.	1	2	3	4	5	6	7
27. I think Teacher Education faculties at other Universities can benefit from knowledge about the development of a Competency Based Criteria Teacher Education program at MSU.	1	2	3	4	5	6	7
28. I plan to incorporate competency based instruction in planning courses I teach in the future.	1	2	3	4	5	6	7
29. I am now using competency based instruction in planning for the courses I teach.	1	2	3	4	5	6	7

APPENDIX D

INSTRUCTIONS AND INSTRUMENT III--

SEMANTIC DIFFERENTIAL

APPENDIX D

INSTRUMENT III - SEMANTIC DIFFERENTIAL

INSTRUCTIONS: The procedure we have chosen to measure your reactions to the various people you might work with on the TTT Competency Based Teacher Education Program is to have you judge each against a set of descriptive scales. The people whose names appear at the top of each page are individuals available in the development of the TTT Competency Based Teacher Education Program. If you do not know the person whose name appears at the top of a page, you will have very little reaction to them and they should be given a neutral rating.

You have been asked to indicate your reactions to 15 people and yourself. The page what you are to indicate responses about yourself has been titled "MYSELF."

HOW TO USE THE SCALES:

If you feel that the person whose name appears at the top of the page is very closely related to one end of the scale, for example, if you see SUSAN COLSON as extremely active or passive, respond as follows:

Active ■ 2 3 4 5 6 7 Passive
or
Active 1 2 3 4 5 6 ■ Passive

If you feel that the person is quite closely realted to one end of the scale, as for example in the case where you feel that MYSELF is very strong or weak, respond accordingly:

Strong 1 ■ 3 4 5 6 7 Weak
or
Strong 1 2 3 4 5 ■ 7 Weak

If, however, you see only a slight relationship to one end of the scale, for example, if you react to SUSAN COLSON as being only slightly positive or negative, then you should respond:

Positive 1 2 ■ 4 5 6 7 Negative
or
Positive 1 2 3 4 ■ 6 7 Negative

If both sides of the scale are equally associated with the person, if the scale is completely irrelevant or unrelated to the person, or if you do not know the person, then you should respond:

Active 1 2 3 ■ 5 6 7 Passive

AS YOU RESPOND:

1. Take a few seconds to think about the person and the scales.
2. Make each response a separate and independent judgment.
3. It is your first considered impression that we want. Please don't labor or puzzle over any scale.

Please enter and code the last 4 digits of your Social Security number.

SAM SMITH

		EXTREMELY	VERY	SLIGHTLY	NEUTRAL	SLIGHTLY	VERY	EXTREMELY		
violent	:	1	2	3	4	5	6	7	:	gentle
unpleasant	:	1	2	3	4	5	6	7	:	pleasant
lenient	:	1	2	3	4	5	6	7	:	severe
fair	:	1	2	3	4	5	6	7	:	unfair
weak	:	1	2	3	4	5	6	7	:	strong
bad	:	1	2	3	4	5	6	7	:	good
unenjoyable	:	1	2	3	4	5	6	7	:	enjoyable
light	:	1	2	3	4	5	6	7	:	heavy
passive	:	1	2	3	4	5	6	7	:	active
still	:	1	2	3	4	5	6	7	:	moving
worthless	:	1	2	3	4	5	6	7	:	valuable
safe	:	1	2	3	4	5	6	7	:	dangerous
fast	:	1	2	3	4	5	6	7	:	slow
labored	:	1	2	3	4	5	6	7	:	easy

APPENDIX E

SUMMARY OF PARTICIPANTS' RESPONSES TO THE RANKING OF OBJECTIVES

APPENDIX E

Pre-number Objective	Math Ed. Rep.	Math Ed. Rep.	Math Ed. Rep.	Math Content Rep.	Math Content Rep.	Math Ed. Rep.	Code	Total	Math Ed. Rep.
1	1	2	2	1	1	3	-	10	1
2	1	2	2	1	1	3	-	10	1
3	2	2	2	1	1	3		11	1
4	1	3	2	1	1	3		11	1
5	2	1	2	1	1	3		10	1
6	2	1	3	1	1	3		11	1
7	1	3	2	1	1	4		12	1
8	3	1	3	1	1	3		12	1
9	2	3	3	1	1	3		13	1
10	2	3	3	1	1	3		13	1
11	2	2	1	1	1	2		9	1
12	1	1	1	1	1	2		7	1
13	3	3	3	1	3	4		17	1
14	3	3	2	1	1	3	v	13	1
15	3	1	2	1	2	3		12	1
16	2	3	3	1	1	3		13	1
17	1	2	1	1	2	2		9	1
18	1	3	2	1	2	1		10	1
19	3	3	2	1	1	2		12	1
20	3	3	2	1	3	3		15	1
21	3	3	2	2	2	3		15	1
22	3	3	2	2	2	2		14	1
23	3	2	2	3	2	3		15	1
24	3	2	2	3	2	3		15	1
25	2	1	3	1	1	3		11	1
26	2	1	3	1	1	3		11	1
27	2	1	3	1	1	3		11	1
28	5	1	3	1	1	3		14	1
29	1	2	2	1	1	2		9	1
30	1	2	2	1	1	2		9	1
31	1	3	3	1	2	3		13	1
32	3	3	3	2	2	2		15	1
33	3	3	3	2	3	3		17	1
34	1	2	1	1	2	2		9	1
35	3	2	2	4	3	3		17	1
36	3	2	2	3	2	2		14	1
37	3	2	2	3	3	2		15	1
38	2	1	1	1	1	2		8	1
39	2	1	1	1	1	2		8	1
40	2	3	1	3	2	3		14	1

	Math Ed. Rep.	Math Ed. Rep.	Math Ed. Rep.	Math Content Rp.	Math Content	Math Ed. Rep.	Code	Total	Math Ed. Rep.
Numeration									
1	1	1	1	1	2	2		8	1
2	1	1	1	1	2	2		8	1
3	1	1	1	1	3	2	-	9	1
4	1	1	1	1	3	2	-	9	1
5	1	1	1	1	4	2	v	10	1
6	1	1	1	1	4	2	v	10	1
7	4	2	1	1	3	4	v	15	1
8	2	1	1	1	2	3	v	10	1
9	4	1	1	1	3	3	v	13	1
10	2	1	1	1	2	3	-	10	1
11	4	1	1	1	3	3		13	1
12	2	1	1	1	3	2	-	10	1
13	3	1	1	1	3	2		11	1
14	2	1	1	1	3	3		11	1
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19	1	1	1	1	2	2		8	1
20	1	1	1	1	3	2	-	9	1
21	1	1	1	1	2			6	1
22	1	1	1	1	2	1		7	1
23	1	1	1	1	1	1		6	1
24	1	1	1	1	2	2		8	1
25	5	1	1	1	2	2	v	12	1
26	4	3	1	1	2	1		12	1
27	2	3	1	1	3	1		11	1
28	2	3	1	1	3	2		12	1
29	1	1	1	1	1	2		7	1
30	3	3	2	1	1	3		13	1
31	1	1	1	1	4	3	v	11	1
32	1	1	1	1	4	3	v	11	1
33	1	1	1	1	2	1		7	1
34	1	1	1	1	2	1		7	1
35	3	4	3	1	3	4	v	18	5
36	1	3	3	1	2	3		13	5
37	1	1	1	1	1	3	-	8	2
38	1	1	1	1	3	3	-	10	2
39	1	1	1	1	3	1	-	8	1
40	1	1	1	1	3	2	-	9	1
41	2	2	3	3	3	3		16	1
42	2	2	3	3	3	3		16	1

	Math Ed. Rep.	Math Ed. Rep.	Math Ed. Rep.	Math Content Rep.	Math Content Rep.	Math Ed. Rep.	Code	Total	Math Ed. Rep.
Numeration									
43	1	2	1	1	2	2		9	1
44	1	1	1	1	2	2		8	1
45	1	1	1	1	2	2		8	1
46	1	1	1	1	1	2		7	1
47	1	1	1	1	1	2		7	1
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49	3	1	1	1	1	3	-	10	3
50	4	1	1	1	2	2		11	1
51	1	1	1	2	1	1		7	3
52	1	1	1	2	1	1		7	1
53	3	2	1	2	3	2		13	2
54	1	1	1	2	2	1		8	1
55	1	1	1	1	1	2		7	1
56	1	1	1	2	3	2	-	10	1
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62	1	1	1	1	2	3	-	9	2
63	1	1	1	2	1	2		8	2
64	1	1	1	1	2	2		8	1
65									1
66	3	2	1	1	3	1		11	1
67	1	1	1	1	2	1		7	1
68	3	1	2	1	3	2		12	1
69	1	1	2	1	2	2		9	1
70	2	1	2	1	2	2		10	1
71	1	1	2	1	2	2		9	1
72	1	1	1	2	2	2		9	1
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75	3	2	1	1	2	3		12	3
76	3	2	1	1	2	3		12	3
77	1	1	1	2	3	2	-	10	2
78	1	3	1	1	3	3		12	2
79	2	3	1	1	2	1	-	10	2
80	2	2	1	1	3	2		11	2
81	2	2	1	1	3	2		11	2
82	2	2	1	1	3	2		11	2
83	2	2	1	1	2	3		11	2
84	2	2	1	1	2	3		11	1
85	3	2	2	1	2	3		13	3

	Math Ed. Rep.	Math Ed. Rep.	Math Ed. Rep.	Math Content Rep.	Math Content Rep.	Math Ed. Rep.	Code	Total	Math Ed. Rep.
Numeration									
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89	2	3	1	1	4	2		13	1
90	3	3	1	1	3	2		13	2
91	3	3	1	1	4	3		15	2
Addition									
1	1	1	1	1	1	3	-	8	1
2	1	3	1	1	2	2	-	10	1
3	1	1	1	1	1	1		6	1
4	1	1	1	1	1	2		7	1
5	1	3	1	1	1	1	-	8	1
6	1	1	1	1	1	1		6	2
7	5	2	2	2	3	3	v	17	3
8	3	1	1	1	3	2		11	3
9	2	1	1	1	1	2		8	1
10	2	1	1	1	1	2		8	1
11	1	1	1	2	1	3	-	9	1
12	2	1	1	1	1	2		8	1
13	1	1	1	1	1	2		7	1
14	3	3	2	1	1	3	-	13	5
15	2	1	1	1	1	2		8	1
16	1	1	1	1	1	2		7	1
17	2	1	1	1	1	2		8	1
18	2	1	1	1	1	2		8	1
19	2	1	1	1	1	2		8	1
20	3	3	2	1	1	2		12	5
21	2	1	1	1	2	2		9	1
22	2	1	1	1	2	2		9	1
23	1	3	1	1	2	2	-	10	5
24	1	3	1	1	2	2	-	10	5
25	1	3	1	1	3	2		11	5
26	1	1	1	1	2	2		8	1
27	3	1	1	1	4	3	v	13	1
Subtraction									
1	1	1	1	1	1	3	-	8	1
2	5	1	1	1	1	3		12	1
3	3	1	1	1	2	3		11	1

	Math Ed. Rep.	Math Ed. Rep.	Math Ed. Rep.	Math Content Rep.	Math Content Rep.	Math Ed. Rep.	Code	Total	Math Ed. Rep.
Subtraction									
4	3	1	1	1	2	3		11	1
5	2	1	1	1	2	2		9	1
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7	2	1	1	1	1	3	-	9	5
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9	2	1	1	1	2	2		9	5
10	3	2	1	1	2	2		11	3
11	3	3	2	1	2	2		12	5
12	1	3	1	1	3	3		12	3
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18	2	1	1	1	1	2		8	5
19	2	1	1	2	1	2		9	5
20	2	1	1	2	1	2		9	5
21		2	1	1	3	3		10	5
Multiplication									
1	2	1	2	1	2	3		11	1
2	2	1	1	1	2	4	v	11	1
3	2	1	1	1	1	3	-	9	1
4	2	1	1	1	2	3	-	10	1
5	3	1	1	1	2	3		11	1
6	1	1	2	1	3	3		11	1
7	3	3	1	2	3	2		14	1
8	1	1	1	1	1	2		7	1
9	2	1	1	1	1	2		8	1
10	2	1	1	1	1	2		8	1

	Math Ed. Rep.	Math Ed. Rep.	Math Ed. Rep.	Math Content Rep.	Math Content Rep.	Math Ed. Rep.	Code	Total	Math Ed. Rep.
Multiplication									
11	3	2	1	1	1	2	-	10	1
12	2	2	1	1	2	2		10	1
13	1	3	1	1	2	2	-	10	1
14	2	3	1	2	2	2		12	1
15	1	1	1	2	2	2		9	1
16	3	3	2	3	3	2		16	5
17	3	3	2	1	3	2		14	5
18	3	3	2	3	3	2		16	5
19	1	1	1	1	2	2		8	1
20	1	1	1	1	3	2	-	9	1
21	1	3	1	1	3	2		11	5
22	1	3	1	1	3	2		11	5
23	2	1	1	1	3	2	-	10	1
24	2	3	1	1	3	2		12	1
25	2	3	1	3	3	2		14	5
26	2	1	1	2	3	2		11	1
27	3	3	2	2	3	2		15	5
Division									
1	3	4	1	1	2	3		14	1
2	3	1	1	1	2	2	-	10	1
3	3	1	1	1	1	2	-	9	1
4	3	4		1	2	3		13	1
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13	3	3	1	1	3	2		13	1
14	3	1	1	1	3	2		11	1
15	3	1	1	1	3	2		11	1
16	3	1	1	1	3	2		11	1
17	3	3	1	2	3	2		14	1
18	3	3	1	1	3	2		13	2
19	3	1	1	1	3	2		11	2
20	3	2	2	3	5	2	v	17	5

APPENDIX F

SAMPLE MEMORANDUM

APPENDIX F

SAMPLE MEMORANDUM

M E M O R A N D U M

TO: B. Fitzgerald, L. Woodby, B. Cole, B. Scrivens, P. Kacanek,
J. Resh, D. O'Neil, H. Barnes, B. Stone, K. Welsh, J. Henderson

FROM: Joyce Putnam

REMINDER: Thursday
May 4, 1972
1:00 to 3:00 p.m.
214 A - Wells Hall
Mathematics Team Working Session

APPENDIX G

FIRST SYNTHESIZED PRE-NUMBER OBJECTIVES, AND FINAL PRE-NUMBER MODULE OBJECTIVES

A. Pre-Number

Module		Program Objectives	Examples and Comments
Classification: Single Attribute Color Shape Size Texture Weight	1.	Given a set of objects, all but one which are alike, the learner will point to the different one	CONCRETE RECOGNITION TASK
	2.	Given a set of objects that can be sorted only by a single attribute, the learner will sort objects into clusters that are alike, (e.g., color, size, shape, texture, weight, etc.)	e.g., red and black checkers, large and small marbles or the same color, or rough and smooth discs of same size and color CONCRETE CONVERGENT PRODUCTION TASK
	3.	Given a set of objects that can be sorted in a variety of ways, the learner will sort objects according to any attribute(s) that he discovers and will explain to others the rationale for his classification. (i e., he will describe the attribute(s) he identified.)	How many ways can he classify the objects? Encourage him to classify objects in as many ways as he can. CONCRETE DIVERGENT PRODUCTION TASK
	4.	Given a set of objects that can be sorted in a variety of ways, the learner will sort objects according to a specific attribute that is verbally described.	CONCRETE CONVERGENT PRODUCTION TASK

Module	Program Objectives	Examples and Comments
Classification:		
Single Attributes (Cont'd)	5. Given two sets of identical objects, the learner will demonstrate by manipulating the objects, pointing, or explaining that the sets are equivalent.	CONCRETE RECOGNITION TASK
	6 Given two non-equivalent sets of identical objects, the learner will identify the set with the least objects and the set with the most objects.	CONCRETE RECOGNITION TASK
	7 Given six or more identical objects, the learner will create two equivalent sets.	CONCRETE CONVERGENT PRODUCTION TASK
	8. Given six or more identical objects, the learner will create two non-equivalent sets and name the set with the most objects and name the set with the least objects.	CONCRETE CONVERGENT PRODUCTION TASK

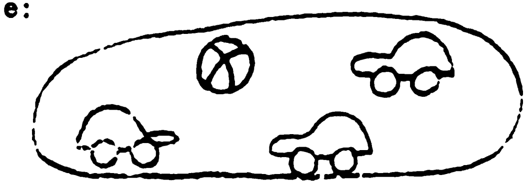
Module	Program Objectives	Examples and Comments
Classification: Multiple Attributes	9. Given a set of objects having multiple attributes, the learner will sort objects into clusters that have specific combinations of two or more attributes that he discovers. He will explain to others the rationale for his classification. i.e., he will describe the attributes he identified.	(e.g., shape and texture, color and size, color and shape, weight and shape, etc.) CONCRETE DIVERGENT PRODUCTION TASK
	10. Given a set of objects having multiple attributes, the learner will pick out objects having specific combinations of two or more attributes that are verbally described by others.	CONCRETE CONVERGENT PRODUCTION TASK
Single Attribute Patterns:	11. Given a pattern using three or more objects different on the basis of only one attribute (e.g., color, shape, size, etc.) the learner will duplicate the pattern, selecting from a set of objects.	CONCRETE CONVERGENT PRODUCTION TASK
	12. Given a set of objects different on the basis of only one attribute (e.g., color, shape, size, etc.) the learner will create a pattern and when given a duplicate set of objects, he will duplicate his pattern.	He may or may not use all the objects. CONCRETE DIVERGENT AND CONVERGENT TASK

Module	Program Objectives	Examples and Comments
Multiple Attribute Patterns:	13. Given a series of three or more objects arranged in a pattern by color and/or shape and the first object of the second series, the learner will complete the pattern series.	CONCRETE CONVERGENT PRODUCTION TASK
	14. Given a set of objects, different on the basis of multiple attributes, (e.g., color, shape and/or size, etc.) the learner will create a pattern and either a) explain his pattern, or b) when given a duplicate set of objects he will duplicate his pattern.	CONCRETE DIVERGENT PRODUCTION TASK
	15. Given a set of blocks with multiple attributes, the learner will so arrange the blocks that adjacent blocks share no common attributes.	If a student tells you he can't do it because all have a common attribute (e.g., all made of wood, all owned by the school) pass him on to the next grade. CONCRETE CONVERGENT - DIVERGENT PRODUCTION TASK

Module	Program Objectives	Examples and Comments
Ordering: Measurement Concepts	1. Given a collection of objects differing only on the basis of one measurement concept (e.g., various heights, lengths, weights, areas), the learner will order them in some natural order and explain the rationale for his order.	CONCRETE CONVERGENT PRODUCTION TASK
	2. Given a set of five pictures, one object to a picture, differing only on the basis of one measurement concept (e.g., heights, lengths, etc.), the learner will order them in some natural order and explain the rationale for his order.	SYMBOLIC CONVERGENT PRODUCTION TASK

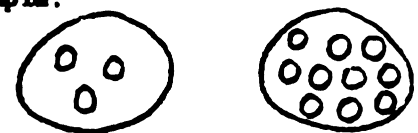
MODULE CLUSTER--PRE-NUMBER

10/18/72

Module	Objectives	Examples and Comments
1. Classification: Single Attribute Color Shape Size Texture Weight	1. Given a set of objects, all but one which are alike, the learner will point to the different one.	CONCRETE RECOGNITION TASK Example: 
	2. Given a set of objects that can be sorted in a variety of ways, the learner will sort objects according to any attribute(s) that he discovers and will explain to others the rationale for his classification. (i.e., he will describe the attribute(s) he identified.)	CONCRETE DIVERGENT PRODUCTION TASK Comments: How many ways can he classify the objects? Encourage him to classify objects in as many ways as he can. Examples: 1. elbow and shell macaroni 2. bottle tops and checkers Example: Given a variety of buttons, they could be sorted by: 1. Shape 2. Color 3. Size 4. Texture 5. Number of holes Example: Given a variety of pens and pencils: 1. Color 2. Length or other size 3. Pen/pencil 4. etc.

Module	Objectives	Examples and Comments
		Example: Given a variety of shapes made from different materials: 1. Shape 2. Texture 3. Color
	3. Given a set of objects that can be sorted only by a single attribute, the learner will sort objects into clusters that are alike (e.g., color, size, shape, texture, weight, etc.)	CONCRETE CONVERGENT PRODUCTION TASK Examples: Color 1. Red buttons 2. Blue buttons 1. Red checkers 2. Black checkers Examples: Shape 1. Balls 2. Attribute blocks Examples: Size 1. Large beads (marbles) same color 2. Small beads (marbles) same color Examples: Texture 1. Rough disc 2. Smooth disc (same color and size) Other texture ideas: a. plastic b. sand paper c. cotton batting, velvet d. rock, floor Examples: Weight Same color-shape-size 1. One box weighted 2. One box lighter than first 1. Metal cylinder heavier than second 2. Metal cylinder

Module	Objectives	Examples and Comments
	4. Given a set of objects that can be sorted in a variety of ways, the learner will sort objects according to a specific attribute that is verbally described.	CONCRETE CONVERGENT PRODUCTION TASK Comments: Examples for Objective 3 can be used-- Example: When given a set of objects such as: 1. Pens/pencils 2. Attribute blocks the learner is directed by someone to sort the objects by color, shape, size, texture. Someone might ask him to put all the blocks of the same shape in clusters. Triangles, circles, squares, rectangles. This student may in turn ask the next one to sort by color.
	5. Cognitive Objective: The learner, when given a set of concrete objects, can sort the objects by single attributes, according to his rule or another's rule.	See Assessment Instruments
	6. Affective Objective: The student will demonstrate interest/enjoyment in activities and materials.	Attending: looking, listening, other ________ Responding: smiling, answering, following directions, other ________ Initiating: questioning, requesting

Module	Objectives	Examples and Comments
Class. Sub-ordinate Concepts Quantity	1. Given two equivalent sets of concrete objects, the learner will demonstrate by manipulating the objects, pointing or explaining that the sets are equivalent.	CONCRETE RECOGNITION TASK Comments: <u>Quantity</u>: Recognition of equivalent or same quantity sets.
	2. Given two non-equivalent sets of objects, the learner will identify the set with the least objects and the set with the most objects.	CONCRETE RECOGNITION TASK Comments: <u>Quantity</u>: student recognizes sets with most or least objects when directed by another person. Example: 
	3. Given six or more concrete objects, the learner will create two equivalent sets.	CONCRETE CONVERGENT PRODUCTION TASK Comments: 1. Given an even number of objects. 2. Given an uneven number of objects.
	4. Given six or more concrete objects, the learner will create two non-equivalent sets and name the set with the most objects and name the set with the least objects.	CONCRETE CONVERGENT PRODUCTION TASK Comments: 1. Given an uneven number of objects. 2. Given an even number of objects.
	5. Given <u>pictures</u> of sets, the learner will pick out pairs of sets whose members cannot be matched one-to-one (non-equivalent); and (a) identify which set has <u>more</u> members, and (b) identify which set has <u>fewer</u> members.	SYMBOLIC RECOGNITION TASK

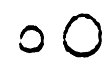
Module	Assessment Objectives	Examples and Comments
Class. Quantity Super- ordinate	6. Given <u>pictures</u> of sets, the learner will pick out pairs of sets whose members can be matched one-to-one (equivalent) and tell which sets have the same number of members.	SYMBOLIC RECOGNITION TASK
	Superordinate Concept: 1-1 Correspondence 7. <u>Cognitive Objective</u>: Given 4 or more sets of concrete objects, the learner will demonstrate by manipulating the objects, pointing or explaining which sets are equivalent and which sets are nonequivalent (more and less). <u>Affective Objective</u>: The student will demonstrate interest/enjoyment in activities and materials. A. Attending: listening, watching, other ________ B. Responding: smiling, answering or following directions, other ________ C. Initiating: questioning, requesting, other ________	See Assessment Instruments

Module	Assessment Objectives	Examples and Comments
	Subordinate Concepts: Equivalent. More, Less 5. <u>Cognitive Objective</u>: (1) Given a set of concrete objects, containing 3 similar and 1 different object, the learner will point to the similar objects. (2) Shown 3 or more sets of concrete objects the learner will point to the equivalent sets. (3) Shown a model and 3 or more sets of concrete objects the learner will point to the sets having more than the model. (4) -less. <u>Affective Objective</u>: The student will demonstrate interest/enjoyment in activities and materials. A. Attending: listening, watching, other ________ B. Responding: smiling, answering or following directions, other ________ C. Initiating: questioning, requesting, other ________	See Assessment Instruments
Class. Multiple Attributes	Objectives 1. Given a set of objects having multiple attributes, the learner will sort objects into clusters that have specific combinations of two or more attributes that he discovers. He will explain to others the rationale for his classification. i.e., he will describe the attributes he identified.	CONCRETE DIVERGENT PRODUCTION TASK Examples: 1. Given: Colors: red, yellow, blue Shapes: squares, circles, triangles Possible Combinations: red circle shape, blue triangle shape, yellow square shape, etc.

Module	Objectives	Examples and Comments
		2. Given: Shapes: squares, circles, triangles Textures: rough, smooth Possible Combinations: rough triangle shape, smooth circle shape, etc. Comments: Other combinations the learner might find are: a. Color and size b. Weight and shape c. Color and texture d. Etc.
	2. Given a set of objects having multiple attributes, the learner will pick out objects having specific combinations of two or more attributes that are verbally described by others.	CONCRETE CONVERGENT PRODUCTION TASK Comments: Possible combinations that could be described are given in Examples for Objective 9 and 10.
2. Patterns: Single Attribute	1. Given a pattern using three or more objects different on the basis of only one attribute (e.g., color, shape, size, etc.), the learner will duplicate the pattern, selecting from a set of objects.	CONCRETE CONVERGENT PRODUCTION TASK Examples: Given: □ blue bead □ yellow bead □ red bead The learner selects a blue bead and places it above, below or as a part of the next series - next to the given series. He does the same for yellow and red beads. He may not start with blue.

Module	Objectives	Examples and Comments
		e.g.: Learner = □ □ □ B Y R Given = □ □ □ □ □ □ = Learner B Y R B Y R Learner = □ □ □ B Y R Given: Red beads - different in shape The learner selects red beads and duplicates the pattern in any of the above ways.
	Given a set of objects different on the basis of only one attribute (e.g., color, shape, size, etc.) the learner will create a pattern and when given a duplicate set of objects, he will duplicate his pattern	CONCRETE DIVERGENT AND CONVERGENT TASKS He may or may not use all the objects. Example: Learner having been given a circle, triangle and square all cut from blue paper, makes the following pattern: Given another set of the same blue shapes, he duplicates the pattern in one of the ways described in Example for Objective 1 (original list)

Module	Assessment Objectives	Examples and Comments
	3. Nice to Know Concepts and Skills Cognitive Objectives: (1) Given a collection of objects differing only on the basis of concept, the learner will order them in some natural order. (2) Given a set of objects different on the basis of multiple attributes, the learner will 1) create, 2) repeat, 3) extend, and 4) complete a pattern. Affective Objective: The learner will demonstrate interest/enjoyment in the activities and materials.	See Assessment Instruments
	Objectives	
Patterns: Multiple Attributes	1. Given a series of three or more objects arranged in a pattern by color and/or shape and the first object of the second series, the learner will extend the pattern series.	CONCRETE CONVERGENT PRODUCTION TASK Examples: Given: Blue Red Blue Blue square The learner will select a red circle and a blue square. He will place the red circle after the blue triangle and the blue square after the red circle. Comments: The learner may be asked if he can extend the series by repeating the pattern again. Example: Given: red blue red green blue red The learner will follow the same procedure as above and extend the series.

Module	Objectives	Examples and Comments
	2. Given a set of objects, different on the basis of multiple attributes, (e.g., color, shape and/or size, etc.), the learner will create a pattern and either (a) explain his pattern, or (b) when given a duplicate set of objects, he will duplicate his pattern.	CONCRETE DIVERGENT PRODUCTION TASK
	3. Given a set of blocks with multiple attributes, the learner will so arrange the blocks so that adjacent blocks share no common attributes.	CONCRETE CONVERGENT/DIVERGENT PROD. TASK Comments: A student may tell you he can't do it because all have a common attribute; (e.g., made of wood, owned by school) Example:
3. Ordering: Length Height Area: (Size) Volume Weight Quantity	Objectives 1. Given a collection of objects differing only on the basis of one concept (e.g., various heights, lengths, weights, areas, etc.), the learner will order them in some natural order and explain the rationale for his order.	CONCRETE CONVERGENT PRODUCTION TASK Examples: 1. Different sizes -- same type of material  2. Same size container -- different material sponge block of wood 3. X Length -- straws, ribbon 4. The "full to empty" can either apply to the sand or the air. (sand) or (air) 

Module	Objectives	Examples and Comments
		5 Arrange a group of children from tallest to shortest, or shortest to tallest.
2	Given a set of five pictures, one object to a picture differing only on the basis of one concept (e.g., heights, lengths, etc.) the learner will order them in some natural order and explain the rationale for his order.	SYMBOLIC CONVERGENT PRODUCTION TASK strategy
3	Given any three consecutive sets of objects consisting of from one to five members, the learner will identify the set that (1) has the most members, (2) has the least (fewest) members, and (3) the set that is between the two in the sequence	CONCRETE RECOGNITION
4.	Given three or more sets of objects consisting of one to five members, the learner will place the sets in sequential order from the set with the fewest members to the set with the most members.	CONCRETE/ABSTRACT CONVERGENT PRODUCTION TASK
5.	Given pictures of three or more sets consisting of one to five members, the learner will place the pictures of the sets in order, from the set with the fewest members to the set with the most members; then he will order the set pictures from most to fewest.	SYMBOLIC/ABSTRACT CONVERGENT PRODUCTION TASK strategy objectives

Module	Objectives	Examples and Comments
Ordering by Quantity Super-ordinate Concepts	Superordinate Concept 6. Cognitive Objective: Given three or more sets of objects consisting of from 1 to 5 members, the learner will place the sets in sequential order from the set with the fewest members to the set with the most members. Affective Objective: The learner will demonstrate an interest/enjoyment in the activities and materials.	See Assessment Instruments
Sub-ordinate Concepts	Subordinate Concepts 7 Cognitive Objectives: Given any 3 consecutive sets of objects consisting of from 1 to 5 members, the learner will identify the set that (1) has the most members, (2) has the least members, and (3) the set that is between the other two in sequence. Affective Objective: The learner will demonstrate an interest/enjoyment in the activities and materials.	See Assessment Instruments

APPENDIX H

NUMERATION OBJECTIVES FIRST SYNTHESIZATION AND FINAL NUMERATION MODULE OBJECTIVES

Module	Program Objectives	Examples and Comments
Cardinality	1. Given any of the oral numbers from one to ten, and sets of concrete objects containing from one to ten members, a child can identify the corresponding sets.	ABSTRACT/CONCRETE RECOGNITION
	2. Given sets of concrete objects (consisting of one to ten members) a child can (a) tell the number of objects in the various sets, and (b) place the appropriate numeral card below the various sets.	CONCRETE/ABSTRACT CON. PROD.
	3. Given any of the numerals from one to ten and sets of concrete objects containing from one to ten members, a child can identify the corresponding sets.	ABSTRACT/CONCRETE RECOGNITION
	4. Given sets of concrete objects (consisting of from one to ten objects) a child can write the correct numeral for the objects given in the various sets.	CONCRETE CONVERGENT PROD.

THESE OBJECTIVES include the original objectives numbers: 8, 9, 10, 11, 12, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, and 29

Module	Program Objectives	Examples and Comments
I. Ordering	1. Given concrete objects and a long line marked off in congruent segments, the learner will (a) construct sets from zero to 10 members in increasing order on the line, (b) say the numbers represented by the sets, and (c) either place or write appropriate numerals below various points on the number line.	CONCRETE/SYMBOLIC CON. PROD. TASK (This objective includes numbers 37, 38, 39, 40 of the original set)
	2. Given three or more written numerals (from 1 to 10) the learner can order the numerals in ascending order.	ABSTRACT CONVERGENT TASK
II. Ordering	1. Given a set of written whole numbers within a decade, the learner will order the numerals in ascending order.	(This is obj. 65 of original) ABSTRACT CON. PROD. TASK
	2. Given a random list of 2 and/or 3 digit numerals, the learner will arrange them in ascending order.	ABSTRACT CON. PROD. TASK (Original obj. 80 and 81)
NOTE: SHOULD OBJ. 85 & 86 be included before obj. 3, or included in grouping?	3. Given a sequence of two to four numerals the learner will tell or write the next number in the sequence.	ABSTRACT CONV. PROD. TASK (Original obj. 84) 2, 4, 6,

NUMERATION (Objectives 46, 47, 48, 49, 77) June 8

Module	Program Objectives	Examples and Comments
Grouping	1. Given numeral cards, 0-9, and two sets of objects each having four or fewer members, the learner will: A. Place the appropriate numeral card by each set. B. Move the sets together forming a new set and write the number name of the set. C. Partition the new set into a pair of subsets. D. Orally name each of the new subsets.	A. Concrete/Abstract Convergent Task B. Concrete/Abstract Convergent C. Concrete Divergent D. Concrete/Abstract Convergent Task
	2. Given nine or fewer objects, the learner will: A. Separate the given set into all possible pairs of subsets. B. Say the number for each subset. C. Write the number for each subset.	A. Concrete Divergent B. Concrete/Abstract Convergent C. Concrete Abstract Convergent

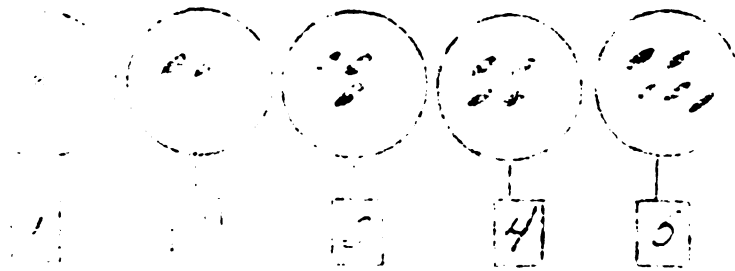
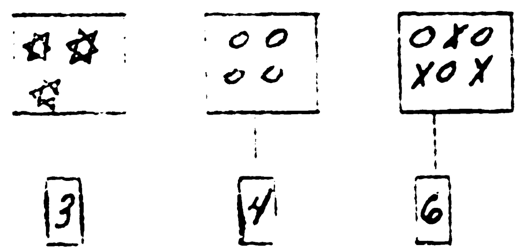
NUMERATION (Objectives 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 87, 90)

Module	Program Objectives	Examples and Comments
Grouping	3. Given a collection of concrete objects, the learner can group a quantity ____ as requested. (e.g., ones, tens, hundreds, etc.: ones, fives, twenty-fives, etc.: ones, threes, nines, etc.), etc.	3. Concrete/Abstract Convergent Task
	4. Given a collection of objects (even and uneven numbers) the learner will group the objects and explain the rationale for his groups.	4. Concrete/Divergent

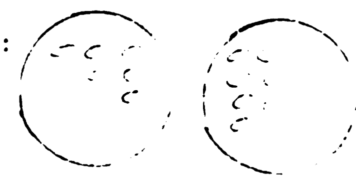
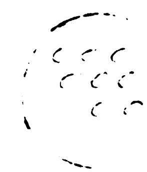
MODULE CLUSTER II: NUMERATION

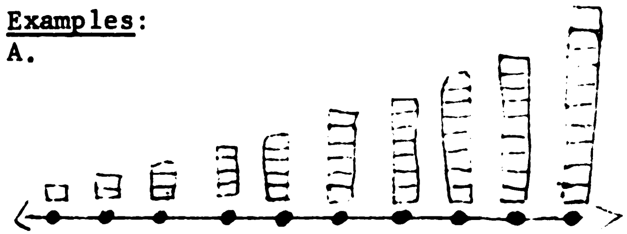
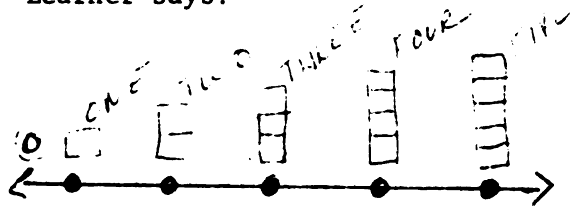
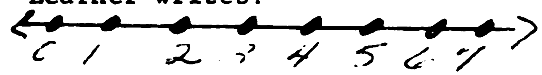
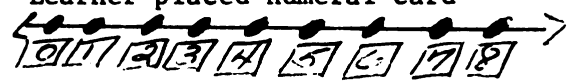
10/18/72

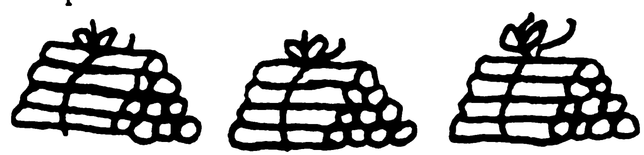
Module	Program Objectives	Examples and Comments
1. Cardinality	1. Given any of the numbers verbally from zero to twenty and sets of objects containing from zero to twenty members, a child can identify the corresponding sets.	ABSTRACT/CONCRETE RECOGNITION Example: The teacher having arranged sets asks the student to identify the set with three members. 
	2. Given sets of objects (consisting of zero to twenty members), a child can tell the number of objects in the various sets.	CONCRETE/ABSTRACT CON. PROD. Comments: If the student is unable to master the terminal objective, the following is an example of the type of activity the students could do to master prerequisite skills. Example: Given a set of objects with 1-9 members, the learner will count the members of the set and state the cardinal number of that set.

Module	Program Objectives	Examples and Comments
	3. Given any of the numerals from zero to twenty and sets of concrete objects containing from zero to twenty members, a child can identify the corresponding sets.	ABSTRACT/CONCRETE RECOGNITION Example: Given numeral cards 1 through 20 and 20 sets of objects consisting of one, two, three, four and five, etc., members, the learner will place the numeral cards in front (below) of the set having the number of members named by the numeral. 
	4. Given any of the numerals from one to twenty and pictures of sets of objects containing from one to twenty members, a child can identify the corresponding sets.	ABSTRACT/SYMBOLIC RECOGNITION Example: 
	5. Given sets of concrete objects (consisting of from 1 to 20 objects), the learner will write the correct numeral for the objects in the various sets.	CONCRETE CONV. PROD. TASK

Module	Program Objectives	Examples and Comments
	6. Given a number verbally or a numeral card and a group of objects, the learner will create a set with the appropriate number of objects.	ABSTRACT/CONCRETE CONV. PROD. TASK (Do any of examples given for objective 1 belong with objective 5?) Comments: The following are examples of types of activities which students could be asked to do if they are unable to accomplish terminal objective 1. Examples: A. Given a set of small objects, the learner (using his own collection of objects) will form another set that has exactly one more object than the original set. B. Given a set of small objects, the learner using his own collection of objects, will make a set with one fewer objects than the original set. C. Given several sets of 0-9 objects with duplicates or triplicates of certain sets, the learner will identify the sets that have the same cardinal number.

Module	Program Objectives	Example and Comments
	7. Given numeral cards, 0-20 and two sets of objects each having four or fewer members, the learner will: A. Place the appropriate numeral card by each set B. Move the sets together forming a new set and write the number name of the set C. Partition the new set into a pair of subsets D. Orally name each of the new subsets	7. A. Concrete/Abstract Convergent Task B. Concrete/Abstract Convergent C. Concrete/Divergent D. Concrete/Abstract Convergent Task
2. Ordering-I	1. Given two sequentially ordered sets of objects, one of which has one more or one less than the other, the learner will form the set that comes next in order.	Child Given:  Child Products Result: 

Module	Program Objectives	Examples and Comments
	2. Given concrete objects and a long line marked off in congruent segments, the learner will: A. Construct sets from 0 to 20 members in increasing order on the line. B. Say the numbers represented by the sets C. Either place or write appropriate numerals below various points on the number line.	CONCRETE/SYMBOLIC CONV. PROD. TASK **Examples**: A.  B. Learner says:  C. Learner writes:  D. Learner placed numeral card 
	3. Given three or more written numerals (from 0 to 20) the learner can order the numerals in ascending and/or descending order.	Abstract Conv. Prod. Task

Module	Program Objectives	Examples and Comments
3. Place Value	1. Given a collection of objects, the learner can group a quantity by any designated number from one through ten when orally requested to do so.	CONCRETE/ABSTRACT CONVERGENT TASK Examples: 1. Given 20, 30, 40, up to 90 objects, the learner will form sets of ten and group and label as requested sets. (straws, lollipops, sticks, beads, spoons) 2. The learner is given 15 objects and asked to group them by two's (3, 8, 13, 19, etc.)
		2. Given a numeral from the set 10, 20,... 90 and a supply of objects, the learner will form a set representing the given number. e.g., Given: 30 Response:  3. Given 100 identical objects, the learner will make 10 bundles, each containing 10 objects, on request. 4. Money 5. Abacus

Module	Program Objectives	Examples and Comments
Place Value	2. Given any number of objects, a person can represent them using a conventional numeration system.	CONCRETE/ABSTRACT CONVERGENT TASK Examples: 1. Given a set of no more than 90 objects grouped by tens, the learner can say and write the numeral represented.  **Response: "fifty" (oral)** **"50" (written)** 2. Given a two-digit numeral, the learner will be able to write it in expanded notation in two ways: as so many tens and so many ones, or as _____ + _____, representing the value of the tens place plus the value of the ones place. Given: 35 Response: 3 tens and 5 ones OR 30 + 5

Module	Program Objectives	Examples and Comments
4. Ordering--II.	1. Given a list of two and three digit numerals: A. Within a multiple of 10, the learner will order the numerals in ascending and descending order. B. Between any two multiples of 10	ABSTRACT CONV. PROD. TASK Examples: A. Given - 23, 31, 25, 29, 32 Response - 23, 25, 29, 31, 32 B. Given - 90, 97, 93, 95 Response - 90, 93, 95, 97
	2. Given a random list of two and/or three digit numerals, the learner will arrange them in ascending and descending order.	ABSTRACT CONV. PROD. TASK Examples: A. Given - 297, 101, 792 Response - 101, 297, 792 B. Given - 123, 47, 91, 796, 31 Result - 31, 47, 91, 123, 796 C. Given - 76, 42, 96, 34, 25 Result - 25, 34, 42, 76, 96

APPENDIX I

PUPIL ASSESSMENT INSTRUMENT--PRE-NUMBER

CLASSIFICATION: QUANTITY

Superordinate Concept: 1-1 Correspondence

Description of Suggested Situation

Show a situation similar to the following to the learner.

Model Set	Comparison Sets
3-cars	2-cars, 1-block, 3-beans, 4-sticks

Learner Tasks

1. Equivalent Sets
   A. Which of these sets are equivalent to this set? ______

   B. Which of these groups are equivalent to this set? ______

   C. Which of these sets are like this set? ______

   D. Which of these groups are like this group? ______

   E. Which of these sets are the same as this one? ______

   F. Which of these groups are the same as this group? ______

   G. Which of these sets(groups) have as many as this set? ______

2. Sets with More (Use either the word set(s) or group(s) depending on learners' knowledge as determined in Task 1.)

   A. Which set(group) have more than this set? ______

   B. Which sets(groups) are different from this set? ______

3. Sets with Less

   A. Which sets(groups) have less than this set? ______

   B. Which sets(groups) have fewer than this set? ______

   C. Which sets (groups) do not have as many as this set? ______

   D. Which sets(groups) are different from this set? ______

AFFECTIVE

A. Note inference (+,-) and behavior demonstrated by the learner from which you inferred presence of absence of enjoyment/interest in:

   A. Attending: Looking______, Listening______, Other_____, Activities______

   B. Responding: Answering______, Manipulating materials______,
   Other______, Materials______

   C. Initiating: Questions______, Other______.

   What did you learn about learners' interests, concerns and activities? ______

______

CLASSIFICATION QUANTITY

Subordinate Concepts: Equivalent Sets

More than, Less than

Description of Suggested Situation	Tasks				
I. Equivalent Sets A. Show learner a set similar to the following: 3-ball 1-block	A. Point to the objects that are the same.				
B. Show learner a situation similar to the following: 2-cars / Comparison sets 3-cars 1-cars 2-cars	B. Point to the sets that are the same as this set.				
C. Show learner a situation similar to the following: Model Comparison Sets 3-balls / 3-balls 1-stick 2-cars	C. Point to the set that is equivalent to this set.				
D. Show learner a situation similar to the following: Model / Comparison Sets 2-cars / 2-balls 1-stick 1-block	D. Point to the set that has as many as this set.				

Description of Suggested Situation	Tasks				
2. Sets With More					
A. Show learner a set similar to the following: 3-blocks 1-car	A. Point to the object that is different from the rest of the objects in this set.				
B. Show learner situation similar to the following: Model/ Comparison Set 2-blocks/ 3-blocks 2-blocks 1-block	B. Point to the sets that have more than this set.				
3. Sets With Less					
A. Show the learner a situation to the following: Model/ Comparison 4-blocks/ 1-block 2-blocks 3-blocks	A. Point to the sets which have less than this set.				
B. Show the learner a situation similar to the following: Model/ Comparison Sets 3-cars/ 2-blocks 3-balls 1-stick	B. Which sets have less than this set.				

AFFECTIVE: NOTE INFERENCE AND OBSERVED BEHAVIOR FROM WHICH YOU INFERRED + OR - INTEREST/ENJOYMENT IN ACTIVITY AND MATERIALS:

A. Attending: Looking__________, Listening_________, Other_______________.

B. Responding: Answering________, Manipulating Materials_________, Other________.

C. Initiating: Questions________, Requests_________, Other______________.

What did you learn about learners' interests and activities?____________________________

____

PROFILE SHEET
CLASSIFICATION - Quantity

Superordinate Concept: 1-1 Correspondence
Cognitive Objective: Given 4 or more sets of concrete objects, the learner will demonstrate by manipulating the objects, pointing to, or explaining which sets are equivalent and which sets are nonequivalent (more and less).
Affective Objective: The student will demonstrate interest/enjoyment in activities and materials through attending, responding, and initiating behaviors.

Subordinate Concepts: Equivalent, More, Less
Cognitive Objectives: Given a set of concrete objects, containing 3 similar objects. (2) Shown 3 or more sets of concrete objects the learner will point to the equivalent sets. (3) Shown a model and 3 or more sets of concrete objects the learner will point to the sets having more than the model. (4) - less.
Affective Objective: The student will demonstrate interest/enjoyment in activities and materials.

Name	Equivalent,* like same, as many as	sets* groups	more* different	less,* fewer, different, not as many as	Affective Attending Responding Initiating	Equivalent, Same Att.	Equivalent, Same Card.	More Different Att.	More Different Card.	Less Diff. Att.	Less Diff. Card.	Affective Attending Responding Initiating

ASSESSMENT TASKS and PROFILE SHEET

CLASSIFICATION - Nice to Know Skills and Concepts
(Color, Shape, Weight, Area, Texture, Quantity)

*H - His rule
*M - My rule or another's

<u>Cognitive Objective</u>: The learner, when given a set of concrete objects, can sort the objects by single attributes, according to his rule and another rule.

<u>Affective Objective</u>: The learner will demonstrate interest/enjoyment in activities and materials through attending, responding, and initiating behaviors.

Name	Color		Shape		Area size		Texture		Weight		Quantity		Affective Attending Responding Initiating
	M*	H*	M	H	M	H	M	H	M	H	M	H	

PATTERNS: ORDERING BY QUANTITY
PATTERNS: PROFILE SHEET

SUPERORDINATE CONCEPT: ORDERING BY QUANTITY
Cognitive Obj: Given three or more sets of objects consisting of from 1 to 5 members, the learner will place the sets in sequential order from the set with the fewest members to the set with the most members.
Affective Obj.: The learner will demonstrate an interest/enjoyment in the activities and materials through attending, responding and initiating behaviors.

Subordinate Concepts
Cognitive Obj.: Given any 3 consecutive sets of objects consisting of from 1 to 5 members, the learner will identify the set that (1) has the most members, (2) has the least members and (3) the set that is between the other two sets in sequence.
Affective Obj.: The learner will demonstrate an interest/enjoyment in the activities and materials through attending, responding, and initiating behaviors.

MORE TO KNOW CONCEPTS AND SKILLS
Cognitive Obj.: (1) Given a collection of objects differing only on the basis of one concept the learner will order them in some natural order. (2) Given a set of objects different on the basis of multiple attributes the learner will (a) create, (b) repeat, (c) extend, and (d) complete a pattern.
Affective Obj.: The learner will demonstrate interest/enjoyment in the activities and materials through attending, responding, and initiating behaviors.

*H = His rule
M = My rule or another's rule

Name	Order in some natural order	Order from least to most	Affective Attending Responding Initiating	2-Sets: can identify fewest/ most	3-Sets: can identify fewest/ most	Affective Attending Responding Initiating	Ordering Lgt	Hgt	A	Vol	Wgt	Patterns C	R	E	Com	Affective Attending Responding Initiating
							M									
							H									

Description of Related Situation	PATTERNS: ORDERING BY QUANTITY ASSESSMENT TASKS					
SUPERORDINATE CONCEPT: Show a situation similar to the following, to the learner: 4-sets; 1 to 4 objects per set, each set containing different objects. 1-block 3-sticks 4-cars 2-balls	I. A. Place these sets in some order.					
	B. Arrange these from fewest (least) to most.					
	C. Which set has the fewest?					
	D. Which set has the most?					
SUBORDINATE CONCEPTS: Show the learner a situation similar to the following: 2-cars, 6-balls	I. A. Which set has the fewest? (least)					
	B. Which set has the most?					
Show the learner a situation similar to the following: 1-block, 2-cars, 6-balls	II. A. Which set has the fewest? (least)					
	B. Which set has the most?					
	C. Can you arrange these sets in a row so that the set with the fewest comes first and the set with the least comes last?					
I. Show the learner the following: 1-block, 5-balls, 2-sticks, 4-cars 3-marbles (Arrange first three sets in order.)	III. A. Learner should place or tell you which set comes next. Which set comes next?					
AFFECTIVE: NOTE INFERENCE AND OBSERVED BEHAVIOR FROM WHICH YOU INFERRED + or - interest/enjoyment in activity and materials.						
	Attending					
	Responding					
	Initiating					
What did you learn about learners' interest, concerns, and activities?						

APPENDIX J

PUPIL ASSESSMENT INSTRUMENT--NUMERATION

CARDINALITY

Cognitive Obj: Given numeral card, 0-20 and two sets of objects each having ten or fewer members, the learner will: A. place the appropriate numeral card by each set; B. move the sets together forming a new set and write the number name of the set; C. partition the new set into a pair of subsets; and D. orally name each of the new subsets
Affective Objective: The learner will demonstrate interest/enjoyment in activities and materials through attending, responding and initiating behaviors.

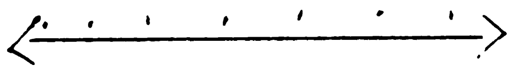
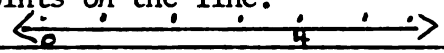
SITUATION AND MATERIALS	TASK	RECORD OF BEHAVIORS TRIALS 1 2 3	TRIALS 1 2 3
A. & B. Place a set of 20 distinct objects and the numeral cards 0-20 in front of the learner.	A. Concrete/Abstract Divergent Task (HIS RULE) 1. Verbally ask the learner: Form a set using some of the objects from this set. 2. After he has formed a set have learner respond to: a. How many objects are in your set?		
	b. Point to the numeral card which represents (that number) of objects. REPEAT 1 and 2 TWICE		

SITUATION AND MATERIALS	TASKS	RECORD OF BEHAVIORS	TRIALS	TRIALS
			1 2 3	1 2 3
	B. Concrete/Abstract Convergent Task (TEACHER'S RULE) 1. Verbally ask the learner to: Form a set of or Show me..... a) 7 b) 12 c) 17			
	(Use numbers he did not show you in task A.) 2. After the learner has formed requested set correctly ask him to: Point to the numerical card which represents (that number of objects).			
C. Place 2 sets of distinct objects each set containing 9 or fewer objects in front of learner	C. Concrete/Abstract Convergent Task 1. Point to first one set and ask: a. How many objects are in "this set"?			

SITUATION AND MATERIALS	TASKS	RECORD OF BEHAVIORS	
	2. Ask the learner to form one set from the objects. Ask: a. How many are in the new set?		
	Give learner paper and pencil. b. Can you write (that number)?		
	3. Can you place)put) these objects in 2 new (different) sets?		
AFFECTIVE DATA	NOTE INFERENCE AND OBSERVED BEHAVIOR FROM WHICH YOU INFERRED + OR - INTEREST? ENJOYMENT IN ACTIVITY AND MATERIALS: A. Attending: Looking, listening, other		
	B. Responding: Answering, manipulating, other		
	C. Initiating: Questions, requests, other		
	D. What did you learn about interests, concerns, and activities?		

ORDERING I.

Cognitive Obj: Given three or more written numerals, 0-20, the learner can order the numerals in ascending and descending order.
Affective Obj: The learner will demonstrate interest and enjoyment in activities and materials through attedning, responding, and initiating behaviors.

SITUATION AND MATERIALS	TASK	RECORD OF BEHAVIORS	
A. Place 3 or 4 numeral cards (0-20) randomly in front of the learner. 	A. Ask the child: 1. Put these numeral cards in ascending/descending order. (from least to most)		
	Pick up cards and place 3/4 others in front of learner. 2. Put these numeral cards in descending order. (most to least)		
B. Give the learner 5 numeral cards. Place a line marked into 21 equal segments in front of the child.	B. Ask the child to: Place his 5 numeral cards below the correct (right, appropriate) point on the line.	Numeral cards	
Then place the zero and one other numeral card below the appropriate points on the line. 			

SITUATION AND MATERIALS	TASKS	RECORD OF BEHAVIORS	
AFFECTIVE DATA	NOTE INFERENCE AND OBSERVED BEHAVIOR FROM WHICH YOU IN FERRED + OR - INTEREST/ENJOYMENT IN ACTIVITY MATERIALS		
	A. Attending: Looking, Listening		
	B. Responding: Answering, Manipulating, other		
	C. Initiating: Questions, requests other		
	D. What did you learn about interests concerns, and activities?		

PLACE VALUE

Cognitive Obj: Given 90 or less identical objects, the learner will make 9 or less bundles, each containing 10 objects.
Given a set of no more than 90 objects grouped by tens, the learner can say and write the numeral represented.
Affective Obj: The learner will demonstrate enjoyment/interest in the activities and materials through attending, responding and initiating.

SITUATION AND MATERIALS	TASK	RECORD OF BEHAVIORS
A. Give the learner 50 to 90 popsicle, coffee sticks.	A. Concrete/Abstract Convergent Task 1. Ask the learner to form as many groups (bundles, sets) of 10 as he can from the objects you have given him.	
Give learner 9 or less bundles of ten sticks	2. Can you tell me how many sticks there are all together?	
Give the student paper and pencil	(If he answers [2] correctly ask: 3. Can you write (that number)?	
B. Paper and pencil	B. Ask the student: 1. Write 35 on this paper.	
	(If he does this correctly ask him: 2. Write 35 again in a different way	
	3. Can you write 35 in a third way? (another, different)	

SITUATION AND MATERIALS	TASKS	RECORD OF BEHAVIORS
	NOTE INFERENCE AND OBSERVED BEHAVIOR FROM WHICH YOU INFERRED + OR - INTEREST/ENJOYMENT IN ACTIVITY AND MATERIALS: A. Attending: looking, listening, other B. Responding: answering, manipulating, other C. Initiating: questions, requests, other D. What did you learn about interests, concerns and activities.	

ORDERING II

Cognitive Objective: Given a set of numeral cards consisting of two and three digit numerals a) within a multiple of 10; b) between any two multiples of 10; and c) a random list, the learner will arrange them in ascending order.
Affective Objective: The learner will demonstrate interest/enjoyment in the activities and materials through attending, responding, and initiating behaviors.

SITUATION AND MATERIALS	TASK	RECORD OF BEHAVIORS
A. Give the learner 3/4 random numeral cards containg 3 digit numbers. (e.g., 297, 101, 793)	A. Ask the learner: Put the numeral cards in ascending or descending order. (least to most increasing) (most to least, decreasing)	
B. Give the learner 5/6 random numeral cards containg both 2 and 3 digit numerals. (e.g., 123, 47, 91, 796, 31)	B. Ask the learner to: Arrange the numeral cards in ascending/descending order. or Order the cards from least to most	
C. Give the learner 5-6 random numeral cards containing 2 digit numerals. (e.g., 76, 42, 96, 34, 25)	C. Ask the learner to: arrange the cards in a ascending order. or Order the cards from least to most.	

SITUATION AND MATERIALS	TASKS	RECORD OF BEHAVIORS
D. Give the learner 5-6 random 2 digit numeral cards within a multiple of 10 (e.g., 83, 91 85, 92, 89)	D. Ask the learner to: Arrange the cards in ascending order. (least to most)	
E. Give learner 5/6 random 2 digit numeral cards between any 2 multiples of ten. (e.g., 31, 39, 35, 33, 37)	Ask the learner to: Arrange in ascending order. (least to most)	
	NOTE INFERENCE AND OBSERVED BEHAVIOR FROM WHICH YOU INFERRED + OR - INTEREST/ ENJOYMENT IN ACTIVITY AND MATERIALS: **A. Attending: Looking, listening, other** **B. Responding: Answering, manipulating, other** **C. Initiating: Questions, requests, other** **D. What did you learn about interests concerns and activities?**	

APPENDIX K

PRE-SERVICE TEACHER INSTRUCTIONAL DESIGN ASSESSMENT AND EVALUATION QUESTIONS

(REVISED FORM)

INSTRUCTIONAL DESIGN ASSESSMENT INSTRUMENT
REVISED FORM

Section 1a.

Name ______________________

Beginning Time ______________________

Finishing Time ______________________

Date ______________________

SITUATION

As an intern teacher you have been assigned to teach a class of 24 children. The first weeks of school have been exciting and worthwhile for both you and your class.

Your students have <u>never had</u> any formal instruction in the area of mathematics. You realize that you are the person responsible for the experiences and learning that will occur during the year. You decide you must now provide for your students their first formal instruction in the area of mathematics.

<u>TASK</u>:

Describe as precisely as you can based on your present knowledge what behaviors you as the teacher in this situation would engage in <u>from now to the end of your first unit of instruction</u>.

Section 1b.

Name ____________________

Beginning Time ____________________

Finishing Time ____________________

ADDITIONAL SITUATION INFORMATION

You feel it is important that you have more data about the situation before you decide what and how you will instruct your students.

TASK:

Describe: (a) What additional information you think you need and (b) how you would go about getting it.

(a) Information

(b) Source(s)

Section IIa.

Name ____________________

Beginning Time ____________________

Finishing Time ____________________

ADDITIONAL SITUATIONAL INFORMATION

The data you collect suggests that in terms of the mathematics curriculum your students are ready for the area of whole numbers, more specifically the unit referred to as "pre-number." The area of whole numbers is made up of three units 1) pre-number; 2) numeration; and 3) operations. The pre-number unit that you have selected contains three major concepts: 1) Classification; 2) Patterns; and 3) Ordering.

Your school district has a curriculum guide which lists objectives for the content areas. Attached are: 1) A sample of the objectives listed in your curriculum guide; 2) A description of a representative sample of your students behaviors.

TASK:

Describe as precisely as you can the procedures you would follow in using this information.

DESCRIPTION - PUPIL BEHAVIORS

Vicki is able to identify a set of objects. She is able to identify equivalent sets, and sets with more than and less than a given set. Vicki is also able to sort objects by colore, shape, area/size, texture, and weight. She responded to all the tasks.

Tom can identify a set of objects. He can sort objects by color and shape. He cannot sort objects by area/size, texture, or weight. Tom can identify sets with less then a given set but is unable to identify equivalent sets or sets with more than a given set. He can identify which object is different when given a set which includes four objects that are the same and one that is different. He initiated questions about the tasks.

Sally cannot identify a set of objects. She can sort objects by colore but not by shape, texture, area/size, or weight. Sally cannot identify the object that is different when she is shown a set of four objects that are the same and one objects that is different. She attended to the task. Sally cannot identify equivalent sets or sets with more than or less than a given set.

Dave can identify a set of objects. He can sort objects by color , shape and size. He is unable to sort objects by texture and weight. Dave can identify sets with more than a given set but is unable to identify equivalent sets or sets with less than a given set. He can identify which object is different when given a set which includes four objects that are the same and one that is different. He responded to the tasks.

SAMPLE OF OBJECTIVES

A. Pre-Number "Nice to Know Skills and Concepts"

Topic	Objectives
Classification: Single Attributes Color Shape Size Texture Weight	1. Given a set of objects, all but one which are alike, the learner will point to the different one.
	2. Given a set of objects that can be sorted in a variety of ways, the the learner will sort objects according to any attribute(s) that he discovers and will explain to others the rationale for his classification. (i.e., he will describe the attribute(s) he identified.)
	3. Given a set of objects that can be sorted only by a single attribute, the learner will sort objects into clusters that are alike, (eg. , colore, size, shape, texture, weight, etc.)
	4. Given a set of objects that can be sorted in a variety of ways, the learner will sort objects according to a specific attribute that is verbally described.
	5. The learner, when given a set of concrete objects, can sort the objects by single attributes, according to his rule or another's rule.
	6. The student will demonstrate interest/enjoyment in activities and materials.

Quantity

"Need to Know Objectives"

1. Given two equivalent sets of concrete objects, the learner will demonstrate by manipulating the objects, pointing or explaining that the sets are equivalent.

2. Given two non-equivalent sets of objects, the learner will identify the set with the least objects and the set with the most objects.

3. Given six or more concrete objects, the learner will create two equivalent sets.

4. Given six or more concrete objects, the learner will create two non-equivalent sets and name the set with the most objects and name the set with the least objects.

5. Given pictures of sets, the learner will pick out pairs of sets whose members cannot be matched one-to-one (non-equivalent): and a) identify which set has <u>more</u> members, and b) identify which set has <u>fewer</u> members.

6. Given pictures of sets, the learner will pick out pairs of sets whose members can be matched one-to-one (equivalent) and tell which sets have the same number of members.

7. The student will demonstrate interest/enjoyment in activities and materials through attending, responding and initiating behaviors.

Pre-Number

Topic	Objectives
Classification Multiple Attributes	1. Given a set of objects having multiple attributes, the learner will sort objects into clusters that have specific combinations of two ore more attributes that he discovers. He will explain to others the rationale for his classification. (i.e., he will describe the attributes he identified.) 2. Given a set of objects having multiple attributes, the learner will pick out objects having specific combinations of two or more attributes that are verbally described by others. 3. The student will demonstrate interest/enjoyment in activities and materials, through attending, responding, initiating behaviors.

Section III.

Name ______
Beginning Time ______ Finishing Time

ADDITIONAL SITUATION INFORMATION

You identified the goals and objectives for each individual pupil in your class. Next you determined possible instructional sets of pupils based on needed objectives. Attached is a description of the instructional sets including typical mathematicaly related behaviors and the objectives each set of pupils have in common.
You are now ready to decide what you are going to do for the next week so that your pupils will achieve their objectives.

Task:
Assume whatever environment and materials you want.
Describe: a) what you will do for the next week, and b) how you will do it.

INSTRUCTIONAL SETS

4-Children: This set of children are able to identify a set of objects. They are also able to identify equivalent sets and sets with more than and less than a given set. All four of these children are able to sort objects by color, shape, area/size, texture, and wei t. They exhibited initiating behaviors during the time you collected the data.

Objectives: Given a set of objects having multiple attributes, the learner will pick out objects having specific combinations of of two ore more attributes that are verbally described by others.

The learner will demonstrate interest/enjoyment in activities and materials through attending, responding, and initiating behaviors.

hildren: These children can identify a set of objects. They can sort objects by colore l shape. They cannot sort objects by area/size, texture or weight. They are able to entify sets with less than a given set but are unable to identify equivalent sets or s with more than a given set. They are able to identify which object is different when ven a set which includes four objects that are the same and one that is different. They hibited responding behaviors during the time you collected the data.

Objectives: Given a set of objects which can be sorted in a variety of ways the learner will sort obejcts according to the specific attribute verbally described. a) size, b)texture, c) weight

The learner when giv en a set of concrete objects, can sort the objects by single attributes, according to his rule or another's rule.

Shown 3 or more, sets of concrete objects the learner will point to sets having more than the model.

The learners will demonstrate interest/enjoyment in activities and materials through attending, responding, and initiating behaviors.

5-Children: This group of children are unable to identify a set of objects. They can sort objects by color but not by shape, texture, area/size, or weight. They are not able to identify the object that is different when shown a set of four objects that are the same and one object that is different. They are unable to identify equivalent sets or sets with more than or less than a given set. They either attended to or responded to the tasks.

Objectives: Given a set of objects, all but one which are alike, the learner will point to the one that is different.

Given a set of objects that can be sorted by a single attribute the learner will sort objects into clusters that are alike.

Shown a model set and 3 or more sets of concrete objects the learners will point to sets having more than the model.

Shown model set and 3 more sets of concrete objects the learners will point to the sets that have less than the model set.

The learners will demonstrate interest/enjoyment in the activities and materials through attending, responding, and initiating behaviors.

INSTRUCTIONAL SETS CONTINUED

7-Children: These children are able to identify a set of objects. They can sort objects by color, shape and size. They are unable to sort objects by texture or weight. They are able to identify sets with more than a given set but not able to identify equivalent sets or sets with less than a given set. They can identify which object is different when given a set which includes four objects that are the same and one object that is different. They responded to the tasks.

Objectives: Given a set of objects which can be sorted in a variety of ways the learner will sort objects according to the specific attribute verbally described. a)texture, b) weight

The learner when given a set of concrete objects can sort the objects by single attributes, according to his rule or another's rule.

Shown 3 or more sets of concrete objects the learner will point to the equivalent set(s).

Shown a model set and 3 or more sets of concrete objects the learner will point to sets having less than the model set.

The learner will demonstrate interest/enjoyment in activities and materials through attending, responding, and initiating behaviors.

Section IVa

Name____________________

Beginning Time________Finishing Time________

ADDITIONAL SITUATION INFORMATION

It is now the <u>last day of instruction in the week you previously planned</u>.

<u>Task:</u>
Describe as specifically as you can what you would do on the last day of instruction concerning classification.

<u>Task:</u>
Describe as specifically as you can what you are going to do following the last day of instruction related to classification.

Section IVb

Name________________

Beginning Time__________Finishing Time________

ADDITIONAL SITUATION INFORMATION

You have now planned and completed instructing your class in the entire pre-number unit including classification, patterns, and ordering.

Task:
Describe as specifically as you can what you did on the last day of instruction for the pre-number unit.

Task:
Describe as specifically as you can what you did following the last day of instruction.

APPENDIX L

APPROPRIATE RESPONSES FOR PRE-NUMBER INSTRUCTIONAL DESIGN QUESTIONS

NAME ____________________

Section 1a

Favorable				Unfavorable
I. Assessment				I. Assessment
A. <u>General Assessment</u>				A. <u>General Assessment</u>
1. Score one point if student asks for or indicates a need for more information, but does not indicate specifically what information they desire	+1			
2. Score one point if student asks for or indicates a need for specific assessment data:				
a. student	+1			
b. other humans	+1			
c. content goal and/or objectives	+1			
d. space/arrangement	+1			
e. materials	+1			
f. time	+1			
g. sensory conditions	+1			
B. <u>Humans - Assessment</u>				B. <u>Humans - Assessment</u>
1. Pupil Assessment - Cognitive				1. Pupil Assessment - Cognitive
a. Score one point each if the student asks for or indicates a need for specific types of pupil assessment data and includes specific sources for data collection				a. Score minus one point if the student limits the collection of cognitive assessment data by:
(1) Pretest - cognitive behaviors				(1) Pretest - cognitive behavior
(a) pretest all students	+1		-1	(a) data collection on only part of students

(b) indicates nonpaper/pencil (e.g., (1) question individuals - find out where each student is (2) question individuals to find out what they have picked up informally - what they know about math play a game to see what individuals can do.)	+1		-1		(b) indicates use of only paper/pencil pretesting
(2) Report data/record data	+1				
(a) Teacher report data	+1				
(b) Parent report data	+1				
(c) Other report data	+1				
(d) Data from records including pupil files (and previous test scores)	+1				
TOTALS					
2. Pupil Assessment - affective					2. Pupil Assessment - affective
a. Score one point if the student asks or indicates a need for data concerning pupil affective behaviors related to school in general					
(1) attending	+1				
(2) responding	+1				
(3) initiating	+1				
(4) family background	+1				
(5) family attitudes toward school	+1				
(6) emotional stability	+1				

b. Score one point if the student asks for or indicates a need for data concerning pupil affective behaviors related specifically to mathematics				
(1) attending	+1			
(2) responding	+1			
(3) initiating	+1			
TOTALS				
3. Pupil Assessment - physical				3. Pupil Assessment - physical
a. Score one point for each item of physical assessment data for which the student asks or indicates a need				
(1) sex of pupil	+1			
(2) hearing	+1			
(3) vision	+1			
(4) medication	+1			
(5) food	+1			
TOTALS				
4. Other Humans - Assessment				4. Other Humans - Assessment
a. Score one point if the student asks or indicates a need for data relative to the availability of personnel acting as teacher aides (e.g., teacher aides, student helpers, team teaching situations, parent volunteers, university students)	+1			
b. Score one point if the student indicates a need for data concerning the accountability of resource people	+1			
TOTALS				

FAVORABLE				UNFAVORABLE
C. Curricular Assessment				C. Curricular Assessment
1. Content Substance a. Score one point each if the student asks for or indicates a need for content substance information (1) asks/indicates a need for textbook	+1		-1	1. Content Substance a. Score minus one point if the student does not indicate a need for content substance information and excludes all pre-number concepts/skills from his/her description
(2) asks for or indicates need for curriculum guide	+1			
(3) asks for or indicates a need for list of math objectives and/or goals	+1			
b. Score one point each if the student indicates knowledge of pre-number content substance as point to begin assessment tasks (1) classifying (sorting)	+1			
(2) patterns	+1			
(3) ordering	+1			
2. Assessment of Content Prerequisite/Sequence a. Score one point if the student asks or indicates a need for content prerequisites/sequence information	+1			2. Content Prerequisite/Sequence
			-1	a. Score minus one point if the student does not indicate a need for prerequisite or sequence information and includes in their description statements which exclude pre-number concepts (e.g., indicates pre-tests or initial instruction includes numeration concepts/skills but in absence of pre-number concepts. "I will begin with lessons related to the concept of numbers then go on to concept of set." "I will begin with simple addition problems.")

b. Score one point if the student indicates knowledge of pre-number sequence				
(1) classifying sets/objects				
(a) single attributes	+1			
(b) multiple attributes	+1			
(c) quantity	+1			
(2) Patterns				
(a) single attribute	+1			
(b) multiple attributes	+1			
(3) Ordering by				
(a) height, weight, volume, size	+1			
(b) quantity	+1			
c. Score one point if the student indicates knowledge of prerequisites for numeration and pre-number skills				
(1) Classifying by quantity	+1			
(2) ordering by quantity	+1			
3. Content Purpose				3. Content Purpose
a. Score one point if the student asks or indicates a need for information concerning content purpose (e.g., "First, we use math." "I would ask the children what things we do that we <u>don't</u> have to use math." "I would try to make my lessons related to some things the children can use."	+1		-1	a. Score minus one point if the student indicates that learning math is necessary only to learn more mathematics
b. Score one point if the student indicates knowledge of content purpose. I would ask the children how they use sorting (classifying) skills every day	+1			

D. Environmental Assessment				D. Environmental Assessment
1. Score one point if the student asks for or indicates a need for general environmental data:				1. Score minus one point if the student's description indicates a feeling of being restricted (e.g., "This school probably won't have ____ so I wouldn't be able to ____." The student does not ask for environmental data and indicates only use of chalkboard or paper/pencil materials.) "You can't give beads to children because they roll all over or the children throw them around."
a. classroom				
(1) space/arrangement	+1			
(2) materials	+1			
(3) equipment	+1			
(4) supplies	+1			
(5) sensory conditions (several temperatures in weather)	+1		-1	
(6) time (e.g., room schedules, time of instruction	+1			
b. School				
(1) space/arrangement	+1			
(2) materials	+1			
(3) supplies	+1			
(4) equipment	+1			
(5) sensory conditions	+1			
(6) time (e.g., length of school day, time of year)	+1			
(7) playground	+1			
c. Community				
(1) space/arrangement	+1			
(2) materials	+1			
(3) supplies	+1			
(4) equipment	+1			
(5) sensory conditions	+1			
(6) time	+1			

Section 1b

1b. Assessment Data Collection

INFORMATION			SOURCE
A. <u>Human</u>			A. <u>Human</u>
1. Pupil - Cognitive/General Math Data a. Score one point if the student indicates a need for pupil assessment data related specifically to mathematics (e.g., "What skills or concepts do pupils have related to mathematics?" "...previous performances.")			1. Cognitive/General Math a/b. Score one point for each source of data the student indicates
		+1	(1) previous test scores
		+1	(2) previous teacher report
		+1	(3) Ca-60's
		+1	(4) pretest
	+1	+1	(5) give oral quiz to each child
b. Score one point if the student indicates a need for pupil assessment data specifically in the area of pre-number. (classifying patterns, ordering)		+1	(6) recorded observation data of pupil performance of math related tasks
		+1	(7) discussion
		+1	(8) other
	+1		
2. Pupil - General/Cognitive Assessment Data a. Score one point for each item of information indicated by the student			2. Pupil - General/Cognitive Assessment Data a. Score one point for each item of information indicated by the student
(1) background experience	+1	+1	(1) discussion - parent/pupil
(2) I.Q. score	+1	+1	(2) record data/CA-60
(3) reading level	+1	+1	(3) parent report
(4) learning problems	+1	+1	(4) standardized test scores
(5) other	+1	+1	(5) diagnostic reading inventory
		+1	(6) diagnostic records/CA-60
		+1	(7) other

3. Pupil - Affective Assessment Data a. Score one point for each information item indicated by student			3. Pupil - Affective Assessment Data a. Score one point for each source indicated for each item
(1) General interest/enjoyment in school	+1	+1	(1) School/General (a) observation of pupil attending, responding, initiating behaviors
(2) emotional stability	+1		
(3) interest areas of pupils	+1	+1	(b) discussion with child
		+1	(c) parent report
		+1	(d) other teacher report
(4) interest/enjoyment in mathematics (attending, responding, initiating, behavior)	+1	+1	(e) recorded data/CA-60
		+1	(2) Emotional Stability (a) diagnostic records
		+1	(b) report
		+1	(3) Pupil interests (a) observation of pupil attending, responding, initiating behaviors
		+1	(b) discussion with child
		+1	(c) parent report
		+1	(d) other teacher report
		+1	(e) other
		+1	(4) Mathematics (a) observation of pupil attending, responding, initiating behaviors
		+1	(b) discussion with pupil
		+1	(c) parent report
		+1	(d) other teacher report
		+1	(e) other

Information item					Source of information
4. Pupil - Physical Assessment Data					4. Pupil - Physical Assessment Data
a. Score one point for each information item indicated by the student					a. Score one point for each source of information indicated by the student
(1) sex of child	+1		+1		(1) sex of child
			+1		(a) observation
			+1		(b) records
(2) auditory skills	+1		+1		(2) auditory skills
			+1		(a) observation
			+1		(b) diagnostic records
			+1		(c) other
(3) visual skills	+1		+1		(3) visual skills
			+1		(a) observation
			+1		(b) diagnostic records
			+1		(c) other
(4) physical health (enough food, sleep)	+1		+1		(4) physical health
			+1		(a) observation
			+1		(b) report
			+1		(c) records
			+1		(d) other
5. Availability of Other Humans					5. Availability of Other Humans
a. Score one point for each information item indicated by student					a. Score one point for each source indicated for each item of information
(1) teacher aides	+1		+1		(1) aides
			+1		(a) principal
			+1		(b) teachers
			+1		(c) other
(2) student helpers	+1		+1		(2) helpers
			+1		(a) principal
			+1		(b) teachers
			+1		(c) other
(3) parent volunteers	+1		+1		(3) volunteers
			+1		(a) principal
			+1		(b) teachers
			+1		(c) parents
			+1		(d) others

(4) university students	+1		+1	(4) students
			+1	(a) principal
			+1	(b) teachers
			+1	(c) university
			+1	(d) others
(5) team teaching	+1		+1	(5) team teaching
			+1	(a) principal
			+1	(b) teachers
			+1	(c) others
(6) resource people	+1		+1	(6) resource people
			+1	(a) principal
			+1	(b) teachers
			+1	(c) parents
			+1	(d) community members
			+1	(e) others

B. Curricular

1. Content Substance
   a. Score 1 point if the student indicates a need for content substance information. (e.g., "I would need to know what skills and concepts I would be teaching." "I need to know what is called for in the curriculum at the level I am teaching." "What do I want the student to know after instruction?" "What type of math. program does this system have?") +1
2. Content Prerequisite/Sequence
   a. Score 1 point if the student indicates a need for content prerequisite/sequence information. (e.g., "I need to know what comes next in sequence so as not to confuse the students." "I need to know where to start instruction.") +1
3. Content Purpose
   a. Score 1 point if the student indicates a need for content purpose information. (e.g., "Does the lesson involve rote memorization that will not be useful and will not lead to any other concept?" "Why do children need to learn the identified content substance?") +1

B. Curricular

1. Content Substance
   a. Score 1 point for each source of content substance information indicated by the student.
      - +1 (1) Building principal
      - +1 (2) Other teachers
      - +1 (3) Textbooks
      - +1 (4) Curriculum guides
      - +1 (5) List of objectives
      - +1 (6) Other ____________
2. Content Prequisite/Sequence
   a. Score 1 point for each source of content prerequisite sequence information.
      - +1 (1) Textbooks
      - +1 (2) Curriculum guides
      - +1 (3) List of objectives
      - +1 (4) Other ____________
3. Content Purpose
   a. Score 1 point for each source of content purpose information indicated by the student.
      - +1 (1) Textbooks
      - +1 (2) Curriculum guides
      - +1 (3) Teacher decision
      - +1 (4) Other ____________

Information			Source
C. <u>Environmental Assessment</u>			C. <u>Environmental Assessment</u>
1. Score 1 point for each environmental assessment item indicated by the student.			1. Score 1 point for each source indicated for each information item.
			a. Classroom
a. Classroom		+1	(1) Observation
(1) Space/arrangement ____	+1	+1	(2) Inventory lists
(2) Materials ____	+1	+1	(3) Principal
(3) Equipment ____	+1	+1	(4) Teachers
(4) Supplies ____	+1	+1	(5) Pupils
(5) Sensory conditions ____	+1	+1	(6) Other ____
(6) Time ____	+1		
b. School			b. School
(1) Space/Arrangement ____	+1	+1	(1) Observation
(2) Materials ____	+1	+1	(2) Inventory lists
(3) Equipment ____	+1	+1	(3) Principal
(4) Sensory Conditions ____	+1	+1	(4) Teachers
(5) Time ____	+1	+1	(5) Pupils
(6) Playground ____	+1	+1	(6) Other ____
c. Community			c. Community
(1) Space Arrangement ____	+1	+1	(1) Observation
(2) Materials ____	+1	+1	(2) Principal
(3) Supplies ____	+1	+1	(3) Teachers
(4) Equipment ____	+1	+1	(4) Pupils
(5) Conditions ____	+1	+1	(5) Community members
(6) Other ____	+1	+1	(6) Other ____
D. <u>Recording Assessment Data</u>			D. <u>Recording Assessment Data</u>
1. Score 1 point if the student indicates he/she will use a system for recording assessment data ____	+1		

Section IIa.

IIa. GOALS AND OBJECTIVES

Favorable			Unfavorable
A. Goal Identification			**A. Goal Identification**
1. Score one point if the student indicates he/she would identify and state a beyond-school goal (e.g., "I would identify a beyond-school goal that would indicate pupil acquisition and application of the needed mathematical content substance knowledge and skill determined during assessment.")	+1		
2. Score one point if the student indicates he/she would identify an analogue of beyond-school goal (e.g., "I would identify an analogue of the beyond-school goal that would be possible in the situational context in which I am teaching.")	+1		
3. Score one point if the student indicates a need for knowledge for the out of school goals for pre-number unit	+1		
4. Score one point if the student indicates beyond-school goals for the pre-number unit	+1		

B. Objective Specification			B. Objective Specification
1. Score one point if the student indicates he/she would make the goal explicit by stating the cognitive objectives necessary for goal attainment	+1	-1	1. Score minus one point if the student does not select objectives for individuals but for the whole group
2. Score one point if the student indicates he/she would make the goal explicit by stating the affective objectives necessary for goal attainment	+1		
3. Score one point if the student indicates he/she would select objectives for individual students based on student assessment data	+1		
4. Score one point if the student indicates he/she would determine instructional sets once objectives have been assigned to individual students	+1		
C. Communication			C. Communication
1. Score one point if the student indicates plans to communicate goals/objectives to pupils	+1		

Section IIb

IIb. GOALS AND OBJECTIVES

Favorable			Unfavorable
A. Identifying Specific Objectives for Pupils			A. Identifying Specific Objectives for Pupils
1. Score one point for each item below that the student includes in his/her description	+1	-1	1. Score minus one point if the student indicates that all pupils begin on first single attribute objective or on same objective
a. Vicki:			
(1) Begin to work on pattern objectives	+1		
(2) Continues classification experiences as practice and/or reinforcement	+1		
(3) Affective objective calls for initiating behaviors	+1		
b. Tom:			
(1) Single attributes - obj. 3	+1		
(2) Quantity - obj. 1,2,3,4	+1		
(3) Affective objective calls for continuing initiating behaviors	+1		
c. Sally:			
(1) Single attribute - obj. 1	+1		
(2) Quantity - obj. 1	+1		
(3) Affective objective calls for increased responding behaviors	+1		
d. Dave:			
(1) Single attributes - obj. 3	+1		
(2) Quantity - obj. 1	+1		
(3) Affective objective calls for initiating behaviors	+1		

Section III

III. STRATEGIES

Favorable				Unfavorable
A. Human				A. Human
1. Score 1 point for each item the student included in his/her description.			-1	1. Score - 1 point if the student's description includes only whole group instruction.
a. Use of both whole group (set) and subset instruction	+1			
b. Subset instruction	+1			
c. Grouping pupils who are working on the same objective	+1			
d. Regrouping pupils based on formative evaluation	+1			
e. Grouping pupils to allow for affective objective attainment	+1			
f. Grouping pupils to allow for modeling	+1			
g. Use of student helpers	+1			
h. Use of teacher aides	+1			
i. Use of parent volunteers	+1			
j. Use of University students	+1			
k. Use of team teaching situation	+1			
l. Pupil working independently	+1			
m. Pupils (2 or 3) working independently	+1			
n. Concern for pupil affective behaviors. (e.g., "I would include something the pupils could do." "I don't want the pupils to think they can't." "Bill is interested in animals; I would ask him to sort toy animals by color."	+1			

Item			
B. Curricular			
1. Score 1 point for each item the student included in his/her description.	+1		-1
2. The student provides for:			
a. Formal Instruction			
(1) Teacher directed	+1		
(2) Independent or small group tasks	+1		
b. Informal Instruction ("Sally, bring a carton of milk for everyone in this group.")	+1		
c. Operant Learning			
(1) Discrimination learning tasks for			
(a) Classification of single and multiple attribute objectives (except quantity)	+1		
(b) Ordering single attributes	+1		
(2) Concept learning tasks for			
(a) Classification-Quantity objectives	+1		
(b) Patterns-Single and multiple attribute objectives	+1		
(c) Ordering-Multiple attribute objectives	+1		
(3) Reinforcement			
(a) Use of reinforcement techniques (general)	+1		
(b) Type of reinforcement technique used based on individual pupil assessment	+1		

B. Curricular

1. Score - 1 if the student's description includes only "teacher telling" activities.

d.	Convergent Tasks	+1		
e.	Divergent Tasks	+1		
f.	Use of symbolic materials only after pupil mastery of objectives which include use of concrete materials	+1		
g.	Modeling			
	(1) Pupils modeling task	+1		
	(2) Teacher modeling task	+1		
h.	Respondent Learning			
	(1) Pupil decides among tasks	+1		
	(2) Pupil decides amount of task	+1		
	(3) Pupil decides nature of task	+1		
	(4) Pupil decides within task structure	+1		
	(5) Use of variety of activities	+1		
	(2-3) per instructional set	+1		
	(6) Games			
	(a) "Guess my rule"	+1		
	(b) Other	+1		
	(7) Challenge (Within pupil) (e.g., "Yesterday you could find two ways to sort the objects we had. I have a different set of objects today. I know it'll be hard, but let's see how many ways you can sort these objects.")	+1		
	(8) Task is at learning level of pupil	+1		
	(9) Opportunity for pupil to learn something new	+1		

C. Environmental				C. Environmental
1. Score one point for each item the student includes in his/her description			-1	1. Score minus one point if the student's plans indicate use only of paper/pencil materials
a. Indicates space and arrangement of classroom for purpose of formal instruction	+1			
b. Indicates space and arrangement of classroom for purpose of informal learning	+1			
c. Use of bulletin boards	+1			
d. Use of activity centers	+1			
e. Use of interest areas	+1			
f. Play tables	+1			
g. Time management (10 minutes whole group instruction, 3-subsets 5 minutes each	+1			
h. Listening center (including manipulative materials)	+1			

2. Score one point for each item the student includes in his/her description

a. Equipment			
(1) Aquarium	+1		
(2) Balance beams	+1		
(3) Building blocks	+1		
(4) Bulletin boards	+1		
(5) Chairs	+1		
(6) Filmstrip projector	+1		
(7) Filmstrips	+1		
(8) Green boards	+1		
(9) Opaque projector	+1		
(10) Overhead projector	+1		
(11) Peg board	+1		
(12) Plants	+1		
(13) Polaroid camera	+1		
(14) Record player	+1		
(15) Records	+1		
(16) Rocking chairs	+1		
(17) Sandbox (table)	+1		
(18) Slide projector	+1		
(19) Tables rectangular	+1		
(20) Tables round	+1		
(21) Tape recorder	+1		
(22) Terrarium	+1		

b. Supplies

(1) Chalk colored	+1		
(2) Coffee stirers	+1		
(3) Construction paper	+1		
(4) Crayons	+1		
(5) "Feeling Box"	+1		
(6) Milk	+1		
(7) Paints (poster, water)	+1		
(8) Paper lined	+1		
(9) Paper unlined	+1		
(10) Paste/glue	+1		
(11) Pencils	+1		
(12) Sand paper	+1		
(13) Snacks	+1		
(14) Straws	+1		
(15) Tongue depressers	+1		
(16) Transparencies	+1		
(17) Variety of seeds	+1		
(18) Wall paper	+1		
(19) Wall paper books	+1		
(20) Yarn	+1		

c. Materials			
(1) Aluminum pie plates	+1		
(2) Attribute blocks	+1		
(3) Books	+1		
(4) Boots	+1		
(5) Box of buttons	+1		
(6) Box of junk	+1		
(7) Brushes	+1		
(8) Carpet squares	+1		
(9) Cars	+1		
(10) Colored cubes	+1		
(11) Cuisenaire rods	+1		
(12) Felt board/pieces	+1		
(13) Jars with screw on tops	+1		
(14) Jells	+1		
(15) Lego blocks	+1		
(16) MAB blocks	+1		
(17) Magnetic board	+1		
(18) Mittens	+1		
(19) Paperclips	+1		
(20) People pieces	+1		
(21) Pictures in room	+1		
(22) Pins	+1		
(23) Rugs	+1		
(24) Scissors	+1		
(25) Shoes	+1		
(26) Stringing beads	+1		
(27) Tinker toys	+1		
(28) Toys	+1		
(29) US flag	+1		
d. Community			
(1) Buildings	+1		
(2) Materials found in neighborhood	+1		
(3) Neighborhood corner store	+1		
(4) Streets in neighborhood	+1		

Section IV

IV EVALUATION

Favorable				Unfavorable
A. <u>Decision-making skills</u>				A. <u>Decision-making skills</u>
1. Score one point for each item the student indicates in his/her description				
a. Pupil - Cognitive/Affective				
(1) selected instruments or tasks for posttest	+1			
(a) cognitive -(the student indicated individuals will be non-paper/pencil tested on specific objectives)	+1			
(b) affective	+1			
(2) determined procedures for posttesting pupils				
(a) individual	+1			
(b) individuals in small groups	+1			
(c) space/arrangement	+1			
(d) time	+1			
(e) use of teacher aides	+1			
b. Assessment				
(1) selected instruments or tasks for determining accuracy of teacher assessment of pupils	+1			
(2) determined procedures for gathering data	+1			
c. Goal Setting Objectives				
(1) determined procedure for gathering data to determine accuracy of individual goals and objectives	+1			

d. Strategies				
(1) selected instruments or tasks to determine efficacy of strategies	+1			
(2) determine procedures for gathering data to determine efficacy of strategies	+1			
e. Feedback Skills				
(1) Score one point if the student indicates he/she will provide feedback based on evaluation to:				
(a) Pupils	+1			
(b) Parents	+1			
(c) Others	+1			
f. Score one point if the student indicates he/she would continue to work on classifying and ordering by quantity but also provide instruction for patterns	+1			
g. Score one point if the student indicates he/she would provide pupils who did not achieve quantity objectives with informal tasks. ("Bring enough milk for everyone in this group.")	+1			

B. <u>Preparation Skills</u>					B. <u>Preparation Skills</u>
1. Score one point if the student indicates he/she would:					
a. Prepare appropriate questions or tasks related to evaluation of:					
(1) Pupil cognitive	+1				
(2) Pupil affective	+1				
(3) Assessment	+1				
(4) Goals/Objectives	+1				
(5) Strategies	+1				
b. Prepare					
(1) Record-keeping devices	+1				
(2) Arrangements for reliable and valid data collection	+1				
C. <u>Data Analysis Skills</u>					C. <u>Data Analysis Skills</u>
1. Score one point if the student indicates he/she would:					
a. Analyze data collected	+1				

APPENDIX M

SYSTEM FOR KEEPING RECORDS OF INDIVIDUAL DEVELOPMENTAL TIME

APPENDIX M

SYSTEM FOR KEEPING RECORDS OF INDIVIDUAL

DEVELOPMENTAL TIME

Record Card

Purpose: Present:

Outcomes:

Date: Time: From______ to________

APPENDIX N

RESEARCHER BIOGRAPHICAL BACKGROUND INFORMATION

APPENDIX N

RESEARCHER BIOGRAPHICAL BACKGROUND INFORMATION

Family Background

According to Stanley and associates (1956) system of classification this researcher was born and raised in a middle class family situation. The family was located in a small town with a population of approximately 6,000. This researcher's family consisted of mother, father, and two non-masculine siblings.

Academic Background

This researcher acquired a B.S. degree from Central Michigan University in 1961 with minors in sociology, art, bioloby, and speech. She earned a Master of Arts degree in elementary education from Michigan State University in 1967. At the time of this study this researcher was completing the requirements for a Ph.D. in elementary teacher education at Michigan State University.

Professional Work Experience

This researcher had been employed as an elementary and intermediate school classroom teacher between the years of 1961 and 1968. From 1968 through the academic year of 1971 the researcher was an elementary intern consultant responsible to an MSU off-campus teacher education center. In the intern consultant role, this researcher was released from all personal classroom teaching responsibilities. This researcher was responsible for working with six to nine intern-teachers. The intern-teachers functioned as a classroom teacher (Special State Certification Provided) for one year prior to graduation from the Elementary Intern Undergraduate Teacher Education Program. This experience included the opportunities to observe teachers and record and analyze the field observations. Verification of observations was obtained through informal and formal interviews.

During the three years as an EIP consultant and for two subsequent years this researcher taught, to university juniors, the introductory university course in educational psychology and social emotional learning. This researcher was also involved in teaching university graduate courses such as "Instructional Techniques" and "The Open Classroom."

During the two academic years from 1971 to 1973, this researcher maintained a position at MSU; the first year, as a graduate fellow in teacher education and the second year as an instructor. During this time this researcher worked in the development and field work aspects of an experimental teacher training program.

Related Experiences

Public school teaching provided this researcher with the opportunity to work in a participant observer role. (See Rachel Reese Sady, Perspective from Anthropology, 1961, p. 7, and others.) This researcher, over a five-year period, had been asked to participate on numerous professional committees, in various participant observer roles.

On several occasions this researcher was trained as an observer and participated in field research studies and field projects. These experiences included training in recording and analyzing both objective and subjective data and in informal and formal interviewing.

Prior to this researcher's arrival to campus for the purpose of completing her MSU graduate residency requirements, she was employed as a consultant for an elementary teacher interm program. In this position as liaison between public school and university personnel, she became aware of the differences in the language of public school employees and university professors. After being on campus and in a position to continue field work in public schools this researcher consciously maintained and used a public school language in those contacts, while learning and using the university language in that society. Therefore, language problems that did exist between this researcher and members of the group being studied were those related to the situations where people from various disciplines were trying to work together. This problem also existed among the other team members. Thus the problem was resolved as a team problem.

As a participant-as-observer, this researcher attended all team meetings. Since the investigator expressed the desire to attend subteam development work sessions, the researcher was included in them. In subteam situations this researcher continued to act in the roles of member and learner.

This researcher was involved with various team members in other professional situations. Also, since this researcher lived in the Lansing area she was able to attend various professional and social functions to which she was invited by various team members.