ABSTRACT

AN ANALYSIS OF THE EFFECTIVENESS OF
A PHENOMENOLOGICAL APPROACH IN TEACHING,
AS USED IN A TEACHER EDUCATION
MODERN MATHEMATICS WORKSHOP

By

Beatrice A. Brenton

This experimental study was designed to analyze the effectiveness of a phenomenological approach in teaching a teacher education course (specifically a two-week modern mathematics workshop), through an investigation of: (1) the learner's attitudes toward the student, and the student-teacher relationship, as measured by the Minnesota Teacher Attitude Inventory; (2) the learner's academic achievement, as measured by the Test on Modern Mathematics; and (3) the learner's perceptions of the following, as measured by the four-item Open-Ended Questionnaire: (a) his change in attitude about modern mathematics, (b) his intent to change his teaching behavior, (c) his satisfaction with the amount of mathematics content learned, and (d) his general reactions to the workshop experience.

Two further purposes which arose during the course of the study were to analyze: (1) the relationship between

the attitudes of the teachers at the beginning of the workshop experience, as measured by the MTAI pretest, and the cognitive gain at the termination of the workshop experience, as measured by the TMM gain scores; and (2) the range of scores on the TMM pre- and posttests.

The experimental group consisted of sixty-two students enrolled in a two-week modern mathematics workshop at Central Michigan University. Approximately half were experienced graduates and half were inexperienced undergraduates. The control group consisted of thirty-one experienced graduates and one inexperienced undergraduate enrolled in a concurrent two-week modern mathematics workshop at Michigan State University. The participation of the researcher as an assistant to the instructor in the experimental group maintained an equivalent student-teacher ratio.

The experimental treatment was the implementation of a phenomenological approach in teaching--a learner-centered approach based upon phenomenological psychology.

Both groups completed the Personal Data Sheet, the MTAI and the TMM as pre- and posttests, and the Open-Ended Questionnaire as posttest only.

Analysis of covariance was used to determine the difference between the experimental and control groups on both the MTAI and the TMM at the .01 level of confidence.

Pearson product-moment correlations were calculated for the analysis of the relationship between the MTAI pretest scores and the TMM gain scores for both groups at the .05 level of confidence. Percentages of responses to the first three items on the Open-Ended Questionnaire were computed by categories.

Conclusions: A significant difference between the experimental and control groups in attitude (MTAI) did exist in favor of the experimental group (.0005). Eighty-four percent of the experimental group as compared to 3% of the control group expressed an intent to change teaching behavior in a more student-centered direction. Although both groups expressed favorable attitudes toward the workshop experience, those expressed by the experimental group seemed to be more student-centered.

A significant difference did not exist between the experimental and control groups in academic achievement (TMM). Both groups expressed favorable attitudes toward modern mathematics and satisfaction with the amount of mathematics learned.

A significant relationship between the pretest MTAI scores and the TMM gain scores did exist for the experimental group, but did not exist for the control group.

The TMM range of scores on the pretest was greater for the control group than for the experimental group, while the inverse was true for the posttest.

With both graduates and undergraduates, this study's phenomenological approach in teaching was as effective as the control teaching approach in facilitating academic achievement (TMM), and more effective in facilitating student-centered attitudinal gain (MTAI and Open-Ended Questionnaire). Therefore, it is suggested that a phenomenological approach in teaching be implemented at all levels of a teacher's professional preparation, if the phenomenological view of behavior is the frame of reference. Further research in the implementation of a phenomenological approach in teaching in teacher education is recommended.

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CHAPTER I

INTRODUCTION

Purpose of the Study

It was the purpose of this experimental study to analyze the effectiveness of a phenomenological approach in teaching a teacher education course (specifically a two-week modern mathematics workshop) through an investigation of the following:

1. the learner's attitudes toward the student and the student-teacher relationship, as measured by the Minnesota Teacher Attitude Inventory, Form A, (Cook, Leeds, and Callis, 1951) hereafter referred to as the MTAI;
2. the learner's academic achievement, as measured by the Test on Modern Mathematics, Form A, (Riedesel and Suydam, 1967) hereafter referred to as the TMM; and
3. the learner's expressed perceptions of the following, as measured by the Open-Ended Questionnaire: (a) his change in attitude about modern mathematics; (b) his intent to change his teaching

behavior; (c) his satisfaction with the amount of mathematics content learned; and (d) his general reactions to the workshop experience.

Two further purposes which arose during the course of the study were to analyze:

1. the relationship between the attitudes of the teachers at the beginning of the workshop experience, as measured by the MTAI pretest, and the cognitive gain at the termination of the workshop experience, as measured by the TMM gain scores; and
2. the range of scores on the TMM pre-and posttests.

The control group was a concurrent two-week modern mathematics workshop taught on another campus. A description of the experimental and control group treatments is presented in Chapter III.

Conceptual Framework and Teaching Strategies of a Phenomenological Approach in Teaching

A phenomenological approach in teaching is a student-centered approach based on phenomenological psychology and redefined in Lewinian-group-dynamic theory and Rogerian-nondirective or client-centered techniques. Its specific definition is situational, determined by its organizing and operational principles. The conceptual framework which defines the phenomenological approach in teaching utilized in this study is that which defines

Combs' (1965) "self as instrument" approach to organizing the professional aspects of teacher education. He formulates three organizing principles: (1) provide information, (2) provide for involvement, and (3) provide for personal exploration and discovery (p. 118). He then suggests a program which would: (1) permit the movement of students at different speeds; (2) provide content and experience in response to student needs; (3) provide simultaneous, rather than sequential, experience for the learner; and (4) place much more responsibility upon the student himself (p. 115).

This study's phenomenological approach in teaching was implemented through the eight teaching strategies described in Chapter III, and summarized here: (1) small group and/or independent study; (2) self-determined goals, objectives, and requirements; (3) self-evaluation of personal growth and self-determined-and assigned grade; (4) self-selection of learning procedures and materials; (5) self-paced learning; (6) emphasis upon individual and/or small group instructor-learner interaction; (7) instructors' roles those of facilitators and resource persons; and (8) student-initiated-and led discussion.

Teaching Strategies of the Control Group

A description of the salient instructional procedures of the control group are presented in Chapter III, and are summarized here: (1) total group

lecture-discussion, instructor initiated and led; (2) instructor and instructor-total group determined goals, objectives, and requirements; (3) instructor and instructor-total group selection of learning procedures and materials; (4) instructor evaluation of the learner's growth and instructor-determined-and assigned grades; and (5) emphasis upon total group instructor-learner interaction.

Theory Underlying a Phenomenological Approach in Teaching

Human behavior may be observed from at least two very broad frames of reference: from the point of view of an outsider, or from the point of view of the behaver himself. The first approach, called the external or objective approach, has aided psychology tremendously in amassing data concerning the behavior of groups. These data have greatly increased our understanding and prediction of normative behavior. But there are those who believe that normative methods are not enough for the understanding of the behavior of individuals. The second approach, which is internally or subjectively oriented, and which is the frame of reference of this study, is thought by the proponents to be a more appropriate and accurate approach to the understanding of the behavior of individuals. A psychology which supports this second approach has

appeared during the past 25 years. Known by a number of terms,[1] phenomenological psychology is deeply concerned with man's being and becoming. Among those educational leaders who are proponents of this psychology are: Allport (1955); Angyal (1941); Combs (1948, 1959, 1962, 1965); Jersild (1951, 1952, 1953, 1955); Kelley (1955); Lecky (1945); Lewin (1951); Maslow (1954, 1962a, 1962b); May (1960); Moustakas (1956, 1966); Snygg (1941, 1959); and Tenenbaum (1961, 1967).

Three basic principles of phenomenological psychology, as perceived by Combs (1965) are: (1) all behavior of a person, without exception, is the direct result of his total field of perceptions at the moment of his behaving; (2) of all the perceptions existing for an individual, the most important single influence affecting his behavior is his self-concept, or his organization of ways of seeing his self; and (3) the need for adequacy is the fundamental motivation of every human being from conception to death (p. 19). This basic need for adequacy includes both striving for self-maintenance and for self-enhancement--a fulfillment of one's self-concepts.

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[1]This psychology is known by such terms as "third force," personalistic, phenomenological, humanistic, perceptual, transactional, existential, and self. The writer chose to adopt the terms "phenomenological" and "perceptual" for this study.

This way of looking at human behavior provides the basis for the characteristics of the fully functioning person, which from the perceptual viewpoint, is the ultimate goal of education. A fully functioning person seems to be characterized by: (1) a positive view of self, (2) identification with others, (3) openness to experience and acceptance, and (4) a rich and available perceptual field.

Phenomenological psychology is concerned with more than the forces exerted upon people from the outside. It seeks also to understand the internal life of the individual: his wants, feelings, desires, attitudes, values, and the unique ways of seeing and understanding that cause him to behave as he does. It does not view intellectual behavior and emotional behavior as a dichotomy; on the contrary, they cannot be separated. Man's emotional commitments are believed to be the key to the profoundest drives, forces, and learning in man; therefore, concomitant learnings are considered of greater educational significance than the direct or primary learning (Combs, 1959; Kilpatrick, 1951; Tenenbaum, 1967). The teacher's attitudes toward the student and toward the student-teacher relationship on the one hand, and the student's perception of this relationship from his point of view on the other, are thought to be crucial for the translation of knowing into behaving (Combs, 1959; Rogers, 1961).

Phenomenological psychology is the foundation upon which the experimental instructional approach used in this study--a phenomenological approach in teaching--is based. Its theory and its implications for teacher education are elaborated upon in Chapter II.

Significance of the Study

There is often a gap between our understanding of the nature of human behavior and the utilization of these understandings in practice (Carpenter and Hadden, 1964; Combs, 1962). The committee for the 1962 ASCD Yearbook believes the tempo of events in the world today demands that the best we know be converted into practice as quickly as possible. Current research within the conceptual framework of a phenomenological approach to teaching in teacher education should aid in bridging the gap between theory and practice because it is based upon the proposition that what teachers have experienced through involvement is most apt to affect behavior.

Denemark and MacDonald (1967), in their review of research for 1963-67, state that "even a casual perusal of the literature reveals a lack of theory," which they suggest, "has resulted in an obvious divorce of theory and practice" (p. 241). A number of writers see teacher education research as needing conceptual frameworks (Goodlad, 1962; Howard, 1963; Smith, 1962; Wattenberg, 1963).

Wiles (1967) expresses a similar opinion, when he states, "It is time that methods courses put emphasis on constructing a theory of teaching rather than proclaiming a particular model or pattern or theory" (p. 262). Denemark and MacDonald (1967) believe that of the few studies that do project a conceptual framework, or unifying theory, Combs' (1965) study provides a "provocative point of view based upon perceptual psychology and the concern for values and man's search for being and becoming" (p. 241).

Combs asserts that "it is at the source of supply--our teacher preparation programs--that review and innovation are most critically called for if we are to bring about the improvements we need in education" (p. v). He calls for a reexamination of teacher education in the context of a modern philosophical-psychological framework evolving from "our changing social needs and purposes on the one hand, and our new understandings about human behavior and learning on the other" (p. vi). Combs (1965) supports his position when he states:

> The basic principle of learning in perceptual psychology is this: Any item of information will affect an individual's behavior only in the degree to which he has discovered its personal meaning for him. The production of effective teachers will require helping each student to explore and to discover his personal meanings about subject matter, people, purposes, and learning, about methods and about himself. The source of many of our failures in teacher education, it now seems clear, is that we have not sufficiently understood that professional

> training must operate on these deeper, more personal levels of learning. We have assumed that knowing and behaving are one and that the time-honored ways of teaching subject matter are appropriate for teaching people to teach as well. Our effort has been involved with teaching our students about teaching instead of helping them become teachers. To the contrary, as we have seen, professional teacher education must be an intensely human process designed to involve the student deeply and personally (p. 28).

Jersild (1955) postulates that the teacher's understanding and acceptance of himself is basic to any effort he makes to help students to develop their own self-adequacy. For Rogers (1961) and Tenenbaum (1967), the only learning which is significant is that which is self-discovered, self-appropriated, and therefore, not directly communicable to another person.

Combs (1962) says that it is possible and essential for a teacher to see his educational goals in terms broad enough to include the self-concept while simultaneously achieving high academic standards. As he looks at the professional aspects of undergraduate, pre-service education within the framework of phenomenological psychology, he asserts that teacher education programs: must be concerned with the perceptual world of the student; must assist its students in the development of a clear and consistent frame of reference about people and their behavior to serve as a guide in dealing with them; must become student-centered; must help students explore

purposes--his, and those of the community, parents, administration, and pupils; must help students to discover the methods of teaching that are right for him; must help students discover the personal meaning of information so that they behave differently as a result of teaching; and must not only satisfy the student's current needs as perceived by him, but harness them so as to encourage the seeking of new goals.

If adequate people promote adequacy in others, and if it is possible to include the self-concept and the perceptual world of the student in educational goals while simultaneously achieving high academic standards, then it would seem that teacher education courses should be designed to promote personal adequacy as well as content adequacy. If behavior is a function of perception, or personal meanings, then it would seem that perceptions should become the focus of the teacher education experiences. If significant learning--learning that effects behavioral change--involves the exploration and discovery of personal meaning, then it would seem that teacher education should permit the individual to explore and discover that which is meaningful to him so that he behaves differently. This would enable the learner to learn how perceptions or meanings are built, changed, or broadened. It would facilitate "learning how to learn,"

which Useem (1963) and other educational leaders deem the hallmark of an educated person in a high civilization. It is the viewpoint underlying this study that a student-centered approach in teaching based upon phenomenological psychology (a phenomenological approach) provides the frame of reference for this kind of teacher education.

It is apparent that a need exists for research in conceptual frameworks, particularly in a phenomenological approach in teaching in teacher education, which is relevant to the needs of the individual as a lifetime learner in a "culture of change."

Questions to be Considered

Several questions now suggest themselves with respect to a phenomenological approach in teaching as used in this study:

First, will the learner change his attitude toward the student and toward the student-teacher relationship as a result of the workshop experience?

Second, as a result of the workshop experience, will the learner express an intent to change his teaching behavior? Will the direction of change be toward student-centered behavior?

Third, will the learner express a change of attitude about mathematics as a result of the workshop experience?

Fourth, what effect will the workshop experience have upon the learner's academic achievement?

Fifth, will the learner express satisfaction with the amount of modern mathematics learned?

Sixth, what effect will the workshop experience have upon the range of scores on an achievement test in modern mathematics?

Seventh, will there be a relationship between the learner's attitudes at the beginning of the workshop and his mathematics achievement at the termination of the workshop experience?

Statistical Hypotheses to be Tested

Hypothesis I. H_o There is no difference between the experimental group and the control group in attitudes as measured by the MTAI.

Hypothesis II. H_o There is no difference between the experimental group and the control group in mathematics achievement as measured by the TMM.

Hypothesis III. H_o There is no relationship between the pretest MTAI scores and the gain scores in mathematics for the experimental group.

Hypothesis IV. H_o There is no relationship between the pretest MTAI scores and the gain scores in mathematics for the control group.

Assumptions Upon Which the Study is Based

1. It is assumed that the development of a fully functioning person should be the goal of education.
2. It is assumed that all behavior is a function of the total perceptual field at the moment of action; therefore, to effect change in behavior, perceptions must be changed.
3. It is assumed that each person is continually motivated by the need for greater effectiveness in relating with his world.
4. It is assumed that intellectual and affective behavior cannot be separated.
5. It is assumed that what a teacher believes about his students will have an important effect upon how he behaves toward them.
6. It is assumed that the attitudes of a teacher afford a key to the indication of the type of classroom atmosphere a teacher will maintain.
7. It is assumed that attitudes, as measured by the MTAI, are valid indicators of a teacher's

openness to learner-centered teaching, and, therefore, to a phenomenological approach in teaching.

8. It is assumed that a teacher with a high positive score on the MTAI will be favorable toward learner-centered teaching and will be open to a phenomenological approach in teaching.
9. It is assumed that the self-reports of teachers are valid representations of their true feelings and belief systems, within the delimitations of any self-report (Combs, 1962; Combs and Snygg, 1959).
10. It is assumed that the objective measures used in this study, namely, the MTAI and TMM, are valid instruments within the delimitations as stated in Assumption Nine.
11. It is assumed that the analysis of covariance and the Pearson product-moment correlation coefficients are appropriate statistical treatments for this experimental-exploratory study.

Definition of Terms Used

Attitude is defined as the "degree of positive or negative affect, or feeling, associated with some psychological object. Psychological object is defined as any symbol, phrase, slogan, person, institution, ideal, or

idea toward which people can differ with respect to positive or negative affect" (Edwards, 1957, p. 2). The kinds of attitudes which are the concern of this study are those that the teacher has toward the learner, himself, the teacher-learner relationship, the teaching-learning process, and subject matter. It is the point of view of this study that attitudes are the function of perceptions.

Learner-centered attitudes, also known as student-centered, integrative, democratic, or nondirective attitudes are defined as those which are positively associated with concern for the needs, feelings, ideas, values, attitudes, desires, and unique understandings and capabilities of the individual. In this study they are positively associated with student-centered teaching, and, therefore, with a phenomenological teaching approach.

Subject-centered attitudes, also known as instructor-centered, dominative, or directive attitudes, are defined as those which are positively associated with subject-matter achievement, teacher-directed needs, authoritarianism, and teacher status. In this study they are associated with subject-centered teaching.

Scope and Limitations

This study was designed to explore the effectiveness of a phenomenological approach in teaching a teacher education course. The experimental and control groups

were concurrent two-week modern mathematics workshops. Thus, intact groups were used. To the degree that statistical equivalence is true, this approach, when replicated with random equivalence, should yield similar results.

As in any research utilizing self-report as a measuring device, this study has the delimitation of the discrepancy between self-perceptions and self-report. How an individual believes and feels, and what he is willing to say about his beliefs and feelings may not be congruent (Combs, 1962).

Design of the Study

This experimental study was designed to analyze the effectiveness of a phenomenological approach in teaching a teacher education course, specifically a two-week modern mathematics workshop. The participants were 102 students enrolled in two workshops held concurrently during the summer of 1968.

The experimental group consisted of 69 students, enrolled in a workshop at Central Michigan University. Since seven did not complete one or both of the posttests, data were analyzed for an N of 62. Of the 35 graduate students, 23 were experienced teachers. Eight of the undergraduates were also experienced.

Thirty-three students enrolled in a workshop at Michigan State University comprised the control group. Because one student did not complete the posttests, data were analyzed for an N of 32. Thirty-one of the students were experienced graduates. The one undergraduate was inexperienced.

The experimental treatment was the implementation of a phenomenological approach in teaching as described in Chapter III of this study.

Pretest and posttest instruments used in the study were the MTAI and the TMM. An Open-Ended Questionnaire consisting of four items was administered as a "posttest" to both groups. Both groups completed a Personal Data Sheet on the first day. Copies of the instruments are included in the Appendices.

The Nonrandomized Control-group Pretest-Posttest Design, as described by Van Dalen (1966) was used in this research. Analysis of covariance was used to compare the adjusted mean scores of the experimental and control groups on the MTAI and the TMM posttests. Pearson product-moment correlations were calculated for relationships between MTAI pretests and TMM gain scores. The TMM pretest and posttest score ranges for both groups were computed and compared. The responses to the first three items in the Open-Ended Questionnaire were individually analyzed and

percentages of responses were computed by categories for both the experimental and control groups. Responses to item four of the Open-Ended Questionnaire are quoted in Appendix E.

Organization of the Study

Chapter I is an orientation to the study. A theoretical rationale for, as well as literature related to, a phenomenological approach in teaching are reviewed in Chapter II. In Chapter III the research procedures, sources of data, and procedures for data treatment are explained. The findings are reported and analyzed in Chapter IV. The summary and conclusions, with implications for teacher education and further research are presented in Chapter V.

CHAPTER II

REVIEW OF THE LITERATURE RELATED TO A PHENOMENOLOGICAL APPROACH IN TEACHING

Before an individual's behavior can be understood, one must have a framework for interpreting behavior. That phenomenological psychology should from such a framework has been debated in the literature (Maslow, 1961; Rogers and Skinner, 1956; Smith, 1950; Snygg, 1941; Snygg and Combs, 1950). It is the point of view of this study that phenomenological theory does provide a framework for teacher education which has as its basic concern the development of a more effective person.

From a phenomenological point of view, to understand the becoming of others, and to use one's self effectively as facilitator of learning, one must understand his own becoming--the factors controlling and limiting the processes of his perceiving and the function of his perceptual field. As stated in Chapter I, five of the basic assumptions underlying this study are: (1) the development of a fully functioning person should be the goal of education; (2) all behavior is a function of the total perceptual

field at the moment of action; (3) each person is continually motivated by the need for greater effectiveness in relating with his world; (4) intellectual and affective behavior cannot be separated; and (5) what a teacher believes about his students will have an important effect upon how he behaves toward them. To assist the reader in the understanding of these basic assumptions, and, therefore, his individual becoming, a theoretical rationale for a phenomenological approach in teaching is presented herein. With the exception of specific documentation, the rationale represents the researcher's synthesis of the central themes of a phenomenological theory of human behavior as postulated by Combs and Snygg (1959) in Individual Behavior, and by Wilhelms (1963) as interpreted by Clark and Beatty (1967) in Evaluation as Feedback and Guide.

Theoretical Rationale of a Phenomenological Approach in Teaching

Phenomenological psychology is a field theory psychology which stresses the important role of the "phenomenal field" or surroundings in which behavior occurs. It is oriented toward the Leibnitzian view of the nature of man's mind, which maintains that man is not a collection of acts, nor simply the locus of acts, but he is the source of acts. The nature of man's mind, therefore, is active, not passive (Allport, 1955).

Phenomenological psychology takes into consideration the learner's motivation, his values, the uniqueness of his perceptions, and the social nature of man. Its basic postulate is that all behavior, without exception, is completely determined by, and pertinent to, the total perceptual field of the behaving organism at the moment of action. Man's basic need, which controls all behavior, is the maintenance and enhancement of the phenomenal self. Stated by Combs (1959), man's basic need "is that great driving, striving force in each of us by which we are continually seeking to make ourselves ever more adequate to cope with life" (p. 46). This need is also referred to as self-adequacy or self-realization (Combs and Snygg, 1959), self-actualization (Maslow, 1962), fully functioning (Rogers, 1961), self-effective (Clark, 1967), or the authentic self (Moustakas, 1966).

The Adequate Personality

It has been postulated that the goal of all behavior is the achievement of personal adequacy, and that man is continaully striving toward that end. Since behavior is a function of perceptions, the adequate personality can be described from the way in which such persons perceive themselves and the world in which they live. An adequate person seems to be characterized by (1) a positive view of self, (2) high identification of self with others,

(3) openness to experience and acceptance, and (4) a rich and available perceptual field.

Phenomenal Field

Perception has been defined by Combs (1959) as "any differentiation the individual is capable of making in his perceptual field whether an objectively observable stimulus is present or not" (p. 31). The phenomenal field includes all of a person's perceptions, including those about himself and those about things quite outside himself, at the moment of action. To each individual, his phenomenal field is reality, the only reality he can directly experience. Each individual invests meanings unique to him in the things about him, and these meanings become the ones to which he uniquely responds.

That part of the phenomenal field which includes all those perceptions which an individual has about his self, in a given situation, irrespective of their importance to him is the phenomenal self (Combs, 1959). People always behave in terms of the total phenomenal field, but since it is always the self which is perceived as behaving, the phenomenal self is the individual's basic frame of reference, in terms of which all else is observed. It is the phenomenal self which each human is always seeking to maintain and enhance. Thus, the more closely related an

experience is perceived to the phenomenal self, the greater will be its effect upon behavior.

To further differentiate the phenomenal field, those perceptions about the self which seem so vital to the individual as to be "he" in all times and in all places are the core of the individual's concept of self.

Several of the known factors which control and limit the processes of perceiving and the function of the perceptual field are: the physical organism; time; opportunity; the effect of need; goals and values; the phenomenal self; and the restriction of the field. Behavior is always a product of a number of these variables operating at any given moment (Combs, 1959).

Differentiation and Behavioral Change

Change in the perceptual field and, hence, change in behavior, occurs through the process of differentiation. Learning, reasoning, problem-solving, remembering, creativity, and forgetting are direct outgrowths of the process of differentiation. A discussion of the differentiation process, as described by Combs and Snygg (1959), may help clarify this concept.

The meaning of any event perceived is a product of the relationship of that item in the phenomenal field to the total ground of which it is a part. This relationship,

and the process by which aspects of the perceptual field are brought into clear figure from ground, is called differentiation.

The process of differentiation, and the levels of awareness, will determine the intensity with which events are experienced in the phenomenal field. Although the perceptual field includes all the universe of which one is aware, one is not aware of all parts with the same degree of clarity at any given moment. Precision of behavior will be a result of precision of figure. Perceptions at low levels of awareness will affect behavior with less precision than those more clearly in figure, but as long as they exist at all in the perceptual field, they will affect behavior. Perceptions, or differentiations, once made are made forever.

Man as a Social Being

Man's basic need for greater effectiveness, as he can best define effectiveness, is explained by his precarious being. He must learn to relate to nature in such a way as to survive and at the same time continually transcend his biological beginnings (Fromm, 1955). Although each man is born with the potential to become involved in a great variety of processes, he develops this potential in the unique way that he chooses. Thus, man is constantly trying out new ways of relating with

his physical and social environment, bringing meanings to his experiences, and constantly testing and judging the results of the relating. This constant process of testing and judging, or evaluation, is the process of making meaning out of experience and is a central part of the learning process, since no one could learn from his experiences unless he received feedback from them and converted it into meaning (Clark, 1967).

No two people see effectiveness the same way, but since all human beings have their humanity in common, they have similar experiences as they mature physically and socially. The presence of similar meanings in the perceptual fields of different persons makes communication possible. From the way each person uniquely knows these similar experiences, each person learns to value certain kinds of relations with his world, always in terms of some form of acceptance (Combs, 1959). Through his interaction with his "significant others," a person comes to see himself much as he perceives them as seeing him (Mead, 1934).

Motivation and Strategies for Becoming

As has been pointed out, man's basic need--the driving power for the process of becoming--is the person's need to be effective. As man learns how he does relate to his world, he also learns how he should or could relate to have a more effective relationship as he uniquely defines

effectiveness. Each individual has a unique and developing concept of adequacy made up of attitudes and goals similar to Havighurst's (1953) developmental tasks. Whenever there is a descrepancy between the perceived self and the concept of adequacy, as defined by the behaver, it must be harmonized. If the self-system perceives its relationship with the world as congruent with its concept of adequacy, the system tries to maintain the relationship. But if the relationship is dissonant, the system must strive to alter the relationship toward greater effectiveness--toward greater harmony. This is the general explanation of human motivation (Clark, 1967).

From the above discussion, it is clear that a person is always motivated, that the motivation is always toward greater adequacy of the phenomenal self, and that the more central to the phenomenal self the discrepancy is, the more meaningful will be its motivational state and its resolution.

Although definitions are unique, each person's self-system is motivated by four motivational states: to <u>maintain</u> relations as they are; to <u>change</u> relations; to <u>explore</u> the discrepancy (curiosity); or to <u>express</u> one's "self" in a relationship which tests the "self" for meaning, as related to the discrepancy. The first two motivational states are aroused when the self is threatened. The

latter two come into effect when the self is not threatened, and can involve the self in many new experiences in which the self can be more richly experienced and more completely understood (Clark, 1967).

Each person builds from his perceptions of the world and his concept of adequacy certain continuing criteria, or strategies for becoming, which enable him to choose activity in patterns. He defines certain satisfactions or activities as appropriate to his self-system and others as inappropriate by two means: (1) by prejudged patterns--those dictated by an external authority, such as a parent, or an internal authority built by his self from his own experiences; and (2) by situational selection, the effectiveness of the relationship determined anew with each experience. This second method allows freedom to discover one's potential for adequacy, and one's values remain relevant.

A person also develops strategies for becoming by deciding upon long range goals and accepting certain roles, which then direct his choices. Each person's activities fit together in a pattern leading to effectiveness, as defined by him, according to his evaluation of his becoming.

New data from the environment can be accepted by the self-system only if they clarify, augment, or change consistently the old meanings in the system (Lecky, 1945).

Consequently, when persons are motivated by the "maintaining state," data which would threaten the defense of the status quo of the self-system is rejected and does not acquire meaning in the self-system.

Restriction of the Phenomenal Field

When attention becomes narrowed to some event being experienced or being anticipated, pleasant or unpleasant, the area of the phenomenal field open to differentiation becomes narrow, and perceptions available for action are confined to this limited area. The narrowing of the phenomenal field when need is strongly affected is called "tunnel vision." Some perceptions are very clearly experienced, but others, which under conditions of less concentrations would be available, are blocked out.

As has been stated, whatever seems to the behaver to be inconsistent with his existing perceptions of self may be experienced by the individual as threat. Whatever seems threatening to the behaver demands attention and produces a degree of tunnel vision in the perceptual field.

A second major factor restricting perception in the phenomenal field is man's need to defend his self when his defenses are threatened. Because of man's basic need, he must resolve dissonance between the perceived self and adequacy, and when the maintaining motivational state is

aroused through threat, his defenses are threatened. But because the phenomenal field is restricted by tunnel vision and defense of self under threat, behavior is apt to be static and unresponsive to change.

The degree of feeling of personal adequacy distinguishes threat and challenge. People feel challenged when confronted by situations in which they feel fairly adequate and see opportunities for testing and enhancing their effectiveness. But they feel threatened when confronted with situations or ideas with which they feel fundamentally inadequate to cope.

The effect of threat has been demonstrated:

> In a series of frustration experiments, Hamilton found that both animal and human subjects under stress often were unable to perceive more than one line of behavior and this they used in rigid fashion despite the fact of its inappropriateness. . . . Other experiments have demonstrated that the experience of threat is accompanied by decreased efficiency and adaptability to a task, by adverse effects on learning and problem-solving, and by perceptual inadequacy (Combs, 1959, p. 171).

Most of the threats experienced in life are social rather than physical--are threats by people rather than by things.

Intellectual Behavior and Affective Behavior

Intelligence, from a perceptional point of view, is a function of the factors which control the richness,

extent, and availability of perceptions in the phenomenal field. Since all the factors stated earlier as greatly influencing perceptions can be changed to some degree, the capacity for intelligent behavior can be created in the degree to which the phenomenal field itself can be changed (Combs, 1959). This new conception which refutes the constancy of intelligence and emphasizes the importance of phenotype development has been researched (Hebb, 1949; Hunt, 1961; Pribram, 1958, 1960).

Every human activity is accompanied by some degree of emotional response (tension). Emotion is a behavioral manifestation of the organism's attempt to satisfy need. It represents the reaction of the organism to the perception of the possibility of need satisfaction (enhancement of self) or the perception of threat (self-maintenance). The behaver's perceptions of his self, of the situations in which he is involved, (including the emotional state), and the interrelationship of these two, are communicated to himself and to others through feelings.

All behaviors are a product of our perceptions, all involve a degree of tension, and all are always a function of the total perceptual field at the moment of behaving. It, therefore, appears that intellectual and affective behaviors cannot be separated. Since perceptions will differ in the degree to which they are related to the

self and, thus, in the degree of emotion, they will differ in the degree of feeling involved; but no behavior can be purely intellectual or emotional (Combs, 1959).

Learning

Learning is the process by which the individual is able to change his behavior. It is an active, goal-directed, and purposeful process which results from the efforts of the individual to satisfy his perceived needs. Its basic characteristic is a progressive differentiation from a more general perceptual field (Combs, 1959).

The degree and direction of learning are determined by the need of the behaver, from his point of view, and the opportunities for differentiation that are available. Although learning can occur in the not-self portions of the field, it cannot occur unrelated to self. Before learning can make a difference in the behavior of the person, perceptions must be differentiated with relationship to his self. This is the explanation for the difference between knowing and behaving (Combs, 1965).

Since man must build his relationship with the world in order to survive and to transcend his biological beginnings, he must learn what he is and what he can become, and he must learn the means by which this can be achieved. The former type of learning is intrinsic, the latter type is instrumental. In the process of becoming, both

intrinsic and instrumental learnings are essential, play into each other in a circular fashion, and must be fostered by both learner and teacher (Clark, 1967).

Intrinsic learnings involve selecting goals and purposes and giving direction to the motivation to survive and find satisfaction. They become the criteria for selecting the instrumental learning to be achieved. They change the internal self-system at the deep level of motivations, perceived self, strategies, of concepts of adequacy. When any of these aspects of the self-system changes in relation to the phenomenal field, the self is different, with different purposes and goals.

Instrumental learning has occurred when, as a result of the "consequences of acting" feeding through the self-system, the system recognizes more or fewer choices of action in the phenomenal field, more skillful ways to perform available actions, or change in the understanding of the consequences of action.

The kind and degree of differentiation which are immediately possible in any situation are determined to a great extent by the character of the existing phenomenal field. The degree of differentiation already attained is always a limiting factor. Since the process of differentiation is quite regular and proceeds step by step, an individual cannot learn any detail for which he is not

ready--for which he does not have the prerequisite learning (Combs, 1959).[1]

Conclusion

It must be emphasized that the aspects of self discussed herein are hypothetical constructs, not physical entities, which facilitate the understanding of human behavior.

In the foregoing discussion, phenomenological psychology postulates that all behavior, without exception, is determined by the total perceptual field at the moment of action. To change behavior, then, the individual's perceptual field must be changed. Of the multiple factors controlling and limiting perception, that of need is viewed as being the most pervasive. The seemingly unlimited number of motives are reduced to a single, all inclusive human need which motivates all human behavior at all times and in all places--the need to maintain or enhance the effectiveness of the phenomenal self. Man is, therefore, deeply and intimately affected by his environment, but capable also of molding and shaping his becoming in important ways.

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[1]For a discussion of other aspects of learning, (from a phenomenological point of view), i.e., memory, reasoning, problem-solving, conception, perception, cognition, synthesizing, and generalization, the reader is referred to Combs and Snygg, 1959.

From a phenomenological point of view, to understand the becoming of others, and to use one's self effectively as facilitator of learning, one must understand his own becoming. Such understanding would reveal that there are not too many ways in which the teacher can affect the becoming of a student. He cannot directly influence the student's perception of self, his concept of adequacy, or his motivational states or strategies. But he can directly influence the richness and availability of the perceptions in the student's perceptual field. Although the student chooses his actions, they can be restricted or facilitated by the teacher.

From a phenomenological point of view, emphasis in relating with people is upon the creation of the kinds of situations which: seek change in behavior through change in perceiving; emphasize an immediate rather than a historical understanding of the causation of behavior; emphasize the role of the teacher as facilitator of learning; emphasize in practice techniques of communication, learning, and exploration and discovery; and emphasize the importance of groups in creating leadership and releasing potential.

As stated in Chapter I, a phenomenological approach in teaching is a student-centered approach based on phenomenological psychology and redefined in Lewinian-group-dynamic theory and Rogerian-nondirective or

client-centered techniques. It, therefore, appears to be a teaching approach relevant to the kinds of emphases deemed important to facilitate the development of greater personal adequacy in the learner.

The remainder of this chapter presents a review of the literature concerned with the teaching methods and techniques pertinent to a phenomenological approach in teaching. Literature concerning the relationship of workshop organizational patterns and attitude change, as well as that assessing the current status of phenomenological approaches in teaching is also presented.

Student-Centered Approaches in Teaching

The concern for learner-centered teaching is not a new one, although each wave of interest has taken a different name (Wispe, 1953). During the middle twenties, largely under Dewey's influence, learner-centered teaching was concerned with the way individuals met and solved problems, the habits they developed in adjusting to their environment, and the implications of these for democratic living. This concern provided an impetus for the discussion method in college teaching. Since educators thought that it was more important to teach students how to think than what to think, and since discussion was felt to encourage reflective deliberation of problems, discussion was deemed important for a democratic society.

In the forties, the learner-centered concept was re-emphasized under the name of student-centered teaching, with its orientation toward pupil-teacher working and planning. Rogerian influence emphasized the "nondirective" terminology. Today, this kind of teaching behavior pattern is known by a variety of terms, such as student-centered, learner-centered, integrative, nondirective, group-centered, or democratic. They have in common a breaking away from the traditional instructor-dominated classroom and an acceptance of greater student participation and responsibility.

Birney and McKeachie (1955) list some of the ways in which a student-centered approach to teaching differs from the traditional instructor-centered approach (p. 53). Table 2.1 contains their summary.

The literature concerning the superiority of one teaching approach over another is vast and characterized by many contradictory and conflicting findings. Excellent surveys of the literature have been presented by McKeachie (1954, 1958, 1960). Gage's (1963) Handbook of Research on Teaching contains valuable reviews, most of which present summaries of findings, discussions or suggestions for improving instruction, and predictions of future trends in research. The Annual Review of Psychology (1958, 1961, 1962) also presents interesting reviews. Anderson (1959)

TABLE 2.1. Dimensions upon which student-centered and instructor-centered methods may differ

Student-Centered	Instructor-Centered
Goals	
Determined by group	Determined by instructor
Emphasis upon affective and attitudinal change	Emphasis upon intellectual changes
Attempts to develop group cohesiveness	No attempt to develop group cohesiveness
Classroom Activities	
Much student participation	Much instructor participation
Student-student interaction	Instructor-student interaction
Instructor accepts erroneous or irrelevant student contributions	Instructor corrects or rejects erroneous or irrelevant student contributions
Group decides own activities	Instructor determines activities
Discussion of students' personal experiences encouraged	Discussion kept on course materials
De-emphasis of tests and grades	Traditional use of tests and grades
Reaction reports	No reaction papers

presents a resume and critical evaluation of forty-nine experimental studies in this area. The studies cited in this review are those which seem to have a significant bearing on the study.

Two of the best known experimental attempts to demonstrate the effectiveness of student-centered teaching are those of Faw (1949) and Asch (1951). Each taught all the groups involved in his experiment. Whereas Faw's student-centered section attended lectures twice a week, and it is assumed were assigned a grade by the instructor based on a final examination, Asch's student-centered section had no lectures, were told that the final examination would not affect their grade in the course, and assigned their own grades. The findings from the two studies do not agree completely. Faw's student-centered group scored significantly higher on the final examination than the instructor-centered group, but perceived the latter approach as more conducive to cognitive gain. Asch's student-centered group scored significantly lower than the instructor-centered group on the final examination, but perceived student-centered instruction as more conducive to cognitive gain. Asch's student-centered group appeared more adjusted than the instructor-centered subjects on the basis of MMPI scores.

Bills (1952) found no difference in achievement between psychology classes taught by lecture-discussion

versus student-centered methods, but did find that the students in the student-centered class were significantly more favorable in their attitude toward psychology. As noted in Chapter III, Stern (1963), in discussing the findings of 34 studies designed to measure the difference between student- and teacher-centered instruction in their effect on either the acquisition of information, changes in attitude, or both, concluded no difference in cognitive gain, and more positive attitudinal gain with nondirective teaching.

The above cited research is representative of the kinds of conflicting and contradictory results of student-centered and instructor-centered research. But while scores on objective final examinations seem to be affected little by teaching method, there are indications that student behavior outside the usual testing situation may be influenced in the direction of educational goals by student-centered teaching.

Bovard (1951) and McKeachie (1951) reported that when the variables of the degree to which the class made decisions about assignments, examinations, and other matters of classroom procedure, as well as the degree to which students were encouraged to interact, were considered, the groups did not differ in achievement as measured by the final examination; but the student-centered groups

reflected much more insight and understanding. Similar findings were reported by Gibb and Gibb (1952). Student-centered subjects were significantly superior to students taught by traditional lecture-discussion methods, in role-playing ability and self-insight, and they rated higher in leadership, likableness, and group membership skills in nonclassroom groups.

Wispe (1951) did an interesting study on the interaction of teaching method and student personality. Instead of trying to control the instructor personality variable by having instructors teach both instructor-centered and student-centered classes, he selected instructors who were rated as permissive or directive. He found no difference in final examination scores between students taught by different methods, and demonstrated that student attitudes toward particular classroom atmospheres were highly selective. Student-centered instruction was preferred by those who reject traditional sources of authority, have strong needs for demonstrating their personal independence, and are characterized by a high drive for academic achievement.

McKeachie (1963) concludes that although findings are conflicting, in general there seem to be no significant differences between student-centered and instructor-centered teaching in achieving lower-order cognitive objectives. When higher-level outcomes are compared--i.e., ability to

apply concepts, attitudes, motivation, and group-membership skills--student-centered approaches seem to be favored.

Hunt (1961) suggests that the contradictory findings in educational and psychological research are due in part to the difficulty encountered when controlling the various factors which are relevant to the outcomes of investigations with human subjects. Teacher enthusiasm for the approach being implemented could be one of these influencing variables. Since innovative methods usually are explored by persons who have a keen interest in them, researchers attempting to function in several roles might have difficulty in developing genuine interest and techniques for each role.

Discussion as a Student-Centered Teaching Technique

Discussion seems to be a method of learning which lends itself to student-centered teaching and small group interaction. The discussion method has no consistent definition, either by its proponents or in the research related to it. Its salient feature is verbal participation on the part of the students. Discussion ranges from a highly unstructured situation in which the instructor is an observer, mediator, or just another group member, to an instructor monologue in which occasional questions are interposed. Varying degrees of student control of class activities are found.

The choice of instructor-dominated or student-centered discussion techniques appears to depend upon one's goals. The more highly outcomes going beyond acquisition of knowledge are valued, the more student-centered the discussion is likely to be (McKeachie, 1963). Therefore, student-centered discussion is more relevant to this review of the literature.

There is experimental evidence that, when the development of concepts or problem-solving skills is the goal, active participation on the part of the learner is more effective than passive listening or observing (McKeachie, 1963). That discussions can promote more active learning than lectures is supported by Bloom (1953) and his colleagues. Tape recordings of classroom activities were played back to groups of college students who were asked to recall what their thoughts had been at the time. Discussion-class students reported more thoughts classified as relating to "self," "other persons," and "problem solving," and fewer thoughts classified as "irrelevant" and "simple comprehension," than students in lecture classes reported. There were no significant differences between lecture and discussion for the thoughts classified as "evaluating and considering meaning" and "attempts to apply material." Krauskopf (1960) employed essentially the same approach in his study and obtained similar results.

McKeachie (1963) discusses the merits of discussion in providing feedback to the learner. If students are to achieve application, critical thinking or some other higher cognitive objective, it would seem that they should practice application and critical thinking and receive feedback on the results. Group discussion provides the opportunity to do this. He says that discussion permits "presentation of a variety of problems enabling a number of people to gain experience in integrating fact, formulating hypotheses, amassing relevant evidence, and evaluating conclusions. . . . students are encouraged to discover solutions for themselves " (p. 1133).

It is known that feedback among or between students can lead to desirable changes in behavior in the same manner as feedback from the class instructor can lead to desirable changes in behavior (Jenkins, 1951). This implies that the structuring of classroom proceedings so that students receive the maximum amount of feedback is desirable. Following this thinking, Herbert Thelen (1949) has proposed that the number of students in a classroom group is of crucial importance in determining group progress. An implication of Thelen's proposal is that the student's "activeness of participation" is a very important factor in learning. He states:

> If one accepts the postulate of an experimental point of view (that one learns by assessing the situation, planning strategy, carrying it out, and appraising the consequences of his actions . . .), then we would submit that vicarious participation does not usually have these dimensions of self-initiation, self-direction and self-evaluation which characterize firsthand self-directive experience.
> . . . . . .
> The size of the group should be the smallest group in which it is possible to have represented at a functional level all socialization and achievement skills required for the particular learning activity at hand (pp. 139, 148).

Phenomenologists believe that providing a non-threatening climate promotes expression of feelings and attitudes which is a step in behavioral change. Discussion could provide the climate for such expression. They further believe that most attitudes that change behavior are developed through interpersonal interactions and stablized, discarded, or modified through one's perception of the attitudes of his significant others. Discussion could promote change in attitudes permitting "significant other" relation to develop, both with other classmates and instructor.

In light of the newer technologies now available and appearing over the horizon, Bush (1967) perceives the role of the teacher as becoming one of interrelating with the learner on an individual or small group basis. But, he states, "Much, if not most, of the current training of teachers is antithetical to effective teaching in small groups. . . . the teacher behaviors needed appear to be

almost exactly the opposite of most of what we are trying even with our experimental programs in teacher training at Stanford . . . " (pp. 248, 250). From his study of teaching in small groups at Stanford, he makes the following observations:

1. An important purpose of small groups is to open wide the channels of communication among its members, on an emotional and social as well as an intellectual level, between pupil and pupil as well as between teacher and pupil.
2. The learner behaviors to be fostered in the small group are: greater responsibility for his own learning; genuine involvement in listening, sharing ideas, probing, approving, arguing, and disagreeing; and active searching for an understanding of himself so as to develop a positive self-concept.
3. The chief characteristic activity in the small group should be discussion--not reading, writing, lecturing, memorizing, or taking examinations. The structure of the learning experiences properly proceeds from the nature of the group and the problems and ideas that emerge from it.
4. The teacher behaviors to be developed are: a nonevaluative acceptance of all contributions;

> sensitivity to the ideas, feelings, and actions of group members; and empathic acceptance of each individual.

McKeachie (1963) concludes that, in general, there are no significant differences between discussion and lecture methods on cognitive gain, but that when there are significant differences in effectiveness between the two methods, the differences favoring discussion usually are on measures other than final examinations testing knowledge.

Combs (1965) summarizes by saying, "Generally speaking, however, various forms of group discussion or individual interaction remain our most valuable means of inducing the exploration and discovery of meaning" (p. 66).

The Importance of Independent Study in Student-Centered Teaching

The role independent study can play in a phenomenological approach in teaching is expressed by Cyphert (1966):

> To shift to the individual the responsibility of his continuing education has often been identified as the ultimate goal for American education. Learning is change in behavior and such change is necessarily personal. . . . Self-pacing, self-discovery, self-appropriation, and self-independence are all central to individual learning to learn. Understanding requires experiencing. . . . Independent study, therefore, . . . is the only learning approach which nurtures self-selection of the relevant, self-execution, and self-evaluation--the student's perceptions must prevail if reality is to exist for him (p. 105).

McKeachie (1963) states that few differences have been found between achievement of students working independently and those taught in conventional classes, and that the expected gains in independence have often failed to materialize. He further states that independent study experiments have varied greatly in the amount of assistance given students and in patterning instructional versus independent periods. Most of the differences in achievement have been in the amount of factual content learned from a particular book, an objective which is not usually the major one in independent study.

Brownell (1966) asserts that much research in evaluation of learning under dissimilar systems of instruction is biased in favor of the conventional instructional method due to the testing of outcomes. In describing one experimental study, as an example of this, he criticizes the use of conventional tests used to measure unconventional teaching and learning:

> . . . it seriously prejudiced the case against the more novel program. That is to say, it was devoted to the content and objectives of the conventional program, and it disregarded certain important content and objectives peculiar to the more recent program. Hence, the achievement of the traditionally taught children was measured precisely with respect to what they had been taught. By contrast, the achievement of the children in the rival program was measured with respect only to what they had been taught in common with their counterparts. They, therefore, had no chance to show what they had learned with regard to those aspects of the subject unique to their program of instruction (p. 268).

Capretta (1966) in his historical review of independent study from its origin in 1900 through 1965, alludes to the ambiguity of definition and essential elements and attributes of the concept: "The term 'independent study' includes tutorials, student-led seminars, colloquia, supervised and nonsupervised reading, library research, and laboratory and field investigations not necessarily related to any particular course" (p. 252).

Bonthius, Davis, and Drushal (1957) state that independent study provides formal opportunity, apart from organized courses, for individual students to pursue scholarly projects under the guidance of faculty advisors.

Alexander (1966) discusses the definition dilemma and concludes that independent study is really more a philosophy of learning and teaching than a single method or procedure. He perceives independent study as a learning activity largely motivated by the learner's own aims to learn, and its rewards largely within its intrinsic value.

In Cyphert's (1966) opinion, the lack of agreement on a definition or on essential attributes of the concept hampers investigation into and communication about independent study, which has resulted in a paucity of studies and studies of questionable design.

That independent study can develop greater integration, increased purposefulness, and more intense motivation

for further study has been demonstrated at the University of Colorado by Gruber and Weitman (1960) and at the University of Michigan by McKeachie, Lin, Forrin, and Teevan (1960). Both of these studies involved a high degree of student-instructor contact.

In a course in physical optics (Gruber and Weitman, 1960) groups of students who attended class independently of the instructor but were free to consult him were superior to students in conventional classes in difficult applications and learning new material, but inferior in facts learned and simple applications. In a retest three months later, the former difference was maintained, while the latter difference disappeared (Weitman and Gruber, 1960). In a class in educational psychology (Gruber and Weitman, 1960) an independent study class meeting once a week with the instructor and twice a week in groups of five or six students without the instructor was equal to a conventional class hearing three lectures a week in mastery of content, but tended to be superior on measures of curiosity.

In the study by McKeachie, Lin, Forrin, and Teevan (1960) students normally met with the instructor in small groups weekly or biweekly, but were free to consult the instructor whenever they wished. The results showed that the experimental students did not learn as much from the textbook as the students taught in conventional lecture and discussion classes, but they did develop stronger

motivation both for course work and for continued learning after the course, as was indicated by the responses on the questionnaire at the end of the semester and by the number of advanced psychology courses later elected.

The paucity of positive results suggests that we need more research on arranging the independent study experience and in measuring the outcomes.

Workshop Patterns and Attitude Change

A question inherent in this study was whether the time element imposed by a two-week workshop pattern would be a delimiting factor in attitudinal change. It was a purpose of this study to determine the degree and direction of attitude change at the termination of the workshop experience. However, it was not a purpose to determine the degree of permanency through a longitudinal study.

There is little research focusing upon attitude change in workshop patterns. However, the writer was able to find some research relevant to this question.

That workshop patterns of teaching are effective in changing attitudes has been documented by Rogers (1961). In his nondirective approach to teaching psychology, he not only achieved attitudinal change through workshop patterns but favored them over the conventional patterns of college courses.

Clos (1966) also documents the effectiveness of the workshop design in changing attitudes. He conducted a study to determine the effect of a mental health workshop experience upon the teacher-learner relationship. Of the seven workshops involved, five extended over a three-week period for a three-hour day, five days a week, and two extended over a semester, meeting each Saturday, and for the same total amount of time. The workshops were on a graduate level, did not require examinations, but did require outside reading in the field of mental health.

The MTAI was given as a pretest, posttest, and nine-month posttest. For all seven workshops, there was a significant positive attitude change beyond the .01 level of confidence. All but one group showed a significant positive attitude change beyond the .01 level of confidence between the pretest mean and the nine-month posttest mean. These findings demonstrated that teacher attitudes changed significantly in a positive direction through taking the workshop, and in general, the positive attitudes held up over a nine-month period.

Shaw, et al. (1952) report similar significant positive attitudinal change as measured by the MTAI in a two-week guidance workshop.

Phenomenological Approaches in Teaching

As pointed out in Chapter I, a number of writers perceive a need for a conceptual framework, or unifying theory upon which to base research in teacher education (Combs, 1965; Denemark and MacDonald, 1967; Goodlad, 1962; Howard, 1963; Smith, 1962; Wattenberg, 1963; Wiles, 1967).

The review of literature in this chapter seems to reveal a lack of research based upon a relevant psychological-philosophical framework evolving from social needs and purposes, and understandings about human behavior and learning. Thus, within student-centered teaching there is evidence of varying degrees of structure imposed by such techniques as lecture, teacher determined requirements, teacher selected materials and learning experiences, and competitive examinations and grades.

Wallen and Travers (1963) state that in the past, teaching methods have lacked a conceptual framework, because it is only within the last few years that scientific knowledge in both ethics and the psychology of learning has reached a point which might provide a solid foundation needed for a rational construction of teaching methods. These authors suggest that most patterns of teaching behavior have derived:

1. from teaching traditions (teaching as he was taught);
2. from social learnings in the teacher's background (reinforcing middle-class values);
3. from philosophical traditions (Froebel or Rousseau tradition);
4. by the teacher's own needs (lecturing to satisfy a need for self-assertiveness);
5. by conditions existing in the school and community (demanding highly disciplined behavior because it is required by the principal); and
6. from scientific research on learning.

It is the point of view underlying this study that phenomenological psychology does provide an appropriate base for the rational construction of a unifying theory of teaching--namely, a phenomenological approach in teaching in teacher education.

There is a lack of experimental studies relating to a phenomenological approach in teaching in the literature. There are a few descriptive studies and a number of philosophical discussions. Although the "self" concept came into psychological literature in the late nineteenth century, largely through William James, rising interest in the concept was not shown until the 1940's (Wylie, 1961).

One of the earliest references to a phenomenological approach "in teaching" appears to be in a paper by Rogers (1942), in which he tried to crystallize into a distinctive point of view some of the things he had learned through the psychotherapeutic treatment of clients. His nondirective counseling laid the groundwork for a new orientation toward teaching, which emphasized the integrity of the learner as the initiating agent responsible in every sense for his own destiny (Rogers, 1953). He stresses the centrality of the "helping relationship," speculating that through maximizing conditions of psychological safety and freedom, we maximize the likelihood of an emergence of constructive creativity and learning. He suggests that psychological safety may be established through a relationship in which (1) the individual is accepted as of unconditioned worth; (2) the individual is accepted without external judgment; and (3) the individual is understood empathically. This concept is supported by research which has investigated certain of its aspects (Baldwin, 1945; Betz and Whitehorn, 1956; Dittes, 1957; Fiedler, 1953; Seeman, 1954).

As Rogers says:

> If I can provide a certain type of relationship, the other person will discover within himself the capacity to use that relationship for growth, and change and personal development will occur (1961, p. 33).

Kellough (1968) points to a need for the utilization in the classroom of our understandings of the nature

of personal meanings and human behavior: "If perceptions become the focus, and the development of self-actualizing people our goal in education, then the student will learn those concepts that he feels are important to him" (p. 48). He recommends the technique of "situational case studies" to bridge the gap between theory and reality in teacher education and supervision.

> . . . teachers must be concerned with effective ways of helping others modify and improve their perceptions. . . . A method has been developed that does help people relate well with others, that presents situational cases, . . . to challenge the thinking and feeling of those capable of identifying with some aspect of the situation depicted (p. 49).

From a phenomenological point of view, the group is provided maximum opportunity to make choices and decisions; to define goals; to interact; to raise questions about anything; to explore the self-other relationship; to analyze and criticize; to contribute to and be involved in their own education; and to participate in self-evaluation. The importance of people rather than things is emphasized.

Will (1967), in discussing the education of the teacher as a person, says that the development of the prospective teacher as a person is an essential responsibility of any teacher education program. If teacher education is to help prospective teachers develop responsibility for their own personal growth and the qualities that emerge from and lead to meaningful encounters with others,

experiences in this area must be provided. He calls for a shift in emphasis:

> . . . from a curriculum characterized by prescription to one characterized by self-discovery, from a curriculum characterized by reliance on external responsibility for growth to one characterized by personal responsibility for growth, and from a curriculum characterized by talking about ideas, values, and qualities to one characterized by the discovery and development of ideas, values, and qualities through personal involvement in real and open relationships and experiences. The teacher education program must become a genuine dialogue between the prospective teacher and the significant experiences and significant others he may encounter throughout the program (p. 474).

Melby (1967), in his paper, "The Contagion of Liberal Education," submitted to the Symposium on Teaching Teachers to Provide Liberal Education, says:

> The all important challenge in the preparation of the teacher is to humanize him. . . . As teacher educators we must see both our students and ourselves as artists. This means that our success depends on what we individually become. . . . But essentially a university or college that is educating teachers faces the task of creating a climate that humanizes both professors and students.
> . . . The teacher's first human quality is compassion. Compassion means involvement (p. 136).

Ryan and Muro (1968) implemented a humanistic approach in teaching an educational psychology course. The student was viewed as being capable of decision making and concerned for his own educational growth. Formal lecture procedures were replaced with group methods designed to create a climate of acceptance, understanding, and respect for the student's views. The three objectives of the experiment were:

1. to involve students in the learning process through group interaction;
2. to present problems in learning as human situations which demand a sensitivity to other persons; and
3. to approach learning through utilization of situational topics which would present problematic application of educational psychology in real cases.

The class operated on a relatively unstructured basis. Student perceptions of educative problems were a focal point for class discussion. A key focus was to discuss and interact with ideas as they had personal meaning for the student. Hopefully, this provided the student with opportunity to discover that learning can occur when man is involved, interested, and committed to examining issues as they relate to his personal growth. After a postsession evaluation, Ryan and Muro concluded that this approach had promoted:

1. greater understanding of human behavior, as verbalized by the students;
2. spontaneous group discussion and the development of group cohesiveness;
3. higher quality writing and topical selection of term papers, as compared to their fall instructor assigned term papers; and
4. numerous student initiated and developed practical research projects.

Moustakas' (1956) research is concerned with the "authentic self" in the "authentic teacher-learner relationship." In an inservice teacher education program aimed at fostering teacher sensitivity and awareness to the personal factors in learning and teaching, he pursued the hypothesis that the most effective learning occurs in educational situations in which threat to the learner's self is minimal. To him, the desirable interpersonal relationship was one:

> . . . where there was freedom of expression within the limits of the classroom, where each person could state himself in terms of himself without fear of criticism or condemnation, where feelings were expressed and explored, where ideas and creative thinking were treasured, and where growth of self was the most important value (p. 259).

In a report of this work, which is clinical, anecdotal, and observational rather than experimental, Moustakas narrated the ways in which the teachers he observed implemented the ideas of the authentic relationship. Through illustrations of significant interpersonal relations in the classroom, he indicated the kinds of teacher behavior that facilitated positive mental health, which he deemed necessary for significant learning and positive growth.

In his study there were 92 elementary and secondary school teachers from a variety of school systems, who met in small groups with other teachers, principals, and counselors, for a period of one year, to discuss their

experiences in the classroom and in the community. Each teacher was also enrolled in an extension course on interpersonal relations which met three hours a week over the academic year. Each school system had the services of a visiting teacher and a psychologist for consultation.

Every teacher developed his own way to implement the "authentic relationship" approach in his teaching. But for a number of weeks prior to attempting their approaches, the teachers studied and discussed the theory and principles of individual psychology and creative teaching. They explored problems in their interpersonal relations and became more sensitive and accepting of each other. Each teacher kept careful notes and/or made tape recordings over the year of the interpersonal relations within his classroom.

They came to believe that children grow through creative, spontaneous experiences which have personal meaning and value. They provided opportunities and resources to make these experiences possible within the classroom. And their work showed movement in the direction of healthier, happier, and more authentic interpersonal interacting between the teacher and the child.

Ten years later, Moustakas (1966) expanded his search into the sources of mental health within the individual, within the home, and within the school that contribute to the evolution of genuine selfhood and

authentic relatedness. The illustrations of the significant interpersonal relations in the classroom discussed in his original report cited above, and a few additional ones, were viewed from a new set of principles, concepts, and values, among which were freedom; choice and the capacity to choose; and responsibility.

He found that "When authenticity and love are combined with freedom to make choices, and be responsible for them, real life emerges, and the teacher relates with children, whether in conflict or harmony, on a meaningful, human basis" (p. vii).

Tenenbaum (1959) describes, from a participant's viewpoint, a four week course taught by Carl Rogers (Brandeis University) using a nondirective technique. It was characterized by being completely unstructured, with the students responsible for their own learning, including their own evaluations and grade. The instructor acted as facilitator and resource person and provided an atmosphere of acceptance and trust. Tenenbaum recalls that out of frustration and chaos, developed group cohesiveness. Of this experience, Rogers (1961) states, "I would without doubt class it as among the most satisfying of my attempts to facilitate learning in courses or workshops" (p. 298). Tenenbaum says of this common experience:

> Its importance , I believe, goes beyond the classroom and extends to every area where human beings communicate and try to live with one another.

> . . . It seems to me this approach ought to be tried out in every area of learning--elementary, high school, college, wherever human beings gather to learn and improve on the old (p. 307).

Tenebaum (1961), in writing about his own teaching experience implementing a similar phenomenological approach in teaching a two week course in psychology, spoke of the release of the person; the exhilaration and excitement; the warmth, mystery, and personal closeness; the group cohesiveness; and the radical and fundamental change in their person--in outlook, values, feelings, and attitudes toward themselves and toward others. The students' oral and written self-reports corroborated his observations.

Moon (1966) describes his experience with implementing a phenomenological approach in teaching a course in beginning poetry in college. He felt that the students got a real enthusiasm and feel for the subject, and that some seemed to have been reached on the level of the authentic self, with its real needs and real responses. For him, he had come to believe the truest and deepest teaching to be one of the teacher's authentic response to the authentic self of the student, and the truest learning to be that of the student's authentic response to the teacher's authentic self.

In The Professional Education of Teachers: A Perceptual View of Teacher Preparation, Combs (1965) suggests a "self as instrument" approach in teacher

education based upon phenomenological psychology. His conceptual framework is discussed in Chapter I of this study, and defines the conceptual framework of this research.

In general, research involving the implementing of a phenomenological approach in teaching in teacher education courses is not prevalent, which would seem to indicate a need for exploration in this area.

Summary

The purpose of Chapter II was to present a theoretical rationale for, as well as literature related to, a phenomenological approach in teaching. Literature concerning the relationship of workshop organizational patterns and attitudinal change was also presented.

The central themes of a phenomenological theory of human behavior that were discussed were the adequate personality, the phenomenal field, differentiation and behavioral change, man as a social being, motivation and strategies of becoming, restriction of the phenomenal field, intellectual behavior and affective behavior, and learning.

Literature concerned with student-centered teaching approaches, discussion as a student-centered teaching technique, the importance of independent study

in student-centered teaching, and phenomenological approaches in teaching was presented.

Although findings are conflicting, the literature seems to point to no significant difference in cognitive gain regardless of teaching method, technique, or patterns of organization. Student-centered teaching approaches, independent study, and discussion methods seem to support greater positive attitudinal gain when compared with more instructor-centered teaching procedures. The literature available concerning workshop organization patterns and attitude change seems to support significant positive attitudinal gain when attitude change is the educational objective.

There is a lack of experimental studies utilizing a phenomenological approach in teaching. The experimental, descriptive, and philosophical research reviewed seems to emphasize the centrality of the "helping relationship" in teaching and the importance, therefore, of the teacher's attitude toward the student and toward the student-teacher relationship, when the objective is to facilitate the development of a fully functioning person.

CHAPTER III

RESEARCH PROCEDURES AND SOURCES OF DATA

Identification of the Population

The experimental subjects were 69 students enrolled in a two-week workshop in modern mathematics at Central Michigan University, Mount Pleasant, Michigan, during August, 1968. Of the original 69 students, 7 did not complete one or both of the posttests, leaving 62 included in the final data.

The control subjects were 33 students enrolled in a concurrent two-week workshop in modern mathematics at Michigan State University, East Lansing, Michigan. Of the original 33 students, 1 did not complete the posttest, thereby leaving an N of 32.

The tables on the following page summarize pertinent data for both groups, as derived from the Personal Data Sheets.

Consideration of the data in Tables 3.1 and 3.2 lead to the following general conclusions regarding the experimental and control groups:

TABLE 3.1. Description of subjects by sex, college level, and experience

Group	Male #	Male %	Female #	Female %	Graduate #	Graduate %	Undergraduate #	Undergraduate %	Experienced #	Experienced %	Not Experienced #	Not Experienced %
Experimental	15	24	47	76	32	52	30	48	30	48	32	52
Control	6	19	26	81	31	97	1	3	31	97	1	3

TABLE 3.2. Number of previous mathematics courses completed, mean age, and mean years of teaching experience

Group	Previous Math Courses: None #	None %	One #	One %	Over One #	Over One %	Age Years	Experience Years
Experimental	13	21	18	29	31	50	30	3
Control	5	15	13	41	14	44	35	6

1. The experimental N was about twice that of the control N. This factor is discussed further under Identification of the Personnel.
2. The experimental group contained about half graduates and undergraduates, whereas, the control group consisted of 97% graduate students.
3. About half of the experimental group were experienced teachers as compared to 97% in the control group.
4. The mean age and mean number of years of teaching experience were higher for the control group.
5. The sex ratios were about equal for both the experimental and control groups.
6. The number of previous mathematics courses completed was approximately the same for both the experimental and control groups.

The variance between the experimental and control groups resulted from the method used in selecting the populations. The study was concerned with analyzing the effectiveness of a phenomenological approach in teaching a course in teacher education. Factors influencing the selection of the experimental and control groups were: the availability of qualified instructors who were willing to cooperate with the requirements of the study; and, the availability of concurrent courses, in a common subject

area, of equal duration, and carrying equal credit. Homogeniety of the experimental and control groups by randomization was not a delimiting requirement, since lack of similarity between the two groups could be eliminated statistically by the analysis of covariance. Therefore, intact class groups were selected.

Identification of the Personnel

The instructors of both the experimental and the control groups were associate professors in elementary education, with experience in conducting educational research and in teaching workshops in modern mathematics. The nature of the experimental approach required that the instructor have a commitment to a phenomenological view of human learning and behavior. The participation of the researcher as an assistant to the instructor in the experimental group maintained an equivalent student-teacher ratio.

Instrumentation and Data Collection

Four instruments were used in this study:

1. Personal Data Sheet
2. Minnesota Teacher Attitude Inventory, Form A (MTAI)
3. Test on Modern Mathematics, Form A (TMM)
4. Open-Ended Questionnaire

The Personal Data Sheet was completed by each class member of both the experimental and control groups at the

beginning of the first day of the workshop. The MTAI and the TMM were given to both groups as pre- and posttests. The Open-Ended Questionnaire was a posttest only for both groups. Copies of each instrument are found in the Appendices.

The Personal Data Sheet

A Personal Data Sheet obtained data with respect to selected demographic factors from all members of both the experimental and control groups.

The Minnesota Teacher Attitude Inventory

A phenomenological approach in teaching is a learner-centered approach which emphasizes the learner's "becoming." It is, therefore, concerned with the learner's affective as well as cognitive growth.

One of the purposes of this study was to evaluate the effectiveness of a phenomenological approach in teaching in effecting attitudinal change in the learner. In Gage's (1963) Handbook of Research on Teaching, Stern classifies the results of 34 studies (for the period 1943-57) designed explicitly to measure the differences between student- and teacher-centered instruction in their effect on either the acquisition of information, changes in attitude, or both. Nineteen studies showed a positive attitudinal gain and fifteen studies showed no attitudinal

gain. Stern concluded that the results of studies involving attitudinal change generally have indicated that nondirective instruction facilitates a shift toward more acceptance of self and others.

The writer attempted to develop an instrument to measure a person's attitude toward the learner and the student-teacher relationship. It was felt that one of the more important results of implementing a phenomenological approach in teaching would be a change in the learner's attitudes about human behavior and learning. The predicted and desirable direction of attitude change would be toward a more humanistic- or person-centered rather than an instructor- or subject-centered point of view.

After considerable effort to construct an original instrument to measure such attitudinal change, it became apparent to the writer that the Minnesota Teacher Attitude Inventory was an appropriate as well as a reliable and validated instrument for this purpose. In the manual, the authors discuss the experimental background of the inventory, and they state that the reliability of the instrument (Spearman-Brown split-half procedure) is .89. The test has a validity coefficient of .60. Both reliability and validity appear to be acceptable (Cook, Leeds, and Callis, 1951).

The MTAI is an instrument designed to determine the extent to which a teacher holds those attitudes which make

for a warm, permissive classroom atmosphere. The authors assume that the higher the score of an individual, the greater the probability that he will conduct a democratic classroom. They state:

> . . . a teacher ranking at the high end of the scale should be able to maintain a state of harmonious relations with his pupils characterized by mutual affection and sympathetic understanding. . . . The teacher and pupils should work together in a social atmosphere of cooperative endeavor, of intense interest in the work of the day, and with a feeling of security growing from a permissive atmosphere of freedom to think, act and speak one's mind with mutual respect for the feelings, rights and abilities of others. . . . Group solidarity resulting from common goals, common understandings, common efforts, common difficulties, and common achievements should characterize the class.
> . . . The teacher tends to think in terms of . . . what the pupil needs, feels, knows, and can do (Cook, Leeds, and Callis, 1951, p. 3).

Stern (1963) states that the most extensive research on teacher attitudes has involved the differences between teacher- and pupil-centered orientations to teaching, and that the MTAI is an instrument devised to measure these dimensions. In reviewing the instrument, Cronbach (1953) states of the MTAI, "The authors wisely seek to predict a particular aspect of the teaching job, success in establishing rapport with children, rather than a nebulous global criterion. . . . There is a clear correspondence between inventory scores and teaching behavior at the time the test is given" (p. 798). Cook and Medley (1955) studied the relationship between the MTAI and the K scale of the Minnesota Multiphasic Personality Inventory.

Since an elevated K score was designed to represent a generalized "set" to mark items in a socially acceptable way more often than the average person does, the finding that teachers scoring high on the MTAI tend to have extremely high K scores, while those scoring low tend to have K scores near the mean of normal adults, led the investigators to argue that no matter what the reason for this high relationship, "There can be no question of the validity of the MTAI which was developed and evaluated by strictly empirical methods" (p. 516).

Since a phenomenological approach in teaching is a learner-centered approach, the MTAI should measure a person's propensity for a phenomenological approach in teaching.

A search of the literature reveals that the MTAI has been used extensively in attitudinal studies (Beamer and Ledbetter, 1957; Campbell, 1967; Clos, 1966; Horn and Morrison, 1965; Jean and Deignan, 1968; Ofchus and Gnagey, 1963; Teigland, 1966; Wilk and Cook, 1963).[1]

The Test on Modern Mathematics

Critics of student-centered instruction often claim that the amount of cognitive gain is less than in

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[1]For further discussion of the MTAI and studies using it, the reader is referred to Gage's Handbook of Research on Teaching, 1963.

instructor-centered teaching. Of the 34 studies cited by Stern (1963) earlier in this chapter, 27 showed no difference in cognitive gain, 5 showed a negative cognitive gain for the nondirective instruction, and 2 a positive cognitive gain for the nondirective instruction. However, Stern criticized the methodology of the latter 7 studies, and concludes that the amount of cognitive gain is largely unaffected by the autocratic or democratic tendencies of the instructor.

In light of the conflicting findings concerning the effect of student-centered teaching on cognitive gain, one of the purposes of this study was to measure the learner's academic achievement, as measured by an objective test.

A search of the literature reveals a paucity of published tests on modern mathematics content for teachers and no standardized tests. Permission was granted by the authors to use the Test on Modern Mathematics by Riedesel and Suydam (1967). The authors of the test describe its 50 items as being divided into three classifications: knowledge (30%), understanding (32%), and application (38%). A reliability of .82 (Kuder-Richardson, Formula 20) was reported (p. 28). This test was used as the pretest and posttest for the mathematics content.

Open-Ended Questionnaire

Both groups were asked to complete a four-item Open-Ended Questionnaire at the end of the workshop, consisting of the following:

1. Compare your attitude about modern math now with your attitude about it at the beginning of the workshop.
2. What influence, it any, will this workshop have on your teaching?
3. In light of your personal goals, do you feel that you learned enough "math content" in the workshop? Please explain.
4. Please add any other comments you wish to make.

To facilitate validity of responses to the questionnaire items, anonymity was assured.

Answers to these open-ended items should give insight into the kinds of experiences afforded by the workshop as perceived by the participants.

Treatment of Subjects

Each workshop met for a period of 2 weeks, 5 days a week, for a minimum of 3 hours each day. The workshops met concurrently on two separate campuses, were conducted by qualified, competent instructors (see Identification of the Personnel in this chapter), and carried equal credit. Both groups had access to an instructional materials center

and a university library. The two texts used in the control group were recommended in the experimental group as being books with which the students might like to become involved.

This research followed the Nonrandomized Control-group Pretest-Posttest Design as described by Van Dalen (1966). The MTAI (Form A) and the TMM (Form A) were used for both pre- and posttests. These two instruments and the Personal Data Sheet were administered to both groups during the first class session. To minimize distortion of attitudes, the MTAI was administered prior to the TMM and the students were not told that a content test was to be administered. Since having to complete a subject matter content test could heighten the anxiety level of some respondents, it was felt that this precaution would lessen contamination. The Open-Ended Questionnaire, the MTAI, and the TMM posttests were administered to both groups during the tenth class session, and in that order.

To minimize the reactive effect of experimental procedures, neither the experimental nor the control group was informed at any time that they were a part of a research experiment, or that posttests would be administered. Data were gathered for both groups by the instructors as a normal part of the instructional program. The instructors emphasized that the testing would not be used for judgmental or marking purposes. To further control internal

validity of the design, the control group instructor was not informed of the experimental treatment. The conditions common to both groups as described in this section further minimized the effect of extraneous variables.

It was not necessary to provide for makeup pre- and posttest data collection, since only data collected under the controlled conditions as described herein were included in the final data analysis.

Treatment of the Control Group

Information concerning the control group instruction was obtained through interviews with the control group instructor and through a description of the workshop activities as written by him. His outline was developed through student-teacher planning and is reproduced here:

Elementary Mathematics Workshop--Control Group

Monday:	A Balanced Mathematics Curriculum; Providing for Individual Differences
Tuesday:	Behavioral Objectives for Elementary Mathematics
Wednesday:	Identifying and Classifying Teaching Strategies
Thursday:	Evaluation
Friday:	Verbal Problem-Solving

Monday: Computer Assisted Instruction

Tuesday: Research in Elementary Mathematics Education

Wednesday: Instructional Materials; Structured Materials

Thursday: Textbook Selection; Materials Selection; Geometry in the Elementary Mathematics Program

Friday: Probability and Statistics

Three films on teaching and one film on computer assisted instruction were used. The following two textbooks were used: Today's Mathematics, A Guide to Concepts and Methods in Elementary School Mathematics, James W. Heddens (1964). Guiding Discovery in Elementary School Mathematics, C. Alan Riedesel (1968).

The following is a summary of the salient features of the instructional procedures of the control group, as described by the instructor through personal interviews:

1. Total group lecture-discussion, instructor initiated and led. Class discussion centered around the topical areas of the day, assigned readings, and the special concerns and interests of the class members concerning certain aspects of modern mathematics.
2. Instructor and instructor-total group determined goals, objectives, and requirements. Topics to be studied by the group were determined through instructor-total group planning.

3. Instructor and instructor-total group selection of learning procedures and materials. The texts and films were selected by the instructor. Individuals developed a project (teaching aid) of their own choosing.
4. Instructor evaluation of the learner's growth and instructor determined and assigned grade. No final examination was administered.
5. Emphasis upon total group-instructor learner interaction. The instructor was available for small group and/or individual student interaction if requested.

Treatment of the Experimental Group

The phenomenological approach in teaching which comprised the experimental treatment in this study was a conceptual framework based upon phenomenological psychology. Its basic organizing principles were (1) providing information, (2) providing for involvement, and (3) providing for personal exploration and discovery. Its operational principles were: (1) permit the movement of students at different speeds, (2) provide content and experience in response to student needs, (3) provide simultaneous, rather than sequential, experiences for the learner, and (4) place much more responsibility upon the student himself.

This approach was implemented in the experimental group through eight teaching strategies which were evolved from the conceptual framework and are described in the following paragraphs:

1. Small group and/or independent study. Each workshop member affiliated with a small group formed around a common area of interest and/or he worked independently. Grouping, regrouping, and interest areas were determined by the learner--as an individual, or as a small group decision.
2. Self-determined goals, objectives, and requirements. Each workshop member developed his own objectives and determined his own requirements for his learning, changing both as his learning demanded.
3. Self-evaluation and self-determined- and assigned grade. Each workshop member evaluated his own needs and goals, and his personal growth in light of these needs and goals. To aid the student in his awareing, and to aid the instructors in providing meaningful feedback, each workshop member wrote two self-evaluations, collected on the fifth and tenth days. Their self-determined- and assigned grade was submitted to and honored by the instructors prior to the posttesting.

4. Self-selection of learning procedures and materials. The structure of the learning experiences proceeded from the nature of the small groups and the problems and ideas that emerged from them, or from the goals, needs, and interests of the individual. Although no common textbook was required, Today's Mathematics, James Heddens (1964), and Guiding Discovery in Elementary School Mathematics, C. Alan Riedesel (1968), were suggested.
5. Self-paced learning. Workshop members self-paced their learning, determining the quality and quantity of content to be learned and when and where to learn it. Attendance of daily class sessions was optional for each student.
6. Instructor-learner interaction on an individual and/or small group basis. These interactions were instructor and/or learner initiated, in an informal or office setting, as determined by the learner. Coffee conferences were encouraged.
7. Instructors' roles that of facilitators and resource persons. The instructors' behaviors were those of nonevaluative acceptance of all student contributions, sensitivity to the ideas, feelings, and actions of the individual and the group, and empathic acceptance of each individual. These

behaviors plus the beliefs that significant learning must be self-discovered and self-appropriated, and faith in the learner to be responsible for his own learning, set the tone for the learning atmosphere of the experimental workshop experience. The instructors provided reprints, journals, books, and research materials to supplement other resources.

8. Student initiated and led discussion. The emphasis was upon small group student initiated and led discussion. The instructors participated upon invitation. Through student-instructor planning, opportunity for large group discussion for those who wished to participate was provided. The instructors did not lecture.

Procedures for Treatment of Data

Subjective data yielded by the final Open-Ended Questionnaire were individually analyzed, then categorized for each of the two groups as follows:

Item One: Compare your attitude about modern mathematics now with your attitude about it at the beginning of the workshop.

Categories of answers for this item were:

1. attitude toward modern mathematics remained constant
2. attitude toward modern mathematics became more favorable
3. attitude toward modern mathematics became less favorable

The percentages of responses for each of the above categories in the experimental group were compared to those of the control group.

Item Two: What influence, if any, will this workshop have upon your teaching?

Categories of answers for this question were:

1. no influence
2. student-centered change
3. subject-centered change

The percentages of responses for each of the above categories in the experimental group were compared to those of the control group.

Item Three: In light of your personal goals, do you feel that you learned enough "mathematics content" in the workshop? Please explain.

Responses to this question were dichotomized into:

1. did learn enough mathematics content
2. did not learn enough mathematics content

Percentages of responses for each group were recorded and compared.

Item Four: Please add any other comments you wish to make.

The responses to this item were considered. They were reproduced and are included in Appendix E of this study.

The TMM and the MTAI were given as pretest and posttest to both groups. Reliability of the test-retest mean scores for each group were compared and the mathematics test yielded a correlation coefficient of .78, while the reliability measure for the MTAI was .66. Both levels appear to be satisfactory for further statistical comparison by analysis of covariance.

Tables 3.1 and 3.2 of this chapter reveal group variance between the two populations. Thus, to be able to compare the mean test scores of the experimental and control groups, a statistical procedure which nullifies group variance was required. Analysis of covariance seemed to be the most appropriate statistical treatment for this purpose.

Van Dalen and Meyer (1966) state:

> Because of the difficulties that arise when matching procedures are employed, educators are grateful for the development of procedures that enable them to control variation in the experimental and control groups through an analysis of covariance. This statistical tool enables

> an E to adjust the T_2 mean scores to compensate for a lack of original equivalency between groups that is discovered when T_1 is given or arises during the experiment (p. 259).

Thus, an analysis of covariance was used to determine at the .01 level of confidence the significance of the difference between the adjusted posttest means of the two groups with respect to their scores on the mathematics test and attitude inventory.

Pearson product-moment correlations were calculated for relationships between the MTAI pretest scores and the TMM gain scores for both the experimental and control groups. The MTAI pretest means and the TMM gain score means for the graduate and undergraduate subgroups in the experimental group were compared. A scatterplot was made of the control group MTAI pretest scores and their TMM gain scores to determine the possibility of a nonlinear relationship between the two sets of data. TMM ranges of scores for the experimental and control groups were compared.

Summary

Procedures utilized in the development of this study are presented in this chapter. A description of the instruments used and the methods of data analysis are also included.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

This chapter presents a statistical analysis of the scores on the two objective instruments, the MTAI and the TMM, for the experimental and control groups, and an analysis of the subjective responses to the four items on the Open-Ended Questionnaire which was given to both groups as a "posttest." A summary of the analysis of data collected for the study concludes the chapter.

Statistical Analysis of the Relationships

An analysis of covariance was used to determine, at the .01 level of confidence with 1,90 df, the significance of the difference between the adjusted posttest means of the experimental and control groups with respect to their scores on the MTAI and the TMM. An MTAI test-retest reliability coefficient of .66 and a test-retest reliability coefficient of .78 on the TMM established satisfactory linear relationship beyond the .01 level of confidence. Therefore, the analysis of covariance was an appropriate statistic to use.

Data pertinent to the experimental and control groups are summarized in Tables 4.1 and 4.2.

TABLE 4.1. MTAI mean and gain scores for the experimental and control groups

Group	N	Pretest $\bar{X}$	Posttest Adj. $\bar{X}$	*Average $\bar{X}$ Gain
Experimental	62	46.23	78.4	30.84
Control	32	53.34	54.3	8.9

*Based upon raw pretest and posttest scores.

TABLE 4.2. TMM means and gain scores for the experimental and control groups

Group	N	Pretest $\bar{X}$	Posttest Adj. $\bar{X}$	*Average $\bar{X}$ Gain
Experimental	62	21.24	29.51	6.89
Control	32	26.59	27.53	4.47

*Based upon raw pretest and posttest scores.

The comparison of the experimental group and the control group was made to test the following null hypotheses that no significant differences existed between the two populations on the stated criteria.

Hypothesis I. H_o There is no difference between the experimental group and the control group in attitudes as measured by the MTAI.

The effects of the teaching approach on attitudes toward the student and toward the student-teacher relationship were measured by the MTAI posttest adjusted means for the experimental and control groups. An analysis of covariance of the posttest difference between the adjusted means of the two groups showed significance at greater than the .01 level of confidence. The null hypothesis of no difference was rejected. The data of this analysis are presented in Table 4.3.

TABLE 4.3. Analysis of covariance of the MTAI posttest difference between adjusted means for the experimental and control groups

Group	N	A.M.	D.F.	M.S.	F
Experimental	62	78.4	1,90	12388.28	34.50*
Control	32	54.3			

*$p > .0005$.

Hypothesis II. H_o There is no difference between the experimental group and the control group in modern mathematics achievement as measured by the TMM.

The effects of the teaching approach on the mathematics achievement were measured by the TMM posttest adjusted means for the experimental and control groups.

An analysis of covariance of the posttest difference between the adjusted means of the two groups showed no significance at the .01 level of confidence. The null hypothesis of no difference was not rejected. The data of this analysis are presented in Table 4.4.

TABLE 4.4. Analysis of covariance of the TMM posttest difference between adjusted means for the experimental and control groups

Group	N	A.M.	D.F.	M.S.	F
Experimental	62	29.51	1,90	78.15	2.47*
Control	32	27.53			

*p > .120.

Hypothesis III. H_o There is no relationship between the pretest MTAI scores and the gain scores in mathematics for the experimental group.

Hypothesis IV. H_o There is no relationship between the pretest MTAI scores and the gain scores in mathematics for the control group.

The relationship between the attitudes of teachers toward the learner and the student-teacher relationship

prior to the workshop experience, and the mathematics gain during the workshop experience, was determined by the MTAI pretest scores and the TMM gain scores for the experimental and control groups.

The Pearson product-moment correlation coefficient between the MTAI pretest scores and the TMM gain scores showed significance greater than the .05 level of confidence for the experimental group, but did not show significance at the .05 level of confidence for the control group. An $r = \pm.211$ or better (60 df) and an $r = \pm.296$ or better (30 df) was needed to establish significance at the .05 level of confidence for the experimental and control groups, respectively. Therefore, the null hypothesis of no relationship was rejected for the experimental group and was not rejected for the control group. The data of these analyses are presented in Table 4.5.

TABLE 4.5. The relationship of the MTAI pretest scores and the TMM gain scores

Group	N	df	r
Experimental	62	60	.248*
Control	32	30	.079**

*p > .05.

**p < .05.

The MTAI pretest scores and the TMM gain scores for the graduate and undergraduate subgroups of the

experimental group were compared to determine if the subgroups differed from each other and, thus, from the total experimental group in the relationship between these two sets of data. The MTAI pretest means and the TMM gain score means for these two subgroups did not differ. Therefore, it was concluded that the relationship between the MTAI pretest scores and the TMM gain scores for the graduate and undergraduate subgroups of the experimental group was the same as that existing between these two sets of data in the total experimental group.

A scatterplot of the MTAI pretest scores and the TMM gain scores for the control group did not suggest a nonlinear relationship between the two sets of data.

Test on Modern Mathematics Range of Scores

The range of scores on the TMM posttest was greater for the experimental group than for the control group, whereas the range of scores on the TMM pretest was greater for the control group. These data are presented in Table 4.6.

TABLE 4.6. Range of TMM scores

Group	Pretest Limits	Pretest Range	Posttest Limits	Posttest Range
Experimental	7-41	34	11-49	38
Control	8-46	38	18-47	29

Analysis of Open-Ended Questionnaire Responses

Since phenomenological psychology postulates that all behavior is a function of the individual's unique perceptual field, it would seem that the way to examine the meaningfulness, to the individual, of the experiences permitted in a workshop would be through analysis of the expressed perceptions of the learner. Therefore, the individual responses to the first three items in the Open-Ended Questionnaire were analyzed, then categorized and summarized for each of the two groups. Responses to item four were considered and included in Appendix E of this study.

> Item One: Compare your attitude about modern mathematics now with your attitude about it at the beginning of the workshop.

The responses to this item were classified according to the degree of change in attitude expressed toward modern mathematics as defined by the following three categories:

a. attitude toward mathematics remained constant
b. attitude toward mathematics became more favorable
c. attitude toward mathematics became less favorable

The percentage of responses in each category for the experimental and control groups is presented in Table 4.7.

TABLE 4.7. Attitude change toward modern mathematics

Group	Remained Constant %	More Favorable %	Less Favorable %
Experimental	31	69	0
Control	56	44	0

Item Two: What influence, if any, will this workshop have on your teaching?

The responses to this question were classified according to the degree to which they expressed their intent to become more student centered, as defined by the following three categories:

a. no influence

b. student-centered change

c. subject-centered change

The percentage of responses in each category for the experimental and control groups is presented in Table 4.8.

TABLE 4.8. Influence on teaching

Group	None %	Student-Centered %	Subject-Centered %
Experimental	2	84	14
Control	3	3	94

Item Three: In light of your personal goals, do you feel that you learned enough "math content" in the workshop? Please explain.

The responses to this question were dichotomized into the following categories:

a. did learn enough mathematics

b. did not learn enough mathematics

The percentage of responses in each category for the experimental and control groups is presented in Table 4.9.

TABLE 4.9. Satisfaction with amount of mathematics learned

Group	Did Learn Enough Mathematics %	Did Not Learn Enough Mathematics %
Experimental	95	5
Control	97	3

Item Four: Please add any other comments you wish to make.

This item was included to allow the workshop members to express anything which was not elicited by the first three items. Therefore, many did not respond to this item. The responses for both the experimental and the control groups were reproduced and are included in Appendix E.

Summary

This chapter has presented an analysis of the data derived from the previous chapters of the study. Significant and nonsignificant findings will be discussed further in Chapter V. Chapter V will also include a summary and conclusions for this study.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND IMPLICATIONS

In this final chapter a summary of the study will be presented. Conclusions derived from the analysis of the data obtained in the study will be presented and discussed. Recommendations for further research and implications for teacher education conclude the chapter.

Summary of the Study

This experimental study was designed to analyze the effectiveness of a phenomenological approach in teaching a teacher education course (specifically a two-week modern mathematics workshop) through an investigation of the following:

1. the learner's attitudes toward the student, and the student-teacher relationship, as measured by the MTAI;
2. the learner's academic achievement, as measured by the TMM; and
3. the learner's perceptions of the following, as measured by the Open-Ended Questionnaire:

(a) his change in attitude about modern mathematics, (b) his intent to change his teaching behavior, (c) his satisfaction with the amount of mathematics content learned, and (d) his general reactions to the workshop experience.

Two further purposes which arose during the course of the study were to analyze:

1. the relationship between the attitudes of the teachers at the beginning of the workshop experience, as measured by the MTAI pretest, and the cognitive gain at the termination of the workshop experience, as measured by the TMM gain scores; and
2. the range of scores on the TMM pre- and posttests.

This research followed the Nonrandomized Control-group Pretest-Posttest Design as described by Van Dalen (1966).

The experimental group consisted of 69 students enrolled in a two-week modern mathematics workshop at Central Michigan University during August, 1968. Data were analyzed on 62 students. About half of the population were experienced graduates, and about half inexperienced undergraduates.

The control group consisted of 33 students enrolled in a concurrent two-week modern mathematics workshop at Michigan State University. Data were analyzed on

32 students. Thirty-one were experienced graduates and 1 was an inexperienced undergraduate.

The instructors of both the experimental and the control groups were associate professors in elementary education. The researcher participated in the study as an assistant to the instructor of the experimental group, thereby maintaining a teacher-student ratio of 1:35 in the experimental group, as compared to the 1:33 ratio in the control group.

The experimental treatment was the implementation of a phenomenological approach in teaching.

A Personal Data Sheet was completed by each class member of both the experimental and control groups. Percentages of pertinent data for both groups were computed.

The MTAI and the TMM were given to both groups as pre- and posttests. A four-item Open-Ended Questionnaire was a posttest only for both groups. Copies of these instruments are in the Appendices.

Analysis of covariance was used to compare the adjusted posttest means of the experimental and the control groups on both the MTAI and the TMM. Pearson product-moment correlations were calculated for the analysis of the relationship between the MTAI pretest scores and the TMM gain scores for both groups. The MTAI pretest means and the TMM gain score means for the graduate and

undergraduate subgroups in the experimental group were compared. A scatterplot was made of the control group MTAI pretest scores and TMM gain scores to determine the possibility of a nonlinear relationship between the two sets of data. Ranges of scores on the TMM pre- and post-tests for both groups were compared. Percentages of responses to the first three items on the Open-Ended Questionnaire were computed by categories for both groups. Responses to item four were considered and reproduced and are included in Appendix E of this study.

Conclusions and Discussion

Conclusions

Hypothesis I, the null hypothesis of no difference between the experimental group and the control group in attitude as measured by the MTAI was rejected in favor of the experimental group. An analysis of covariance of the posttest difference between the adjusted means of the two groups showed significance at greater than the .01 level of confidence (.0005).

Hypothesis II, the null hypothesis of no difference between the experimental group and the control group in modern mathematics, as measured by the TMM was not rejected. An analysis of covariance of the posttest difference between the adjusted means of the two groups showed no significance at the .01 level of confidence.

Hypothesis III, the null hypothesis of no relationship between the pretest MTAI scores and the TMM gain scores for the experimental group was rejected. The Pearson product-moment correlation coefficient ($r = .248$) showed significance greater than the .05 level of confidence.

Hypothesis IV, the null hypothesis of no relationship between the pretest MTAI scores and the TMM gain scores for the control group was not rejected. The Pearson product-moment correlation coefficient ($r = .079$) was not significant at the .05 level of confidence. A scatterplot did not indicate a non-linear relationship between the two sets of data.

The relationship between the MTAI pretest scores and the TMM gain scores for the graduate and undergraduate subgroups in the experimental group was the same as that for the total experimental group. Comparison of the MTAI pretest means and the TMM gain score means for the subgroups did not indicate a difference.

The TMM range of scores on the pretest was greater for the control group than for the experimental group. The TMM range of scores on the posttest was greater for the experimental group than for the control group.

The attitudes of some teachers about modern mathematics did change subsequent to the workshop experience. Forty-four percent of the control group and 69% of the

experimental group expressed more positive attitudes in response to item one of the Open-Ended Questionnaire. The remaining students expressed no change in attitudes.

The intent to change teaching behavior in a more student-centered direction as a result of the workshop experience was expressed by 84% of the experimental group and by 3% of the control group, in response to item two of the Open-Ended Questionnaire. Only 2% of the experimental group and 3% of the control group expressed no intent to change.

Nearly all (95% and 97% of the experimental and control groups, respectively) of the participants in both workshops claimed that in light of their personal goals, they had learned enough mathematics content, in response to item three of the Open-Ended Questionnaire.

The members of both the experimental and the control groups seemed to have favorable attitudes toward the workshop experience, as expressed in response to item four of the Open-Ended Questionnaire. The attitudes of the experimental group seemed to be more student centered than those of the control group.

Discussion

These conclusions are interpreted within the framework of phenomenological psychology. To set this context, the assumptions basic to this study are restated here.

1. It is assumed that the development of a fully functioning person should be the goal of education.
2. It is assumed that all behavior is a function of the total perceptual field at the moment of action; therefore, to effect change in behavior, perceptions must be changed.
3. It is assumed that each person is continually motivated by the need for greater effectiveness in relating with his world.
4. It is assumed that intellectual and affective behavior cannot be separated.
5. It is assumed that what a teacher believes about his students will have an important effect upon how he behaves toward them.
6. It is assumed that the attitudes of a teacher afford a key to the indication of the type of classroom atmosphere a teacher will maintain.
7. It is assumed that attitudes, as measured by the MTAI, are valid indicators of a teacher's openness to learner-centered teaching, and, therefore, to a phenomenological approach in teaching.
8. It is assumed that a teacher with a high positive score on the MTAI will be favorable toward learner-centered teaching and will be open to a phenomenological approach in teaching.

9. It is assumed that the self-reports of teachers are valid representations of their true feelings and belief systems, within the delimitations of any self-report (Combs, 1962; Combs and Snygg, 1959).
10. It is assumed that the objective measures used in this study, namely, the MTAI and the TMM, are valid instruments within the delimitations as stated in Assumption Nine.
11. It is assumed that the analysis of covariance and the Pearson product-moment correlation coefficients are appropriate statistical treatments for this experimental-exploratory study.

The students in the experimental group scored significantly higher on the MTAI than did the control group students. The level of confidence (.0005) at which Hypothesis I was significant strongly indicates this result is not due to chance. As stated earlier in the study, Cronbach (1953) purports a clear correspondence between the teacher's scores on the MTAI and the teaching behavior at the time of the inventory. In view of this and the basic assumptions underlying this study, it seems highly probable that the phenomenological approach in teaching strongly influenced the type of student-teacher relations, and, therefore, the kind of classroom atmosphere teachers think they should or will maintain.

This conclusion is supported further by the responses to items two and four of the Open-Ended Questionnaire. Eighty-four percent of the experimental group as against 3% of the control group expressed an intent to change teaching behavior in a more student-centered direction. The responses to item four seemed much more student-centered for the experimental group than those of the control group (see Appendix E). This conclusion supports those of Stern (1963) and McKeachie (1963), as reported in Chapter II.

Although there was no difference at the .01 level of confidence between the experimental and control groups in mathematics achievement, the experimental group did attain an adjusted mean score on the posttest of nearly two points higher than that of the control group, which was significant at the .120 level of confidence. Responses to items one, three and four on the Open-Ended Questionnaire support further the conclusion that the academic achievement was satisfactory for the individuals within both groups. It seems, therefore, that the phenomenological approach in teaching implemented in this study was as effective as the control approach in facilitating academic achievement, as measured by the TMM. This conclusion supports those of Stern (1963), McKeachie (1963), and Dodes (1953), as reported in Chapter II.

During the course of the study, speculation about these conclusions just discussed led the researcher to hypothesize as to other kinds of relationships which might exist.

Is there a difference in the TMM range of scores for the control and experimental groups? It would seem that in the experimental atmosphere, where the individual was responsible for his own learning (self-determined goals, requirements, procedures, and grade), individual differences in quantity and quality of subject matter learned would be accentuated, and would be reflected in a wider range of scores on the TMM posttest. Conversely, it would seem that in the control atmosphere, where content to be learned is more instructor prescribed, individual differences in quantity and quality of subject matter learned would be restricted, as reflected in a narrower range of TMM post-test scores. This hypothesizing was supported by the data.

Is there a relationship between the attitudes of the teachers at the beginning of the workshop, as measured by the MTAI pretest, and the cognitive gain, as measured by the TMM gain scores? Did students with high MTAI pretest scores (student-centered) have more cognitive gain than students with low MTAI pretest scores (instructor-centered) in the experimental environment? Did student-centered students tend to resist the control environment and have average cognitive gain, or did they extend effort beyond

that required and have high cognitive gain? Did the instructor-centered student have high cognitive gain in the control group, where content requirements were more prescribed?

These kinds of questions led to Hypotheses III and IV. Conclusions bearing on these hypotheses show that a relationship ($r = .248$), significant at the .05 level of confidence, did exist between the MTAI pretest scores and the TMM gain scores for the experimental group, but that no relationship existed between these sets of data for the control group. The relationship between the MTAI pretest scores and the TMM gain scores for the graduate and undergraduate subgroups in the experimental group, as determined by a comparison of the MTAI pretest means and the TMM gain score means for the subgroups, revealed the same relationship between the two sets of data as for the experimental group as a whole. A scatterplot of the two sets of data for the control group did not suggest a non-linear correlation between them.

What variable, or composite of variables, intrinsic to a phenomenological approach in teaching might explain the conclusions bearing on Hypotheses III? Are there personality variables within the learner which could be isolated through research as having a significant relationship with certain variables of a phenomenological approach?

Further research is needed to explore this problem more fully.

In view of the basic assumptions underlying this study, and the findings of this study, it seems that a phenomenological approach in teaching is relevant to the kinds of emphases deemed important in the professional preparation of the teacher. This conclusion gives direction to the recommendations and implications which follow.

Recommendations for Further Research

Since a phenomenological approach in teaching seems to provide for educational goals in terms broad enough to include the self-concept while simultaneously achieving high academic standards, the study should be replicated, implementing any one of the following changes:

1. Provide for random equivalence.
2. Vary the time factor, from a one-day workshop up to three periods of class a week, for a full term or longer.
3. Have the population consist of graduates or undergraduates, exclusively.
4. Have a population consisting of a faculty group for inservice education.
5. Apply to courses of varying subject matter content.
6. Have a population consisting of para-professionals.

7. Eliminate the collection of data by objective measures. Obtain data with subjective measures, such as student self-reports or student-instructor conferences. Observe individual, rather than normative data.

A long term follow through of the students involved in the study would be desirable in order to ascertain the following:

1. the delayed and/or superficial effects of a phenomenological approach in teaching;
2. the persistence of the attitudinal gain and the cognitive gain; and
3. the percentage and persistence of the students in the study who put into practice a phenomenological approach in teaching in their own classroom.

There was a significant, positive, direct relationship between the learner's attitudes toward the student and the student-teacher relationship at the beginning of the experimental workshop, and his cognitive gain. Research is needed to determine the independent variables existent within a phenomenological approach in teaching which cause this relationship.

The relationship between specific personality variables, such as high and low dependency proneness, and attitude and/or cognitive change should be explored within

a study implementing a phenomenological approach in teaching.

The continuous increase in the school-age population creates the problem of increased class size. The possibility of creating a student-centered atmosphere regardless of class size should be studied.

The effects that a phenomenological approach in teaching has upon the total culture of the college should be ascertained:

1. Do students taught by a phenomenological approach in teaching rather than another make more use of their knowledge and skills in other courses?
2. How does the implementation of a phenomenological approach in teaching affect faculty-administration relationships?
3. How does the implementation of a phenomenological approach in teaching change faculty perceptions of teaching and its value?

Research implementing a phenomenological approach in teaching and based upon the following questions needs to be pursued:

1. Do differing evaluative and grading practices facilitate or block learning?
2. How do students learn to evaluate themselves?
3. How do students learn to set goals for themselves?

Implications for Teacher Education

Before an individual's behavior can be understood, one must have a framework for interpreting behavior. Teacher education courses should assist its students in the development of a clear and consistent frame of reference about people and their behavior to serve as a guide in relating with them. That phenomenological psychology should form such a framework is postulated in this study.

From a phenomenological point of view, the fundamental goal of education is the development of a fully functioning person. Therefore, emphasis is upon the promotion of both affective and cognitive growth.

A phenomenological approach in teaching was effective in facilitating both cognitive and attitudinal gain with both undergraduates and graduates in this study. It seems, therefore, that a phenomenological approach could be implemented at all levels of a teacher's professional preparation, both graduate and undergraduate, if the phenomenological view of behavior is the frame of reference.

The apparent success of a phenomenological approach in teaching in a two-week workshop suggests that inservice education would benefit from the implementation of this kind of teaching approach.

The discussion of the experimental treatment in Chapter III, and the general observations of the students

as expressed in their responses to item four of the Open-Ended Questionnaire, may suggest to future innovators various possibilities for replicating or modifying the activities implementing a phenomenological approach in teaching.

In conclusion, this researcher feels that there is a need for further research in the implementation of a phenomenological approach in teaching in teacher education. Such research may be of value both in measuring the effectiveness of different instructional designs, and in providing clues for implementing change in the professional preparation of teachers.

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APPENDICES

APPENDIX A

PERSONAL DATA SHEET

APPENDIX A

PERSONAL DATA SHEET

(a) Name: _____

(b) Sex: (1) Male (2) Female

(c) Age:

(1)	Under 25	(5)	40 - 44
(2)	25 - 29	(6)	45 - 49
(3)	30 - 34	(7)	50 - 54
(4)	35 - 39	(8)	Over 54

(d) College education:

(1)	Under 2 yrs	(5)	4.1 - 4.9 yrs
(2)	2 - 2.9 yrs	(6)	5.0 yrs
(3)	3 - 3.9 yrs	(7)	5.1 - 5.9 yrs
(4)	4.0 yrs	(8)	6.0 or over

	Undergraduate	Graduate
(e) Academic major(s):	_____	_____
	_____	_____
Academic minor(s):	_____	_____
	_____	_____

(f) Previous math course(s) completed:

Name	Term Credits	Grade
Name	Term Credits	Grade
Name	Term Credits	Grade

(g) Number of years teaching experience:

(1)	1 year	(5)	5 - 9 years
(2)	2 years	(6)	10 - 14 years
(3)	3 years	(7)	15 - 19 years
(4)	4 years	(8)	20 or more

(h) Number of years experience teaching math by grade level:

_____	_____	_____	_____	_____	_____	_____	_____
years	grade	years	grade	years	grade	years	grade

(i) If elementary teacher, please list grade(s) you teach:

_____

(j) Approximate class size: _____

(k) If secondary teacher, please complete the following:

Subject	Grade Level	Class Size

Subject	Grade Level	Class Size

(l) Number teachers in your whole school system:

(1) Under 21 (2) 21 or more

(m) Organizational pattern of your school:

(1) Self contained grades
(2) Departmentalized grades
(3) Combination of 1 & 2
(4) Nongraded

(n) Please state your reason(s) for taking this workshop:

_____

_____

APPENDIX B

MINNESOTA TEACHER ATTITUDE INVENTORY (FORM A)

APPENDIX B

DO NOT OPEN UNTIL TOLD TO DO SO

MINNESOTA TEACHER ATTITUDE INVENTORY

Form A

WALTER W. COOK
University of Minnesota

CARROLL H. LEEDS
Furman University

ROBERT CALLIS
University of Missouri

DIRECTIONS

This inventory consists of 150 statements designed to sample opinions about teacher-pupil relations. There is considerable disagreement as to what these relations should be; therefore, there are no right or wrong answers. What is wanted is your own individual feeling about the statements. Read each statement and decide how YOU feel about it. Then mark your answer on the space provided on the answer sheet. Do not make any marks on this booklet.

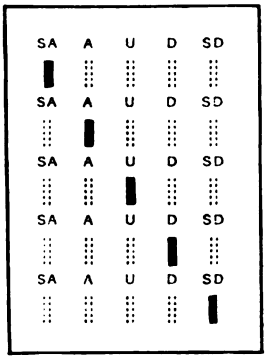
If you **strongly agree,** blacken space under "SA" .....

If you **agree,** blacken space under "A" .....

If you are **undecided** or **uncertain,** blacken space under "U" .....

If you **disagree,** blacken space under "D" .....

If you **strongly disagree,** blacken space under "SD" .....



Think in terms of the general situation rather than specific ones. There is no time limit, but work as rapidly as you can. PLEASE RESPOND TO EVERY ITEM.

The Psychological Corporation
304 East 45th Street
New York 17, N. Y.

Printed in U.S.A.

51-161 TB

SA—Strongly agree
A—Agree

U—Undecided
or uncertain

D—Disagree
SD—Strongly disagree

1. Most children are obedient.
2. Pupils who "act smart" probably have too high an opinion of themselves.
3. Minor disciplinary situations should sometimes be turned into jokes.
4. Shyness is preferable to boldness.
5. Teaching never gets monotonous.
6. Most pupils don't appreciate what a teacher does for them.
7. If the teacher laughs with the pupils in amusing classroom situations, the class tends to get out of control.
8. A child's companionships can be too carefully supervised.
9. A child should be encouraged to keep his likes and dislikes to himself.
10. It sometimes does a child good to be criticized in the presence of other pupils.
11. Unquestioning obedience in a child is not desirable.
12. Pupils should be required to do more studying at home.
13. The first lesson a child needs to learn is to obey the teacher without hesitation.
14. Young people are difficult to understand these days.
15. There is too great an emphasis upon "keeping order" in the classroom.
16. A pupil's failure is seldom the fault of the teacher.
17. There are times when a teacher cannot be blamed for losing patience with a pupil.
18. A teacher should never discuss sex problems with the pupils.
19. Pupils have it too easy in the modern school.
20. A teacher should not be expected to burden himself with a pupil's problems.
21. Pupils expect too much help from the teacher in getting their lessons.
22. A teacher should not be expected to sacrifice an evening of recreation in order to visit a child's home.
23. Most pupils do not make an adequate effort to prepare their lessons.
24. Too many children nowadays are allowed to have their own way.
25. Children's wants are just as important as those of an adult.
26. The teacher is usually to blame when pupils fail to follow directions.
27. A child should be taught to obey an adult without question.
28. The boastful child is usually over-confident of his ability.
29. Children have a natural tendency to be unruly.
30. A teacher cannot place much faith in the statements of pupils.

GO ON TO THE NEXT PAGE

SA—Strongly agree
A—Agree

U—Undecided
or uncertain

D—Disagree
SD—Strongly disagree.

31. Some children ask too many questions.

32. A pupil should not be required to stand when reciting.

33. The teacher should not be expected to manage a child if the latter's parents are unable to do so.

34. A teacher should never acknowledge his ignorance of a topic in the presence of his pupils.

35. Discipline in the modern school is not as strict as it should be.

36. Most pupils lack productive imagination.

37. Standards of work should vary with the pupil.

38. The majority of children take their responsibilities seriously.

39. To maintain good discipline in the classroom a teacher needs to be "hard-boiled."

40. Success is more motivating than failure.

41. Imaginative tales demand the same punishment as lying.

42. Every pupil in the sixth grade should have sixth grade reading ability.

43. A good motivating device is the critical comparison of a pupil's work with that of other pupils.

44. It is better for a child to be bashful than to be "boy or girl crazy."

45. Course grades should never be lowered as punishment.

46. More "old-fashioned whippings" are needed today.

47. The child must learn that "teacher knows best."

48. Increased freedom in the classroom creates confusion.

49. A teacher should not be expected to be sympathetic toward truants.

50. Teachers should exercise more authority over their pupils than they do.

51. Discipline problems are the teacher's greatest worry.

52. The low achiever probably is not working hard enough and applying himself.

53. There is too much emphasis on grading.

54. Most children lack common courtesy toward adults.

55. Aggressive children are the greatest problems.

56. At times it is necessary that the whole class suffer when the teacher is unable to identify the culprit.

57. Many teachers are not severe enough in their dealings with pupils.

58. Children "should be seen and not heard."

59. A teacher should always have at least a few failures.

60. It is easier to correct discipline problems than it is to prevent them.

GO ON TO THE NEXT PAGE

SA—Strongly agree
A—Agree

U—Undecided
or uncertain

D—Disagree
SD—Strongly disagree

61. Children are usually too sociable in the classroom.

62. Most pupils are resourceful when left on their own.

63. Too much nonsense goes on in many classrooms these days.

64. The school is often to blame in cases of truancy.

65. Children are too carefree.

66. Pupils who fail to prepare their lessons daily should be kept after school to make this preparation.

67. Pupils who are foreigners usually make the teacher's task more unpleasant.

68. Most children would like to use good English.

69. Assigning additional school work is often an effective means of punishment.

70. Dishonesty as found in cheating is probably one of the most serious of moral offenses.

71. Children should be allowed more freedom in their execution of learning activities.

72. Pupils must learn to respect teachers if for no other reason than that they are teachers.

73. Children need not always understand the reasons for social conduct.

74. Pupils usually are not qualified to select their own topics for themes and reports.

75. No child should rebel against authority.

76. There is too much leniency today in the handling of children.

77. Difficult disciplinary problems are seldom the fault of the teacher.

78. The whims and impulsive desires of children are usually worthy of attention.

79. Children usually have a hard time following instructions.

80. Children nowadays are allowed too much freedom in school.

81. All children should start to read by the age of seven.

82. Universal promotion of pupils lowers achievement standards.

83. Children are unable to reason adequately.

84. A teacher should not tolerate use of slang expressions by his pupils.

85. The child who misbehaves should be made to feel guilty and ashamed of himself.

86. If a child wants to speak or to leave his seat during the class period, he should always get permission from the teacher.

87. Pupils should not respect teachers anymore than any other adults.

88. Throwing of chalk and erasers should always demand severe punishment.

89. Teachers who are liked best probably have a better understanding of their pupils.

90. Most pupils try to make things easier for the teacher.

GO ON TO THE NEXT PAGE

SA—Strongly agree
A—Agree

U—Undecided
or uncertain

D—Disagree
SD—Strongly disagree

91. Most teachers do not give sufficient explanation in their teaching.

92. There are too many activities lacking in academic respectability that are being introduced into the curriculum of the modern school.

93. Children should be given more freedom in the classroom than they usually get.

94. Most pupils are unnecessarily thoughtless relative to the teacher's wishes.

95. Children should not expect talking privileges when adults wish to speak.

96. Pupils are usually slow to "catch on" to new material.

97. Teachers are responsible for knowing the home conditions of every one of their pupils.

98. Pupils can be very boring at times.

99. Children have no business asking questions about sex.

100. Children must be told exactly what to do and how to do it.

101. Most pupils are considerate of their teachers.

102. Whispering should not be tolerated.

103. Shy pupils especially should be required to stand when reciting.

104. Teachers should consider problems of conduct more seriously than they do.

105. A teacher should never leave the class to its own management.

106. A teacher should not be expected to do more work than he is paid for.

107. There is nothing that can be more irritating than some pupils.

108. "Lack of application" is probably one of the most frequent causes for failure.

109. Young people nowadays are too frivolous.

110. As a rule teachers are too lenient with their pupils.

111. Slow pupils certainly try one's patience.

112. Grading is of value because of the competition element.

113. Pupils like to annoy the teacher.

114. Children usually will not think for themselves.

115. Classroom rules and regulations must be considered inviolable.

116. Most pupils have too easy a time of it and do not learn to do real work.

117. Children are so likeable that their shortcomings can usually be overlooked.

118. A pupil found writing obscene notes should be severely punished.

119. A teacher seldom finds children really enjoyable.

120. There is usually one best way to do school work which all pupils should follow.

GO ON TO THE NEXT PAGE

SA—Strongly agree
A—Agree

U—Undecided
or uncertain

D—Disagree
SD—Strongly disagree

121. It isn't practicable to base school work upon children's interests.

122. It is difficult to understand why some children want to come to school so early in the morning before opening time.

123. Children that cannot meet the school standards should be dropped.

124. Children are usually too inquisitive.

125. It is sometimes necessary to break promises made to children.

126. Children today are given too much freedom.

127. One should be able to get along with almost any child.

128. Children are not mature enough to make their own decisions.

129. A child who bites his nails needs to be shamed.

130. Children will think for themselves if permitted.

131. There is no excuse for the extreme sensitivity of some children.

132. Children just cannot be trusted.

133. Children should be given reasons for the restrictions placed upon them.

134. Most pupils are not interested in learning.

135. It is usually the uninteresting and difficult subjects that will do the pupil the most good.

136. A pupil should always be fully aware of what is expected of him.

137. There is too much intermingling of the sexes in extra-curricular activities.

138. The child who stutters should be given the opportunity to recite oftener.

139. The teacher should disregard the complaints of the child who constantly talks about imaginary illnesses.

140. Teachers probably over-emphasize the seriousness of such pupil behavior as the writing of obscene notes.

141. Teachers should not expect pupils to like them.

142. Children act more civilized than do many adults.

143. Aggressive children require the most attention.

144. Teachers can be in the wrong as well as pupils.

145. Young people today are just as good as those of the past generation.

146. Keeping discipline is not the problem that many teachers claim it to be.

147. A pupil has the right to disagree openly with his teachers.

148. Most pupil misbehavior is done to annoy the teacher.

149. One should not expect pupils to enjoy school.

150. In pupil appraisal effort should not be distinguished from scholarship.

ATTITUDE INVENTORY

Cook · Leeds · Callis

THE PSYCHOLOGICAL CORPORATION

NORMS USED

NAME ______ LAST ______ FIRST ______

COLLEGE AND CLASS ______

DATE ______

Each item is answered SA A U D SD.

SA A U D SD	SA A U D SD	SA A U D SD	SA A U D SD	SA A U D SD
1	31	61	91	121
2	32	62	92	122
3	33	63	93	123
4	34	64	94	124
5	35	65	95	125
6	36	66	96	126
7	37	67	97	127
8	38	68	98	128
9	39	69	99	129
10	40	70	100	130
11	41	71	101	131
12	42	72	102	132
13	43	73	103	133
14	44	74	104	134
15	45	75	105	135
16	46	76	106	136
17	47	77	107	137
18	48	78	108	138
19	49	79	109	139
20	50	80	110	140
21	51	81	111	141
22	52	82	112	142
23	53	83	113	143
24	54	84	114	144
	55	85	115	145
	56	86	116	146
	57	87	117	147
	58	88	118	148
		89	119	149
		90	120	

APPENDIX C

TEST ON MODERN MATHEMATICS (FORM A)

APPENDIX C

TEST ON MODERN MATHEMATICS - FORM A

C. Alan Riedesel and Marilyn N. Suydam
The Pennsylvania State University

Directions:

Read each question carefully and decide which of the answers is correct. Indicate your answer by blackening the corresponding space on the answer sheet. Use the scrap paper provided for any computation you need to do: please do not mark on the test booklet.

1. Let A be the set of animals, and D be the set of dogs. What is the most correct way of expressing the relationship?

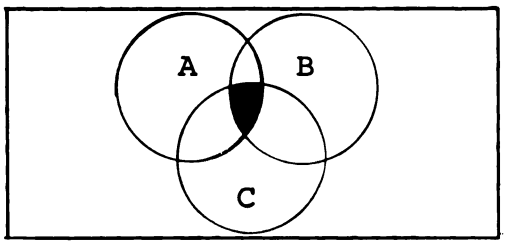
   a) $A \in D$
   b) $D \in A$
   c) $A \subset D$
   d) $D \subset A$
   e) $D \not\subset A$

2. If $C = \{n \mid 3 < n\}$ and $D = \{n \mid n < 12\}$, then what is $C \cap D$? (n is an element in the set of whole numbers)

   a) {0, 1, 2, 3, ..., 12}
   b) {0, 1, 2, 13, 14, ...}
   c) {..., 0, 1, 2, 13, 14, ...}
   d) {3, 4, 5, 6, 7, 8, 9, 10, 11, 12}
   e) {4, 5, 6, 7, 8, 9, 10, 11}

3. What does the shaded area on the diagram represent?

   a) $(A \cap B) \cap C$
   b) $(A \cup B) \cup C$
   c) $A \cup (B \cap C)$
   d) $A \cap (C \cup B)$
   e) $(A \cap B) \cup C$



4. Consider: set M = {1, 2, 3} set N = {2, 3, 5}
What is the union of set M with set N?

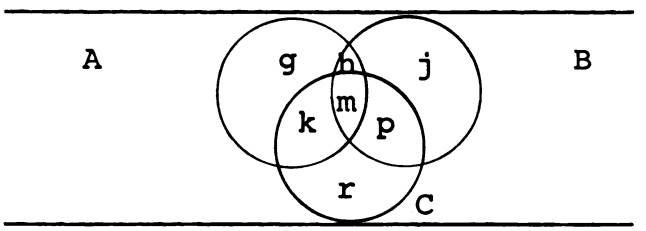
a) {2, 3}
b) {1, 2, 3, 2, 3, 5}
c) {5}
d) {1, 2, 3, 5}
e) none of the above

5. For which set is the following statement true? "A larger number cannot be subtracted from a smaller number."

a) set of natural numbers
b) set of real numbers
c) set of integers
d) set of rational numbers
e) none of the above

6. What is the cardinal number associated with set A?

a) 1
b) 2
c) 3
d) 4
e) 7



7. Tom and Jim were drawn from the set of students in Jefferson School. The relation Ⓣ exists such that Jim Ⓣ Tom if Jim is taller than Tom. Which of the following properties does the relation Ⓣ have?

a) reflexive
b) symmetric
c) transitive
d) all of the above
e) none of the above

8. Consider set A = {1, 2, 3, 4, 5}
set B = {a, b, c, d, e}
set C = {3, 2, 4, 1, 5}
set D = {f, g, h, i, j}
For which sets does the equality relation exist?

a) A and B
b) A and C
c) B and D
d) all of the above
e) none of the above

9. What is $a^3 \div a^0$, providing $a \neq 0$?

   a) 0
   b) a^2
   c) $a^{3/0}$
   d) a^3
   e) none of the above

10. Which is an example of an ordinal use of number?

   a) 3 groups of apples
   b) 48 East Maple Road
   c) 12 dozen eggs
   d) 237 boxes of candy
   e) none of the above

11. Which of the following represents {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} when a numeration system with base eight is used?

   a) $1_8, 2_8, 3_8, 4_8, 5_8, 6_8, 7_8, 8_8, 9_8, 10_8$
   b) $1_8, 2_8, 3_8, 4_8, 5_8, 6_8, 7_8, 10_8, 11_8$
   c) $1_8, 2_8, 3_8, 4_8, 5_8, 6_8, 7_8, 10_8, 11_8, 12_8$
   d) $1_8, 2_8, 3_8, 4_8, 5_8, 6_8, 7_8, 8_8, 10_8, 11_8$
   e) none of the above

12. What is $5^p \cdot 5^q$?

   a) $5^{p \cdot q}$
   b) 5^{5p5q}
   c) $25^{p \cdot q}$
   d) 25^{p+q}
   e) 5^{p+q}

13. How is 124 (base five) expressed in expanded notation as sums of the powers of the base?

   a) $(1 \times 10^2) + (2 \times 10^1) + (4 \times 10^0)$
   b) $(1 \times 10^3) + (2 \times 10^2) + (4 \times 10^1)$
   c) $(5^2 \times 1) + (5^1 \times 2) + (5^0 \times 4)$
   d) $(1 \times 5^3) + (2 \times 5^2) + (4 \times 5^1)$
   e) none of the above

14. What is equivalent to the following?
$(6 \times a^3) + (2 \times a^1) + (4 \times a^0)$

a) $2a\ (3a^2) + 4a$
b) $6a^3 + 2a + 0$
c) $6a^3 + 2 + 0$
d) $12a^4$
e) $6a^3 + 2a + 4$

15. Which represents the largest base six number?

a) 555
b) 666
c) 599
d) 999
e) 699

16. How is 10010 (base two) written in base ten?

a) 18
b) 5005
c) 36
d) 202
e) none of the above

17. What number in base six is represented by the following notation?
$3(6)^3 + 4(6)^2 + 2(6)^1 + 0(6)^0$

a) 54
b) 540
c) 342
d) 804
e) 3420

18. What is 1101 (base two)
+ 1011 (base two)

a) 101000 (base two)
b) 2112 (base two)
c) 11000 (base two)
d) 10001 (base two)
e) none of the above

19. Which is correct terminology?

a) multiplier times multiplicand equals sum
b) factor times factor equals product
c) addend minus addend equals sum
d) subtrahend minus minuend equals difference
e) none of the above

20. Which of the following demonstrates the identity element for addition?

a) a + b = a
b) a + b = c
c) a + a = 2a
d) a + b = b + a
e) none of the above

21. What is the additive inverse of 9?

a) 0
b) 9/1
c) 1/9
d) 1
e) -9

22. For which pair of numbers is exact division possible?

a) 1, 13
b) 2, 178
c) 15, 75
d) all of the above
e) none of the above

23. Consider modulus 9. What is 7 + 5, mod 9?

a) 3
b) 12
c) 4
d) 13
e) none of the above

24. Which shows the use of the distributive property to find n for 43 x 3 = n?

a) (40 x 3) x 3 = (40 x 3) x (3 x 3)
b) (40 + 3) x 3 = (40 x 3) + (3 x 3)
c) (40 + 3) x 3 = 3 x (40 x 3)
d) (40 + 3) x 3 = 3 x (3 x 40)
3) (40 x 3) + 3 = (40 + 3) x (3 + 3)

25. What regrouping was necessary to complete the multiplication in the example shown?

$$\begin{array}{r} 3152 \\ \times\ \ 3 \\ \hline 9456 \end{array}$$

a) 10 ones to 1 ten
b) 10 tens to 1 hundred
c) 10 hundreds to 1 thousand
d) 3 hundreds to 4 hundreds
e) none of the above

26. The product of 475 x 968 would be how many more than the product of 415 x 968?

a) 60 tens x 968
b) 600 tens x 968
c) 6 tens x 968
d) 6 x 968
e) none of the above

27. Which of the following illustrates the relationship between the division algorithm and subtraction?

a) $16 \div 4 = (16 - 4 - 4 - 4)$
b) $x \div y = (y - z) \cdot x$
c) $20 \div 5 = (20 - 5 - 5 - 5 - 5)$
d) $9 \div 3 = 9 - 3^2$
e) none of the above

28. Consider the operation such that $(a \odot b) \odot c = a \odot (c \odot b)$. What properties of this operation $\odot$ (is) (are) demonstrated above?

a) Commutative
b) Associative
c) Distributive
d) Associative and Distributive
e) Associative and Commutative

29. When the equal additions method of subtraction is used, which statement tells what would be done in the following example?

$$\begin{array}{r} 865 \\ -\ 437 \\ \hline \end{array}$$

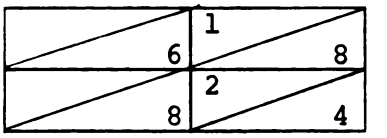
a) Change 865 to (85 tens and 15 ones)
b) Change 865 to (85 tens and 15 ones) and 437 to (42 tens and 17 ones)
c) Change 437 to (42 tens and 17 ones)
d) Change 437 to (44 tens and 7 ones)
e) Change 865 to (86 tens and 15 ones) and 437 to (44 tens and 7 ones)

30. What is 423 (base five) minus 234 (base five)? (Answer in base five)

a) 179
b) 89
c) 134
d) 324
e) none of the above

31. What two numbers are being multiplied using the historical "lattice" method?

a) 68 x 1824
b) 39 x 23
c) 86 x 4281
d) 26 x 34



32. a)

(hundreds)	(tens)	(ones)
2a	3b	1

Consider the above illustration. 2a represents a number in the hundreds column of the dividend. If 2a is divided by a in what column will the first digit of the quotient be?

a) Hundreds
b) Tens
c) Could be in either hundreds or tens
d) Could be in either tens or ones
e) Impossible to tell without specific numbers

33. Which is an example of the partition type of division problem?

a) 16 balloons are divided among 4 boys; how many will each boy get?
b) 3 oranges cost 27¢; how much does one cost?
c) 21 children are divided into 3 groups; how many are there in each group?
d) all of the above
e) none of the above

34. Which of the following is a member of the set of integers?

a) $\sqrt{2}$
b) -2
c) 2 1/2
d) 2.2
e) none of the above

35. Which is true?

a) (-7) + (-3) = 10
b) (+6) - (+2) = -4
c) (-3) - (-5) = 2
d) (-2) - (-4) = -6
e) none of the above

36. Which of the following statements is true concerning fractions?

a) A fraction indicates an expressed division.
b) A fraction indicates a ratio.
c) A fraction may represent a point on a line.
d) All of the above are true.
e) None of the above are true.

37. Which represents the equivalence class for 3/5?

a) {1/5, 2/5, ...}
b) {3/2, 3/4, ...}
c) {9/15, 12/20, ...}
d) {9/25, 27/125, ...}
e) {5/3}

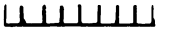
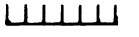
38. What are all the positive exact divisors of 36?

a) 1, 2, 3, 4, 6, 9, 12, 18, 36
b) 2, 3, 4, 6, 9, 12, 18
c) 0, 1, 2, 3, 4, 6, 9, 12, 18, 36
d) 2, 3, 4, 6, 9
e) 1, 2, 3, 4, 6, 9

39. Which of the following represents the largest number?

a) 30.3
b) 30.03
c) 30.0333
d) 30.003
e) 30.303

40. Which decimal indicates how long line B is in relation to line A?

line A  line B 

a) .5
b) .625
c) 1.25
d) .75
e) .33

41. Which illustrates the commutative property for the set of rational numbers?

a) $\frac{m}{n} + \frac{p}{q} = \frac{p}{q} + \frac{m}{n}$

b) $\frac{m}{n} + \frac{p}{q} = mq + pn$

c) $\frac{m}{n} + \frac{p}{q} = \frac{m}{q} + \frac{p}{n}$

d) $\frac{m}{n} + \frac{p}{q} = mp + nq$

e) none of the above

42. What would be the effect on the product if you dropped the zero from 62.50?

$$\begin{array}{r} 62.50 \\ \times\ 3.75 \end{array}$$

a) The product would be the same.
b) The product would be one-tenth as large.
c) The product would be ten times as large.
d) You would point off three places.
e) It would be the same as subtracting zero from the product.

43. What numeral should replace the $\square$ so the ratio of 6 to 7 will be expressed?

($\square$, 49)

a) 6
b) 7
c) 36
d) 42
e) none of the above

44. Consider 6, 12, 20, and 15; what does 60 represent?

a) the greatest common divisor
b) the least common multiple
c) the greatest common factor
d) the least common divisor
e) the greatest common multiple

45. The cost of an item is reduced 30%. What fraction of the original price is the new price?

a) 3/10
b) 3/100
c) 7/10
d) 7/100
e) 40/100

46. Consider: $\frac{6}{25} = \frac{5}{x}$ What is x equal to?

a) 6/5
b) 750
c) 5/6
d) 20 5/6
e) none of the above

47. Which illustrates the ratio or rate-pair idea of solving--"What is 15% of 80?"

a) $x = (.15)\ (80)$

b) $\frac{1}{x} = \frac{15}{80}$

c) $.15x = 80$

d) $\frac{15}{100} = \frac{x}{80}$

e) $\frac{x}{15} = \frac{80}{100}$

48. Which of the following represents a non-terminating, non-repeating decimal?

a) $.\overline{6}$
b) $\sqrt{5}$
c) $\sqrt{13}$
d) 1/5
e) 1/6

49. A sequence of nested intervals begins as follows: (3,4), (3.3, 3.4), (3.33, 3.34), ... What are the next two intervals in the sequence?

a) (3.4, 3.5), (3.44, 3.54)
b) (3.333, 3.334), (3.3333, 3.3334)
c) (3.334, 3.335), (3.3334, 3.3335)
d) (3.334, 3.335), (3.336, 3.337)
e) none of the above

50. The result of rounding a number to the nearest hundredth is 12.27. What is the smallest and largest number this represents?

a) greater than 12.2700 but less than 12.2800
b) greater than 12.265 but less than 12.275
c) greater than 12.2 but less than 12.3
d) greater than 12.27 but less than 12.28
e) none of the above

APPENDIX D

OPEN-ENDED QUESTIONNAIRE

APPENDIX D

OPEN-ENDED QUESTIONNAIRE

If your answer requires more space than allowed, continue on the back of this sheet.

1. Compare your attitude about modern math now with your attitude about it at the beginning of the workshop.

2. What influence, if any, will this workshop have on your teaching?

3. In light of your personal goals, do you feel that you learned enough "math content" in the workshop? Please explain.

4. Please add any other comments you wish to make.

APPENDIX E

RESPONSES TO ITEM FOUR OF THE OPEN-ENDED QUESTIONNAIRE

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RESPONSES TO ITEM FOUR OF THE OPEN-ENDED QUESTIONNAIRE

Control Group

Item Four: Please add any other comments you wish to make.

Student One: The use of films I found a useful means of illustrating and clarifying class discussion. My only regret is that the course was not longer (say, five weeks) so that many of the topics could have been penetrated to greater depth. However, the reasons for things as they were is clear and obvious to me.

Student Two: Maybe we could have had some textbook authors in for a presentation.

Student Three: I found the informal makeup of this workshop contributed much to it. It was very enjoyable.

Student Four: I think the structure of the workshop was very good. Activities were varied and topics interesting.

Student Five: I thought having class discussion was very worthwhile this past two weeks. It gave us a chance to express our needs and ideas. I gained much valuable information from the projects. The text is well organized. The inside cover charts are very useful.

Student Six: This course was well tailored to my needs. I feel that it accomplished the reasons for my taking the workshop. The time in class was well spent and the ground covered was very important. The text was very usable and helpful.

Student Seven: I enjoyed the class. I needed it. There was a relaxed and pleasant atmosphere, and in my case in particular, much accomplished.

Student Eight: I enjoyed the workshop and felt it very worthwhile.

Student Nine: Due to your background in computer assisted instruction, I had expected and looked forward to more time in this area. Best of luck to you in this area.

Student Ten: I enjoyed the informal atmosphere of our class. This tone was set by our instructor. I would have liked a little more study on machines.

Student Eleven: I do wish more time had been spent on teaching materials and demonstrations.

Student Twelve: In spite of the heat and hayfever, I enjoyed this workshop and feel my teaching of math will improve because of it.

Student Thirteen: I enjoyed making and seeing all the projects. It will give me a positive start in the coming school year.

Student Fourteen: I feel the workshop was worthwhile and a valuable experience.

Student Fifteen: I think teachers should get free tuition from the state for going to summer school.

Student Sixteen: I am glad to have had the time for working on projects as I was able to accomplish things that are hard to find time for during the school year and also during lecture time, I got many ideas for my project that I hadn't thought of before. The movies were excellent and I would like to have seen more of them--but there just isn't time in two weeks. This has been a worthwhile and enjoyable course.

Student Seventeen: I felt the workshop very worthwhile in many ways.

Student Eighteen: I liked the idea of making a project.

Student Nineteen: The workshop did meet my expectations and I was completely satisfied with it.

Student Twenty: I felt the atmosphere of the class was friendly and open, and there was a ready exchange of ideas. I felt that we had a good opportunity to get from this course just what we wanted.

Student Twenty-One: I was glad that we were not under any pressure of having any tests. I thought the instructor helped create a real relaxed atmosphere in the room.

Student Twenty-Two: The workshop was well handled. I took it primarily to get any new ideas that I could for a teacher's meeting that I will be working on in October. I did learn some new approaches and got many new ideas. There were many fine projects and I liked the exchange of ideas by grade level. I also liked the idea of examining various texts.

Student Twenty-Three: Enjoyed the course.

RESPONSES TO ITEM FOUR

OF THE OPEN-ENDED

QUESTIONNAIRE

Experimental Group

Item Four: Please add any other comments you wish to make.

Student One: I enjoyed this class. This approach, stressing the importance of the individual, should tend to bring out the best in the student. I would like to see more courses handled in this manner.

Student Two: I really have enjoyed this class mainly because of the way in which it was conducted. I certainly hope that I am able to experience more learning processes like this and that I will be able to pass it on to the classes I teach.

Student Three: Yes, this was a completely different experience for me. I have never had a workshop like this before and it proved to be very worthwhile and I did learn from the way it was conducted.

Student Four: I liked, very much, the idea of putting us into small groups and letting us work on what was really important for each individual. This way I feel that each person had the opportunity to gain what he needed and thought was most important for himself. Each of us had different needs so all should have gained much from this class, if he so desired. This experience has further strengthened my idea that a child should be taken from whatever level he is at and to continue working with him from there.

Student Five: I will have to admit that I liked this class much better that I thought I would. Education and math have never been my favorite classes. I really like this independent study approach. I've really worked hard--and because I wanted to. Generally I've had the same kind of idea, but I never thought it could go so well.

Student Six: This was indeed a great experience for me. I know now that learning experiences should leave a person with the good feeling I have and desire to continue searching--again as I have.

Student Seven: I enjoyed the class and I have learned more than math. Thank you.

Student Eight: It was fun, exciting at times, a learning experience, but most of all a really worthwhile two weeks.

Student Nine: This class has given me a new outlook on teaching. Instead of being so interested in content, I am going to try to center my attention on each individual student. I enjoyed this class very much and it gave me a new excitement toward teaching that I have never experienced before. This class has given me so much more than I ever hoped for. I feel it is one of the best classes I have ever enrolled in.

Student Ten: This was the most valuable class that I have ever taken.

Student Eleven: I have enjoyed being in a class of this type very much. I felt much more relaxed and able to talk about my ideas. It is a class in which you can think about what the instructor and the students are saying and compare it to your own ideas rather than take notes and worry about giving it back on a test. I have learned a great deal in the small groups from the interaction of the people. I feel that I have learned a great deal more in the field of education and not just in elementary math, although I felt that I needed a little more guidance the first few days.

Student Twelve: A unique experience!

Student Thirteen: At first I didn't know what to think about this class. It seemed too unreal. But, as time went by, I came to realize that a class this size with so many backgrounds as far as math is concerned would be almost impossible to teach any other way. I'm glad you gave us the opportunity for independent study because if you hadn't I would have felt that this class was a complete waste of time. But it was quite the opposite.

Student Fourteen: I like the course and I felt it was worthwhile.

Student Fifteen: I have really enjoyed this class. I have not always agreed with you, but I have learned much more than I ever expected to.

Student Sixteen: I wish all my dorm mates, and all other students, could have the experience of a class like this.

Student Seventeen: The university should install air conditioning in this hall.

Student Eighteen: It was a different experience, but a thoroughly enjoyable one!

Student Nineteen: I can see how this 'Democratic Approach' can work for two weeks, but have my doubts about it working for a full semester. I would be glad to be proven wrong.

Student Twenty: I enjoyed the course. I wish I could have taken it during a semester, although it was relaxing for summer.

Student Twenty-One: I've been happy to know others are in agreement with me concerning testing and grading. I've always felt grading was the hardest and most unrewarding phase of teaching. No two individuals are alike, and therefore one test can never touch the knowledge each individual holds in his mind. The class has been an unusual experience, but in its uniqueness, has been most gratifying to me.

Student Twenty-Two: I certainly liked this course, not mainly because we assigned our own grade, but that we had a chance to think and exchange our ideas with other teachers. Thank you again for teaching this course the way you did. I hope you can influence many other teachers, also. Keep up the good work!

Student Twenty-Three: Please keep your sense of humor--it's great in or out of the classroom!

Student Twenty-Four: I will hopefully be a much better teacher because of the philosophy of methods of helping children teach themselves that has been expressed here. The values of this kind of

teaching were forcefully 'brought home' to me by seeing them actually put into practice. I shall surely try to use these values with the children. I did enjoy periods of professional direction, too. Ten minutes with you over coffee one day were some of the most valuable minutes of the two weeks. Seeing what was valuable to others already teaching was also helpful to me. Associations with people are always valuable--some good friendships were made this week.

Student Twenty-Five: Thank you. I have truly enjoyed this class and the opportunity of working with you. It helps a student so much to see his instructors react as honest people. Your work has not stopped at the classroom, you were both forever suggesting new ideas and places where research is available. You have convinced me that teaching is a full time job. I really hope I will grow to be as effective as you both have been.

Student Twenty-Six: Please persevere in your methods as they are appreciated and worthwhile!

Student Twenty-Seven: This was a great class and I wish more instructors would teach and conduct their classes in this manner.

Student Twenty-Eight: I think this was a very worthwhile class and very satisfying to me.

Student Twenty-Nine: The first couple of days I did nothing but listen to others in the group discuss items that they found beneficial. Before I knew what was happening I began to contribute. I realized that I wanted to learn something that would make me a better teacher, not only in just math, but in other areas, too. It was a sort of disease and I found myself enthused about teaching, something I haven't been before now. Even though nothing was required to do in the book I found it enjoyable to do. I learned something I wanted to learn and had fun at the same time.

Student Thirty: I have enjoyed the informality of this class. It has encouraged me to try to be less formal as a teacher. I have learned much from the discussions, both between the instructors, and between the instructors and the class members.

Student Thirty-One: Although this was a large class, I feel that both of you were friends to all of us. Everyone seemed relaxed and willing to learn together, at times, or share what they had learned individually. Excellent atmosphere for wanting to learn.

Student Thirty-Two: We need this freedom and I'm sure there would be less revolt from the younger students, as is taking place all over the country, if such classes would become the rule rather than the exception. You had 70 students who enjoyed learning and want more such experiences.

Student Thirty-Three: When I came into this class I set no objectives because I thought it would be like other education classes and I already had good modern math concepts. However, my attitudes changed. Since I know math, I was enthusiastic about putting it to use. I didn't know what grade I would be teaching so I constructed a book for all grades (sets, clocks, add, etc.) of teaching aids. How much more useful this will be to me than just another class in math. This is one of the few courses I have taken that I have set an objective. I can't begin to tell anyone how much it has helped me.

Student Thirty-Four: I am going to keep my math text for reference and help with supplementary ideas. At first I planned to sell it back at the end of the session, but now I know I'll get $7.00 worth of help from it (and more!).

Student Thirty-Five: I've enjoyed working with my group. It was a wonderful opportunity for us to research what we thought was important.

Student Thirty-Six: I had my first opportunity to decide for myself what I should do for a class. I sense a growth in the appreciation of how self-perception is so important and how unique each human is. The handouts are going to be valuable to help myself and others make wise decisions on curriculum and school policy. The long coffee breaks we took several times were almost as valuable, sometimes even more so, than group or joint sessions. We were able to relate some of our developing ideas to real life situations and evaluate possible

solutions. Besides this, I met some very nice people. Although this class is over, I feel it's time to set some more goals and start planning on a plan of action.