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BEHAVIORAL OBJECTIVES FOR INTRODUCTORY COLLEGE GEOGRAPHY: AN EFFECTIVE COMMUNICATIVE TECHNIQUE

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BEHAVIORAL OBJECTIVES FOR INTRODUCTORY COLLEGE GEOGRAPHY

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CHAPTER I

BACKGROUND OF STUDY

Persons who work in education have always felt the need for goals or objectives (Montague & Butts, 1968). Although the classical Greek philosophers such as Plato, Aristotle and Socrates did not explicitly state their educational objectives, these scholars had as their objective the search for truth. The search for truth is an example of an educational objective which expresses a vague goal, is abstract in meaning and does not require the learner to perform in a specific manner. "Behavioral objectives are intentions, expectations or goals that lead us to act or perform in a certain way. As such, they should be useful in guiding and improving both the teaching and learning process" (Bernabei and Leles, 1970, P. XI).

Until recently when a student did not learn it was generally assumed to be caused by the student's inabilities. Today this assumption is being questioned. Contemporary writings are demanding that public education validate this assumption or be held accountable for a student's failure to learn (Silberman, 1970; Coleman et al., 1966; Holt, 1964). Educators in all disciplines, including geography, are being urged to search out and define empirically the most advantageous learning, instructional and communication theories to insure that maximum learning occurs. The behavioral objective technique may be one method that could be employed to achieve the maximum learning goal.

An early influential statement of educational objectives was formulated by the Commission on the Reorganization of Secondary Education in 1918. These seven objectives were:

1. Health.
2. Command of fundamental processes.
3. Vocational efficiency.
4. Worthy home membership.
5. Citizenship.
6. Worthy use of leisure.
7. Ethical character (Bent, Kronenberg, & Boardman, 1970, p. 43).

Each of the above objectives has merit. They are intrinsic to the "American" way of life and its educational system; but they are vague. Just as individuals differ, so interpretations of these objectives differ unless one explicitly defines the expected behavior which should result from each objective.

If one were to rank the various beliefs or assumptions in the field of curriculum that are considered valid, the belief in the need for clarity and specificity in stating educational objectives would probably rank high.

> Educational objectives, it is argued, need to be clearly specified for at least three reasons: first, because they provide the goals toward which the curriculum is aimed; second, because once clearly stated, they facilitate the selection and organization of content; third, because when specified in both behavioral and content terms, they make it possible to evaluate the outcomes of the curriculum (Eisner, 1967, p. 250).

Ideas concerning the positive effects of educational objectives emerged around the beginning of the 20th century with the introduction of a more rigorous scientific movement in education. Thorndike argued theoretically that transfer of learning occurred if and only if elements in one situation were identical with elements in the other (Eisner, 1967, p. 251).

Franklin Babbitt's book, How to Make a Curriculum, attempted to operationalize Thorndike's theory. This movement reached its zenith in the late 1920's with many educators writing pupil oriented objectives.

The method waned because teachers had difficulty in writing behavioral objectives; and a new philosophy was introduced by education specialists which stated that the child was a unique growing organism. With this philosophy it was reasoned that all students should not be trying to achieve the same objectives. Since each person was a separate entirely different growing organism, then each also had distinct needs and objectives. It was not until the late 1940's that the importance of behavioral objectives was revived.

As a result of this rebirth a group of college examiners attending the 1948 American Psychological Association Convention in Boston met informally and decided that there was a need for a taxonomy of educational objectives (Bloom et al., 1956, p. 4). Many meetings followed with the eventual result being two important works, Taxonomy of Educational Objectives Handbook I: Cognitive Domain in 1956 and Taxonomy of Educational Objectives Handbook II: Affective Domain in 1964. One result of these works was that behavioral objectives could be quantitatively measured and related to student achievement.

In the interim, Robert Mager introduced his text, Preparing Instructional Objectives. Mager (1962, p. V) explained to teachers how they could determine what to teach, how they would know when they had taught it, and what materials and procedures would work best to produce desired teaching results. Mager's text is important because it provided teachers with the means and methods for writing behavioral objectives.

During this period a switch in educational philosophy was occurring, and it became apparent that objectives were flexible and did not limit child growth. This alteration in conventional theory generated many studies that attempted to test the utility and effectiveness of educational objectives. These studies can be attacked as subjective because most lack empirical evidence. In reviewing literature it was found that many premises for using behavioral objectives were unacceptable because the logic was not tested and based on a priori reasoning.

The above shortcoming was brought to the attention of the author when he received complaints about the relevance of materials and the lecture method of presentation from a group of fourth class cadets at the United States Air Force Academy in a world regional geography class. Two or three teacher preparation hours were employed for each fifty minute class and innumerable teaching aids such as overhead projections, slides, films, maps, library materials and current events were used. Students were constantly asked questions and encouraged to participate in class. Many hours were spent teaching geographic concepts that were considered to be relevant to the world's problems. The cadets' complaints did not seem reasonable so discussion sessions with the classes were conducted to determine the problem.

It was found that cadets had difficulty understanding the study objectives and expected terminal course learnings. They enjoyed the class but were unable to relate a geographic concept like climatic classifications to their educational needs. When the classification system was explained to them as an objective of needing to know world climates because of their travels as Air Force officers, and the relationship of climate to peoples' customs, they were able to recognize the relevance of the learning concept.

(Example: An Air Force officer is better prepared for reassignment to any world area if he has a general knowledge of climatic conditions. The officer knows in advance the types of clothes required, the kinds of food to expect and should be able to adjust to unfamiliar work habits which are influenced by climatic conditions).

Based on the above, it was decided that an experiment was needed to determine if students perceived course content as relevant and meaningful* when behavioral objectives were employed. It must be emphasized, however, that a rigorous scientific experiment was not developed. One class was instructed using behavioral objectives while instruction in the other class was continued as before. The class receiving behavioral objectives appeared to score significantly higher on a final exam when compared with the class in which behavioral objectives were not employed. Identical tests were given and thirty-eight students participated. An interview survey of approximately half the cadets indicated that the class where behavioral objectives were used felt the course was more interesting and relevant.

As a result of this quasi-experiment, many questions developed, but the one that troubled this writer most was: how do behavioral objectives apply to learning, teaching and communicative theory? Little is known about the practical application of the numerous variables that affect learning, teaching and communication.

Dessler suggests that,

> Behavioral objectives bring immediacy to the learning process. With them for reference the student need no longer be content with far-off values; he knows what he is doing, where he is going, and whether he is getting there. By using behavioral objectives

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*Relevant is here defined as having direct application and meaningful is defined as having intrinsic interest to an individual.

> teachers also have a clearer idea of what they are doing and can eliminate much of the repetition that clogs the present curriculum (Dessler, 1970, p. 174).

Learning can then be defined in terms of desired behavior, and the theory of teaching might be hypothesized as dealing with how controls are to be implemented and communicated to maximize learning (Beck & Shaw, 1960, p. 547). The teaching/learning process represents centuries of theorizing and 80 years of experimentation, first with functionalism and more recently behaviorism (Estes, 1960, pp. 207-208).

Need for the Study

There are critics who argue that behavioral objectives are not useful tools for teachers. They argue that 1) outcomes of instruction can be predicted, but the interaction of students cannot; 2) behavioral objectives are not flexible enough and place constraints on subject matter; (for example, how does a geography instructor predict the exact responses he desires) and 3) behavioral objectives can be used to measure achievement, but there is no way to standardize a teacher's value judgment of a student's creative work. Much has been written to counteract these charges, but little has been done to prove or disprove them. For example, Elliot W. Eisner suggested:

> ...that the contribution of educational objectives to the processes of curriculum construction, teaching, and learning is an empirical problem. Yet the claims that have been made concerning their utility and importance have not been substantiated by empirical evidence. This is to say that, if one consults the research literature to identify studies which demonstrate that educational objectives when clearly specified facilitate the construction of curriculum, learning, or teaching, one finds that these studies are inconclusive (Eisner, 1967, p. 277).

There are numerous empirical studies that have attempted to measure

student achievement as a result of using behavioral objectives. The author's research, however, did not reveal an empirical study dealing with behavioral objectives and student test performance for college geography.

General geographic objectives have been stated similar to the seven cardinal principals of education. The article, "Developing and Using Behavioral Objectives in Geography," by Ambrose A. Clegg, Jr., which appeared in the 40th Yearbook of the National Council for the Social Sciences, exemplifies how behavioral objectives can be applied to the teaching of geography. Clegg notes that in the past almost any curriculum guide in geography would list instructional objectives. Terms such as to know, to understand, or to appreciate were used and a teacher could not really evaluate what learning activity was intended. He further elaborates that geography teachers should use behavioral objectives. These objectives should be written so that an intended outcome is described, the expected level of performance is understood, and materials or conditions are specified (Clegg, 1970, pp. 291-294).

The need for the study being proposed is summarized in the following statements. In general, the question, does the use of behavioral objectives increase pupil performance has not been answered. There is little empirical evidence in the area of college geography that indicates whether or not the behavioral objective technique has a positive effect on student performance.

Theoretical Implications of the Study

Behavioral objectives should not be considered as an educational theory.* They are a technique that can improve the educational environment when

*Educational theory refers to all processes, materials and interactions which generate a favorable learning environment.

employed properly by instructors. Correct utilization of the behavioral objective technique requires knowledge and understanding of three basic educational theories; learning, communicative and teaching/instructional. Behavioral objectives should be used in conjunction with all three theories to facilitate cognition.

Learning Theory. There are three general categories of accepted learning theory--conditioning, association and cognition. While behavioral objectives are applicable to all three, they are most useful with cognitive theory.

To know is to be cognizant. Educators have identified several specific cognitive processes. For example, Bruner and his colleagues identified perceiving, remembering, recognizing, concerning, judging and reasoning while Bloom and his associates described knowledge, comprehension, application, analysis, synthesis and evaluation. The lists are remarkably similar, sequential and hierarchical (Steinbrink, 1970, p. 11).

> Cognitive learning implies growth and change. Since all new experiences are added to previous experiences, the cumulated organization of these learnings is the cognitive structure. Every individual has a different and relatively unique cognitive structure. Further, the on-going accumulation of new experiences require a continuous reorganization of the individual's cognitive structure in order to assimilate the new learnings into the cognitive framework. Thus cognitive learning theory is an attempt to explain how people acquire knowledge (Steinbrink, 1970, p. 12).

Knowledge acquisition in the classroom usually includes instructions which make it possible for the learner to recognize the required end performance. Learning theory suggests the ways an organism learns and defines the teacher's role as arranging and presenting material and insuring that conditions are conducive to maximum learning (Jones, 1967, pp. 15-16). Behavioral objectives coordinate the action of these two independent variables, instructions and subordinate capabilities, as they interact and

increase human performance (Gagné, 1962, pp. 356-357). Behavioral objectives should be perceived as a catalyst to productive learning theory.

Communicative Theory. Communicative theory will be discussed only as it relates to education and impedes or advances the instructional and learning processes. For the purpose of this study communication is defined as the receiving or transmitting of information by the instructor or student.

During the Middle Ages few people could read or had access to written materials. Telling and listening were the primary modes of communication, and learning occurred as a result of these techniques or by practical experience. Today telling and listening are still the primary methods for student/teacher information exchange. The amount of information and knowledge has increased so tremendously that students require very precise information telling them what should be learned. No longer can classroom listening be taken for granted because electronic media and the constant high decibel noise produced has resulted in students having shortened attention spans (Brown & Thornton, 1971, p. 67).

Murry summarizes this idea when he states:

> In the main we tend to neglect the underlying fundamentals of communication while we continue to stress the isolated and outward mechanical factors. While we must not neglect matters of mechanics and delivery, we might better deal with them from a basis of the whole communication process and whole communication situation (Murry, 1970, pp. 39-40).

Educators agree that students' innate abilities vary as does the time required for students to advance through the hierarchical levels of cognitive learning. The teacher is not relieved of the responsibility to communicate with all students because one learns faster than another. Behavioral objectives provide teachers with a communicative method that

insures that all students have the same opportunity to know exactly what is expected of them regardless of their cognitive limitations.

Teaching/Instructional Theory. Classroom instructions are usually verbal and assumed to convey the same communicative meaning to all learners. Theoretically, a learner with proper instructions, proceeds systematically to ascend the hierarchical order of cognition. As he progresses toward the highest level of cognition, achievement tasks become increasingly more difficult. For this progression to occur successfully, instructions must be explicit and the learner must be able to 1) identify the required terminal performance; 2) recognize elements of the stimulus situation; 3) achieve a high level of recallability; and 4) apply the instructions he has learned to a new or different situation (Gagné, 1962, p. 357).

A symbolic teaching preparation model (See Appendix A) depicts the application of behavioral objectives to teaching/instructional theory. The four criteria identified above as being integral parts of the classroom instructions are met.

The teaching preparation model emphasizes that behavioral objectives have a direct effect on two aspects of instructional theory. Behavioral objectives provide an answer to the question of who is responsible for learning success in the classroom and suggest that teachers should determine and measure instructional performance.

> Through the years, the assumption persists that because teachers teach, students learn. But unless the teaching/learning process makes specific provisions, 1) to identify and prescribe what it is to be learned, and then undertakes, 2) to measure and determine these learnings--the explanations which justify successes or failures in school will continue to be ambiguous, contradictory, and indeterminate (Bernabei & Leles, 1970, p. 40).

Behavioral objectives, in summary, are a communicative technique that

increases the instructional performance level of teachers and results in higher achievement levels by students. Theoretically, behavioral objectives have application to learning, communicative and instructional theory; but only as an operational technique.

Statement of the Problem

This study investigates whether increased cognitive performance occurs when a college geography instructor employs behavioral objectives as an integral component of instructional strategy versus an instructional approach without specific daily objectives.

Operational Definitions

For the purpose of this study the following definitions were used:

Increased performance: Refers to the mean of posttest achievement scores for (T_1) being greater than (T_2) at the .20 level of significance which was set for this study.

Instructor: Refers to the author who was the instructor for both (T_1) and (T_2).

Behavioral objectives: Refers to a sentence that elaborates on what the learner will be doing, the conditions under which the learner will demonstrate his competence, and the standards of performance expected of the learner.

Cognitive domain: Refers to the six levels of educational goals as defined by Bloom's Taxonomy of Educational Objectives Handbook I: Cognitive Domain. These levels are: knowledge, comprehension, application, analysis, synthesis, and evaluation.

Instructional strategy: Refers to the method of teaching. The

experimental method employed behavioral objectives and told the students what their objectives were on a daily basis. The control method did not use behavioral objectives and made no reference to what was expected of the students.

Pre and posttest: Refers to an identical test. The test was administered to a group of students not participating in the experiment and reviewed by three geography professors to establish reliability and content validity.*

Geographic unit: Refers to one chapter of the textbook used for the experiment. One week was used to teach each geographic unit.

Experimental group (T_1): Refers to students who were taught six geographic units using behavioral objectives.

Control group (T_2): Refers to students who were taught six geographic units without the use of behavioral objectives.

Organization of the Study

This study is organized into five chapters. Chapter I is concerned with the background, need and theoretical basis of the study. The second chapter is a review of the literature related to the study. Chapters III and IV deal with the procedures of collecting, presenting and analyzing the data to support or reject the hypothesis. The final chapter consists of summary, conclusions and recommendations.

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*Professors John Steinbrink, Nelson Nunnally and Marvin Baker participated in establishing test reliability and test content validity.

CHAPTER II

REVIEW OF THE LITERATURE

A voluminous literature has been written on educational and behavioral objectives. Unfortunately few publications have direct bearing on the present problem. Because few educators are behavioral scientists, they have difficulty distinguishing between an educational objective and a behavioral objective. Since educators are having problems understanding and using behavioral objectives, most literature dealing with the subject concerns itself with the explanation of how to write and use behavioral objectives rather than how they actually work in the classroom compared to other instructional techniques. Therefore, this review concerns itself with literature that establishes the theoretical rationale supporting the use of behavioral objectives, criticizes the employment of behavioral objectives and empirically supports or rejects the behavioral objective technique.

Rationale Supporting Behavioral Objectives

Theoretical Inferences. Clarke (1970) suggests that teaching involves many processes and that there is no single teaching theory. Clarke does recognize the possibility of a general teaching theory with intricate additional theories that are employed during special teaching situations. To validate the multi teaching theory premise Clarke lists the criteria

comprising teaching theory proposed by the Commission on Instructional Theory. The criteria are the following:

> (1) A statement of instructional theory should include a set of postulates and definition of terms involved in these postulates. (2) The statement of an instructional theory or subtheory should make explicit the boundaries of its concern and the limitations under which it is proposed. (3) A theoretical construction must have internal consistency - a logical set of relationships. (4) An instructional theory should be congruent with empirical data. (5) An instructional theory must be capable of generating hypotheses. (6) An instructional theory must contain generalizations which go beyond the data. (7) An instructional theory must be verifiable. (8) An instructional theory must be stated in such a way that it is possible to collect data to disprove it. (9) An instructional theory must not only explain past events but must also be capable of predicting future events. (10) At the present time, instructional theories may be expected to represent qualitative synthesis (Clarke, 1970, p. 404).

Clarke emphasizes that there is no paradigm of teaching that satisfies all the criteria listed above. The behavioral objective technique does provide a method for satisfying many of the above criteria. The teacher writes behavioral objectives based on desired student behavior, plans activities which direct a student toward this desired behavior, interacts with students to insure that the objectives are understood and evaluates results to determine if the objectives have been achieved.

Ralph W. Tyler was one of the first to advocate educational objectives, and as a result of his efforts, many educators turned to the theory of describing objectives in terms of student performance (Bernabei & Leles, 1970, p. 1). Tyler's Basic Principles of Curriculum and Instruction attempted to explain a rationale for viewing, analyzing and interpreting the curriculum of an educational institution. Tyler (1950) pays particular attention to selecting, stating and evaluating educational objectives.

Benjamin Bloom and his colleagues followed Tyler's work with the

Taxonomy of Educational Objectives Handbook I and Handbook II. In these works a complete taxonomy consisting of three parts was developed: the cognitive, the affective and the psychomotor domains. The psychomotor domain will not be discussed here for it is not directly applicable to this study.

The cognitive domain contains six major classes: 1) knowledge, 2) comprehension, 3) application, 4) analysis, 5) synthesis, and 6) evaluation (Bloom et al., 1956, p. 18). The underlying principle is that a simple behavior would mix with other simple behaviors to form more complex behaviors. The utility of the cognitive domain lies in its ability to aid teachers in recognizing whether or not desired learning goals are being accomplished.

The affective domain contains five major classes and several subcategories. The major classes are: 1) receiving, 2) responding, 3) valuing, 4) organization, and 5) characterization by a value or value complex (Krathwohl, Bloom, & Masia, 1964, p. 35). The major difference between the cognitive and affective domains is that it is more difficult for a teacher to appraise a student's knowledge on the affective level than on the cognitive. In addition, our society is generally opposed to any system that might reduce the possibility of free choice when attitudes and opinions are formulated. Many educators feel that writing behavioral objectives in the affective domain would be dictating an individual's interests, values and beliefs.

Carswell (1971, pp. 107-130) evaluated affective learning in geography to determine the success of instructional procedures rather than to generate grades. He suggests that since values are taught it is possible to evaluate

value teaching. His research employs questionnaires, interviews and observations to assess positive behavior in relation to geographic instruction. Carswell concludes that if attitudes can be assessed, then instruction can be improved and students will have positive feelings about the value of geography. Although Carswell presents an impressive argument, the findings are beyond the scope of this study which will deal primarily with the cognitive domain.

Behavioral Objectives and Teaching Strategies. Tennyson and Merrill (1971, p. 28) emphasize that Bloom's taxonomy should not be considered an instructional paradigm advocating a specific teaching process. The usefulness of the taxonomy is related to its attempt to delimit and establish a hierarchical list of educational goals. Bloom envisioned the taxonomy as a beginning point for instructional research.

Hilda Taba, a recognized expert in curriculum development, formulated several basic teaching strategies. Each of her strategies begins with the writing of specific behavioral objectives. It is suggested by Trezise (1972) that when the State Department of Education in Michigan bases its instructional strategy for English and reading on the Taba technique, students' levels of cognition will be expanded. Christensen (1972) supports Trezise's idea and advocates the use of the behavioral objective technique in teaching foreign language, suggesting that student performances in foreign languages would improve considerably if behavioral objectives were employed.

Instructional objectives written for 1962 are not the instructional objectives that can be used in 1972 (Popham, 1972, p. 432). Comerford and Fleury (1972) stress this point and emphasize the importance of correctly stating behavioral objectives. Times change and goals should be defined in

terms of present issues. Mager (1962) wrote behavioral objectives primarily for the student. More recently (1972), properly written behavioral objectives reflect the interactions of students and teachers.

The preceding premise is supported by Ojemann's three reasons for stating objectives behaviorally. They are 1) overt classroom and laboratory behavior is not the same as the behavior an individual displays when he is on his own, 2) both types of behavior must be considered when developing an instructional strategy and 3) what a student perceives as important to learn is as significant as what the instructor feels should be learned (Ojemann, 1968, p. 231).

Students are constantly complaining that much required school work is unnecessary. The basis for this agitation according to Ojemann (1971, p. 210) is the failure of the administration and faculties of universities, colleges and schools to develop curricula based on student needs. When behavioral objectives are employed properly, the needs of students are considered. The use of performance objectives does not result in a less humanistic or more mechanistic teaching process, but does contribute to a clearer understanding of educational goals (Merritt, 1971, p. 210).

A highly significant instructional approach has been the development and use of measurable objectives (Popham, 1971, p. 76). The importance of behavioral objectives lies in their ability to clarify the instructional intent of the teacher. The National Education Association (NEA) (1972, p. 34) views performance-based instruction as one of today's foremost educational innovations. The NEA advocates that the United States Office of Education and state departments of education consolidate their resources to experiment with performance-based instruction at all levels of education.

Behavioral Objectives in the Social Studies. Drumhiller (1971, p. 32) says the chief objective of public school social studies programs is the development of social behaviors and that desired social behaviors are more readily learned if the curriculum is based on behavioral objectives. He asserts that learning increases when students are aware of expected terminal behaviors.

A recent educational innovation is the inquiry-orientated New Social Studies Curriculum. Before the New Social Studies Curriculum will facilitate the teaching/learning processes, teachers must acquire an indepth knowledge of the objectives. Gerlach (1971, p. 180) supports this proposition when he posits that for teachers to implement a curriculum correctly they must possess a thorough understanding of its objectives.

Lewis (1972) notes that the High School Geography Project units are excellent examples of how to use behavioral objectives and evaluate student performance. He states,

> It is perhaps time for geographers, many of whom have insisted that spatial phenomena that cannot be measured should not be studied, to ponder whether many instructional objectives that go unmeasured either implicitly or explicitly, are valid (Lewis, 1972, p. 71).

Criticisms of Behavioral Objectives

Purpose of Educational Objectives. Pursuing the right purpose is a necessary part of teacher effectiveness according to Ebel (1970, pp. 171-173). This should not be interpreted to mean that all objectives must be specific and explicitly stated. Ebel recommends that teachers spend more time developing pupils' cognitive resources and less time writing behavioral objectives.

> We should state most of our immediate educational objectives in terms of achieved knowledge or specific abilities, not in terms of desired behavior, general abilities, or adjustment. We should recognize ability to think--reflectively, critically, and straight--for what it really is in essence: the application of specific factual knowledge to specific problems to reach sound conclusions. We should discontinue our search for the "essential traits of mental life," or for "the dimensions of achievement," since they probably are not there to be found. We can stop paying even lip service to that second, always troublesome, dimension of our two-way-grid test blueprints--the one labeled "abilities" or "objectives,"--and we should concentrate more on the other dimension--the one labeled "subject matter" or "content"--to achieve an adequate sampling of the most useful knowledge.
>
> Conclusion: the cultivation of mental abilities is not an alternative to development of command of knowledge. If a mental ability can be developed, the best way to develop it is through command of knowledge relevant to the task (Ebel, 1971, p. 39).

Frase and Talbert (1971, p. 85) agree with Ebel on the importance of cognitive knowledge but believe teachers spend too much time on the first level of Bloom's taxonomy. List, name or identify are the verbs most often used to describe the desired learned behavior. These verbs require memorization and leave little time for the teaching/learning processes to facilitate the remaining five levels of Bloom's taxonomy. This implies that the higher mental processes are seldom reached. Frase and Talbert summarize by suggesting that knowledge acquisition is important but can become boring when the lower processes (knowledge and comprehension) are the primary goals. They view the development of higher mental processes (application, analysis, synthesis and evaluation) as requiring equal teacher emphasis. Behavioral objectives are worthwhile if they are not limited to knowledge acquisition.

Broudy (1970, p. 44) relates the above to current behavioral objective methodology. He suggests some educators would argue that if information cannot be stated objectively, it cannot be tested. Accepting this premise leads to the injunction that teachers should teach only information that

can be tested. Broudy posits that knowledge acquisition is absolutely necessary, but there is more to learning than memorization and testing.

Are Behavioral Objectives an Important Teaching Variable? The teacher is the primary classroom variable according to Stephens (1967). He claims it is unrealistic to give the teacher curricular objectives or to require specific written objectives. Unrehearsed momentary interactions among teachers and students is what constitutes the teaching/learning process. Recognizing this process and applying teaching innovations to classroom situations is where educational dividends are realized.

A study by MacDonald and Wolfson (1970) has been interpreted as anti-behaviorism, but this was not the intent of the authors. They reject the behavioral objective technique as a method for promoting student expertise. The terminal behavior of students should be examined but just as important are the inferences drawn from teacher perceptions. "We believe that the real issue is not that of specifying appropriate behaviors. Rather, we question the appropriateness of the procedure of using behavioral specification to develop teaching/learning situations" (MacDonald and Wolfson, 1970, p. 119).

Testing with Behavioral Objectives. The limitations of behavioral objectives in test development are discussed by Ebel (1965) and Adams (1972). Ebel writes that objectives do not keep pace with the times, many terms used as verbs in writing behavioral objectives cannot be defined, and priorities of which and how many behavioral objectives are desired is open to criticism. Adams asserts: "Nothing is more absurd and dangerous than thinking that we measure all results worth achieving; what we in fact end up measuring may be trivial, insipid, and useless" (Adams, 1972, p. 25).

Adams further suggests that identifying all worthwhile learning experiences with preconceived behavioral objectives may result in bypassing the most important educational issues and wasting a great deal of human energy.

Smith (1972) agrees with the above unless behavioral objectives are used to measure physical skills. Evaluating physical skills, however, is not the same as appraising school achievement. For example, if "to recognize" means the ability to match one item with another on a teacher-made test, then behavioral objectives have been misused. According to Smith, behavioral objectives are an attempt to increase teaching effectiveness through goal clarity; and this is acceptable as long as teaching/learning processes are not restricted.

Educational Objectives Should Be Used with Caution. Atkin cautions against the use of behavioral objectives for the following reasons:

> 1. It is readily assumed that we know or can identify all desired educational objectives;
>
> 2. Certain desirable educational innovations may be lost when teachers attempt to write behavioral objectives for all learning situations;
>
> 3. The behavioral objective technique lends itself to didactic teaching. When this happens the total classroom educational potential is lost;
>
> 4. Advocaters of behavioral objectives assume that an objective to be worthwhile must be measurable. Meaningful goals are not always possible to evaluate, but this does not mean that teachers should disregard those goals (Atkin, 1968, pp. 28-30).

Raths (1971, p. 9) asserts than an educational program based on behavioral objectives is not always a motivating instructional strategy. Field trips, dramatic presentations, free periods, school government and school newspapers rarely have preset objectives. However, students are motivated toward these activities and learning does occur.

Criticisms of behavioral objectives are perhaps summarized in the following quote:

> A full commitment to the use of objectives demands that the faculty attend to student learning as its prime consideration. It demands a role shift--one which instructors may say they accept but which they cannot abide because it moves the focus of attention away from themselves and opens the door to the possibility that students can learn as well with or without the intervention of the instructor (Cohen, 1970, p. 59).

Experimental Research Using Behavioral Objectives

Research Reports. It is suggested by Krathwohl (1965, pp. 83-92) that educational research is required to discover what kinds of instructional methods are needed to permit efficient and effective achievement of educational objectives. Lindvall and Bolvin (1967, pp. 236-237) add credence to Krathwohl's argument. They worked with programmed instruction and suggested that student performance be identified as observable behavior, specifying the exact ability and content to which it is applied. These authors proceeded to explain logically and sequentially why this is true but offered no empirical proof.

Klein (1972, pp. 38-50) concluded that the six levels of behavior defined by Bloom's Taxonomy of Educational Objectives: Cognitive Domain, could be distinguished and measured for children in the age range of seven to nine. Klein's conclusion that it is possible to measure and distinguish the six levels of cognition can be questioned. Knowledge and comprehension, the two lowest levels of Bloom's taxonomy, it is agreed, can be measured and identified. The primary question for consideration is: Did Klein measure and identify the higher mental processes of application, analysis, synthesis and evaluation? The author asserts that a scientific laboratory lends itself to these kinds of evaluations, but a typical classroom does

not. Experimenters employing behavioral objectives often assume they have tested levels three through six when actually only one and two have been evaluated. This error occurs when the theory and rationale behind the application of behavioral objectives is not fully understood.

Research was conducted by Jenkins and Deno (1971, pp. 67-70) to determine whether providing teachers, students, or teachers and students with behavioral objectives increased learning during fixed instruction time. The findings did not substantiate the above proposition. The authors did suggest that there was no significant difference because the teachers and students did not heed/follow the objectives. "When a unit is well structured, designed to facilitate the attainment of particular objectives, explicitly stated objectives may be superfluous in that teachers and students are able to 'read through' the materials to the objectives" (Jenkins & Deno, 1971, p. 69).

A study was carried on at Hinds Junior College in Raymond, Mississippi, where behavioral objectives were used and the following was observed. The performance of students increased, the faculty accepted the use of objectives as an educational innovation and continued teaching/learning successes were anticipated. The study dealt with audiovisual education and planned to employ multimedia materials in further research efforts (Elkins, Gaby & Rabalais, 1970, p. 21). The serious limitation of the study was that it was based on subjective observation and not tested empirically.

An experiment by McNeil (1967, pp. 69-74) was conducted to prove that the efficiency of the teacher can be indicated by what his pupils are able to do following instruction. Teachers and supervisors agreed on what behavioral objectives would be sought for particular pupils and what amount

of achievement by the pupils would be accepted as evidence that the teacher did his job. Results indicated that the emphasis and use of behavioral objectives did result in increased performance by the learners.

Pfeiffer (1967, pp. 31-38) studied verbal interaction and the differentiation of cognitive goals. Two cognitive ability levels were selected and five teachers taught classes consisting of both levels. Pfeiffer found that: 1) lower mental processes are emphasized in lower cognitive classes, 2) knowledge goals are differentiated by test items for classes that vary in cognitive abilities, and 3) teachers did agree on the pattern of cognitive goals that should be developed, but tested for another.

Dissertation Research. Conlon (1970) challenged the premise that knowledge of behavioral objectives significantly alters student performance. In this study one group of seventh graders were given behavioral objectives prior to instruction and another group was not. The hypothesis that seventh-grade students employing instructional objectives would score significantly higher than seventh-grade students not using objectives was tested at the .05 significance level. The findings were not statistically significant and it was concluded that behavioral objectives do not alter student performance.

Oswald (1970) used explicit instructional objectives to experiment with 619 eleventh grade social studies students. He, also, was testing at the .05 level of confidence for increased test performance but was not able to conclude that behavioral objectives had a positive effect upon the performance of his subjects.

Support for the application of behavioral objectives to classroom situations can be drawn from research by Jordan (1971), Boardman (1970),

and Bidwell (1971). These individuals with minor variations attempted to prove empirically that increased learning did occur from using specific instructional objectives. None of the three were able to report positively on this proposition. Each, however, did report an important observation concerning the use of objectives.

Jordan concluded that the use of behavioral objectives did result in students having positive attitudes toward biology and the better a student's attitude the higher his level of cognitive understanding. Boardman stated that students should be instructed in how to use behavioral objectives. If students do not understand the rationale behind the use of behavioral objectives, they cannot employ them properly and therefore increased learning cannot occur.

Bidwell suggests that the writing of behavioral objectives for lecture courses benefits the instructor more than the student. During the process of preparing behavioral objectives, the instructor has increased his proficiency by emphasizing the important concepts and issues. As students respond to these concepts and issues, their attitudes toward lecture presentations become positive. Favorable student response inspires additional teacher preparation. Perhaps behavioral objectives for students would become incidental if all lectures were carefully prepared and emphasized learning outcomes.

In contrast to the above, research by Doty (1968), McCullouch (1970), Nelson (1970), and Dalis (1969) suggests that student performance does increase when behavioral objectives are used. Doty found that students who received objectives, before the teaching of an instructional unit, usually achieved higher test scores than students who did not receive

the objectives. McCullouch reported test results which indicated that students who employ behavioral objectives score higher in arithmetic fundamentals and reasoning than students who do not use objectives.

Nelson's study dealt with the teaching of college economics. He concluded that increased achievement occurred when students were given specific instructional objectives. Nelson implies that professors who apply the traditional lecture as the method for transferring knowledge to students can employ behavioral objectives with a minimal amount of effort.

Three conclusions were arrived at by Dalis: 1) Classroom achievement can be enhanced through the use of precise behavioral objectives, 2) instructional objectives enable students to select learning activities associated with the objectives, and 3) students who use behavioral objectives study the same length of time outside class as they did before objectives were used.

An investigation by O'Connell (1971) attempted to identify teacher decision-making as it relates to instructional objectives. It was concluded that pre-planned objectives for classroom use encouraged in-class emergent objectives; cognitive objectives are much more identifiable than affective; and instructional goal-setting is an ongoing classroom process.

Behavioral Objective Employment Requires Training. A new approach is being advocated by Bernabei and Leles (1970). They suggest that schools should have in-service programs that teach instructors and supervisors how to write behavioral objectives. It should be noted that the authors emphasize that behavioral objectives are not a panacea for the assorted ills of curriculum and instruction.

Cardarelli (1971) investigated the Bernabei and Leles suggestion as

it relates to pupil achievement. Teacher training in the use of behavioral objectives did have a limited effect. Teachers who utilized behavioral objectives without prior training did not significantly influence pupil achievement. Teachers trained in the use of behavioral objectives but not employing the behavioral objective technique experienced the highest cognitive achievements by students. Students that had the advantage of behavioral objectives, but were taught by teachers who had not been trained in the proper use of objectives, achieved the lowest test scores.

In conclusion, despite the literature that has been written on behavioral objectives, there is no conclusive evidence at any grade level for any subject that decisively proves increased performance does occur when a teacher employs behavioral objectives versus a technique where behavioral objectives are not used.

CHAPTER III

DESIGN, MATERIALS AND PROCEDURES

The purpose of this chapter is to describe the following elements of the study: 1) experimental design, 2) assumptions, 3) limitations, 4) population, 5) instructional strategy, 6) construction of curriculum materials, 7) test validity and reliability, 8) testing procedures, 9) hypothesis of the study, 10) pattern of logic, and 11) statistical analysis.

Experimental Design

A modified version of Campbell and Stanley's (1963) Pretest-Posttest Control Group Design as shown below was used in the study.

$$R\ O_1\ X\ O_2$$

$$R\ O_3\quad O_4$$

The R's in the first column indicate that random assignment of students to the two groups did occur and that the treatment was randomly assigned to group one. The O's in column two denote the administration of an identical pretest to both groups. The X in column three indicates that only the experimental group received the treatment. Column four denotes that both groups were given the posttest which had been previously administered as the pretest.

The decision to apply the above research design was based on its simplicity and exceptional controls for internal validity. Randomization

permitted the investigator to control most of the variables that could bias the study (Kerlinger, 1964, Ch. 15-19).

Two problems with internal validity were anticipated. The first dealt with the possibility of interaction among students. The two groups had class on the same day; the experimental met at 8:30 A.M. and the control at 12:30 P.M. Every possible precaution was taken by this investigator to keep student interaction at a minimum, but interviews at the conclusion of the experiment indicated that some interaction did occur.

The second potential for violating internal validity existed because the investigator was to teach both groups. Once the instructor prepared for and taught the 8:30 A.M. class using behavioral objectives, the same course material could not be presented without content preparation bias.

This should not be interpreted as intentional instructor bias. Instructor bias was controlled and the controlling methodology is described in the "Instructional Strategy" section of this chapter. The author's lecture preparation for the 8:30 A.M. class where behavioral objectives were employed could not be isolated or controlled and had to affect the 12:30 P.M. lecture. The investigator, given the restraints of the experimental design, could not prevent this deficiency. (This violation made it more difficult to prove the hypothesis and could not invalidate the results.)

The method of statistical analysis selected to test the results of the study was to compute the mean difference in posttest achievement scores between the two groups ($O_2 - O_4$). The statistical test which is best suited to analyzing the above design is the two independent t. Since the researcher was interested only in the effect of the behavioral objective treatment, the above design and statistical test were considered appropriate.

Assumptions

Three assumptions, two experimental and one statistical, were necessary to conduct this study. The experimental assumptions were: 1) The two groups, experimental (T_1) and control (T_2), were assumed to be equal in the abilities to achieve cognitive levels of learning. The validity of this assumption is based on the American College Test (ACT) scores obtained for the two groups and the means and standard deviations of the pretest.* 2) It was assumed that (T_1) and (T_2) were exposed to the same course content during the experimental period. This assumption is valid because the following aspects of the teaching situation were controlled. a) The author taught the same material to both groups with one exception. (T_1) received the treatment and (T_2) did not. b) The same tests over the same course content were administered to both classes. c) The same text (de Blij, 1971) was used for both groups. d) Two professors from the Department of Geography attended all classes to insure that the author did not bias the results.**

The statistical assumption concerns the two independent t which is the instrument used to evaluate the hypothesis of the study. Three assumptions must be met when employing this statistical instrument. These assumptions are normality, homogeneity of variance and independence of observations. The two independent t is robust to normality and equal variances if the subjects are chosen from a normal population and the samples are sufficiently large. This statistic is never robust to independence of observations.

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*Since the University of Oklahoma does not require transfer students with acceptable academic achievement (at least 2.0 on 4.0 scale) to take the ACT, scores for all subjects could not be obtained. Available ACT scores and pretest results are reported in Appendix B with their means and standard deviations.

**Professors Nelson Nunnally and John Steinbrink attended all classes to insure experimental control of this variable.

The supposition that the assumptions of the two independent t are met is valid because no form of selectivity was used in choosing the samples. The groups were comprised of random female students who enrolled in an introductory college geography course for elementary education majors at the University of Oklahoma, Norman, Oklahoma, during the fall semester of the academic year 1972-73. The students had no prior knowledge concerning the experiment and registered according to their scheduling needs in either (T_1) or (T_2). Appendix B is again offered as proof that this is a random sample and the necessary assumptions of the t statistic have been met.

Limitations

This study was conducted within the following limits to internal validity:

1. The same geography achievement test was used as the pretest and posttest for both the (T_1) and (T_2) groups.
2. Both the (T_1) and (T_2) classes were taught by the same instructor. This is considered a limitation because (T_1) was taught first. The instructor used behavioral objectives to teach (T_1) so (T_2) had to be influenced somewhat by the behavioral technique.
3. Because of university enrollment and scheduling procedures, the two groups were not perfectly matched. The subjects were middle class American caucasian females and practically all were between the ages of 18-23. While class homogeneity was assumed the limitation is recognized.

External validity, or generalizing to a larger population, is difficult to resolve. Theoretically, the conclusions drawn from the study are only applicable to the sample. Perhaps through cautious analogy, some general

statements concerning the implementation of the behavioral objective technique to the teaching of introductory college geography can be suggested for both male and female students regardless of their academic majors and geographical location.

Population

The Chairman, Department of Geography, University of Oklahoma, made arrangements for the author to experiment with two classes of Introductory Geography for Elementary Teachers (2614).* The course 2614 was chosen because most elementary education majors at the University of Oklahoma are female, caucasian, middle class and between the ages of 18 and 23. Since the investigator had chosen a practically homogeneous sample, potential violations of internal and external validity were minimized.

Randomization was easily obtained because elementary education majors are required to take 2614. When students registered, they chose either the 8:30 A.M. or 12:30 P.M. class.

Forty-four students enrolled in (T_1) and 41 in (T_2). Males, minority students and persons who were not present for the pretest were eliminated from the experiment. There was a total of 36 possible subjects for (T_1) and 33 for (T_2). Thirty-three students were randomly chosen from (T_1); so the treatment and control groups would be of equal size. Thirty-three subjects per group was considered an acceptable sample size (Hays, 1963).

The experimenter used the students' American College Test (ACT) scores and the means and standard deviations of the pretest to determine if the two groups were similar in cognitive abilities. The groups were found to be

*Professor John W. Morris was Chairman during this experiment.

practically equal, and the treatment was then randomly assigned to (T_1)*. (See Appendix B).

Instructional Strategy

The literature review revealed a number of experiments dealing with behavioral objectives (Bidwell, 1971; Boardman, 1970; Cardarelli, 1971; Conlon, 1970; Dalis, 1964; Doty, 1968; Jordan, 1971; McCullouch, 1970; Nelson, 1970; O'Connell, 1971; Oswald, 1970). In practically every instance, however, the experimenters used research designs which measured the effect of behavioral objectives on more than one variable (test performance, student attitudes and high, middle and low achievers). The investigator deliberately chose a design which was simple and permitted the isolation of the increased performance variable. The intent of the instructional strategy was to compliment the research design.

During the spring semester of 1972, the investigator attended numerous classes of "Geography for Elementary Teachers." The purpose of the observation periods was to aid the researcher in understanding the educational perception of University of Oklahoma female elementary education majors. The conclusions drawn from the observations provided direction for the

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*1970-71 ACT scores for a 10 percent random sample of 21,720 students at 97 type four institutions are reported by the American College Testing Program (1972, p. 124). Seven-hundred ninety-eight women were selected for the sample. The women had a composite mean of 19.4 and standard deviation of 4.8. (Type four institutions are those that offer doctor of philosophy and equivalent degrees). During school year 1971-72 there were 11,472 high school females in Oklahoma that were administered the ACT. Their composite mean was 18.2 and the standard deviation was 5.2 (American College Testing Program, Oklahoma, 1972, p. 37). (T_1) had a composite ACT mean of 20.6 and standard deviation of 3.94 and (T_2) had a mean of 20.62 and standard deviation of 4.79. These means and standard deviations indicate that in comparison with national and state scores, the investigator had chosen above average groups. A probable explanation for the higher scores is that the majority of students used in the experiment are sophomores and juniors in college while the ACT scores are based on information attained from testing high school seniors.

teaching strategy which was developed. Instructional methodology utilized in teaching the experimental and control groups was expected to accomplish more than the empirical measurement of the behavioral objective technique. The investigator was responsible for preparing future elementary social studies teachers. Therefore, the teaching strategy that evolved resulted from the following conclusions:

1. The majority of the students taking 2614 are white, female, middle class and between the ages of 18 and 23. (Most of this information was verified by a records check.)
2. Generally students do not understand why they must take 2614, are not interested in geography and consider it a difficult subject. (One of the main course objectives of the instructor was to convince 2614 students that geography is an integral part of elementary social studies.)
3. Lack of student interest results in low class attendance unless class lectures provide information needed to achieve a satisfactory course grade.
4. Instructor lectures are preferred over class participation activities. (This is true until a successful activity is conducted.)
5. The students' impression of the instructor on the first class day is very important. (Such items as the instructor's mode of dress, authoritative manner and subject interest will affect a student's attitude toward the class.)
6. Most of the students enrolling in 2614 have not studied geography since eighth grade. They have little knowledge of geographic concepts and cannot be expected, in a one semester course, to become geographers.

Because of the above, the writer realized that only geographic concepts which would be useful to elementary teachers should be taught. A communicative technique which left little doubt in the students' minds as to what was expected of them was needed.

The schedule of classes for the time period when the experiment would be conducted indicated that two different professors would teach 2614.* If two professors taught the classes, content information and teaching methodology would differ somewhat. Therefore, it was decided that internal validity would be greater if the author taught the classes and the professors observed to insure that all experimental procedures were identical with the exception of the treatment.**

The experiment was conducted over a period of seven weeks, beginning August 28 and ending October 13, 1972. Six weeks were used to teach six geographical units and administer six 10 minute quizzes. The remaining time was used for introducing the course and administering the pretest and posttest. The duration of the experiment was purposely kept brief to limit the possibility of student interaction.

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*Professor Steinbrink was scheduled to teach the 8:30 A.M. class and Nunnally the 12:30 P.M. class. Because of scheduling commitments neither professor was able to teach both classes.

**The students were told that the author was teaching their classes to satisfy his degree requirements. They were not informed that an experiment was being conducted. Elimination of the "Hawthorne Effect" was considered more important than the possibility of student interaction. During the experiment, one (T_2) student did ask why (T_1) had a behavioral objective handout and her class did not. The author explained that Professor Steinbrink required the use of behavioral objectives and Professor Nunnally thought they were unnecessary. The student was advised to follow instructions given to (T_2) and ignore what (T_1) was doing because she might become confused. When asked at the conclusion of the experiment if she had done what the author advised, the student stated that she had.

The curriculum materials, behavioral objectives and tests were prepared during the spring and summer sessions of 1972. (T_1) was not taught how to use behavioral objectives. They were informed that class lectures and examinations would coincide with the objectives. (T_1) received the objectives for a geographical unit one class day before teaching of the unit was begun. Except for receiving a copy of the behavioral objectives, methodology for instructing (T_2) was identical.

One of the criticisms of behavioral objective application is that they can lead to didactic teaching. Therefore, the investigator attempted to employ a mixture of expository and discovery methodology. Key constructs for each lecture were written on the blackboard. The instructor would discuss the constructs using concrete examples to develop geographical concepts. Comments from students were solicited, critiqued and clarified. Individual concept discovery was encouraged and in one instance group dynamics was utilized. Instructional application of geographical concepts to an elementary classroom were constantly stressed. Lecturing dominated but class participation was highly encouraged and sometimes forced. The general objective of the experimental teaching period was to demonstrate to future elementary teachers that geography is an integral part of an elementary social studies curriculum.

The 2614 class has a required laboratory period which is taught by graduate assistants. The assistants were briefed on the purpose of the experiment and the importance of not informing students that experimental research was being conducted. They were requested to prepare student lab activities based on concepts which had not been introduced in the class lectures.

The laboratory periods were used by the investigator to interview students at the conclusion of the experiment. The information collected from the interviews was used to determine the amount of student interaction that had occurred and to ascertain student reactions to the behavioral objective technique.

Curriculum Materials

The text Geography Regions and Concepts (de Blij, 1971) had been adopted by the professors teaching Geography 2614. This text was quite appropriate for the researcher's purpose and was adequate for preparing future elementary school teachers.

Since the duration of the study was limited to seven weeks (18 instructional lessons), only the first six chapters of the text were assigned. Behavioral objectives for each chapter were written prior to the experiment. These objectives were reviewed and approved by the professors of 2614 (see Appendix C).

The first six chapters of the textbook (de Blij, 1971) are 1) Regions of the World, 2) The Growth of Europe, 3) Regions of Europe, 4) Eastern Europe--The Shatter Zone, 5) The Soviet Union--Region and Realm and 6) North America (by S.S. Birdsall). All behavioral objectives were written to assist the students in attaining cognitive knowledge and comprehension of the concepts contained in chapters 1-6.

The behavioral objectives created for this study do not adhere to the strict behavioralist's method of writing objectives. For example, Clegg suggests that if instructional geographic objectives are written properly they must include the following five criteria:

1. The person who is to perform the particular learning behavior (e.g., the student, the learner, the class, a small group, a committee).

2. The specific behavior required to demonstrate accomplishment of the objective (e.g., to write, to name, to construct, to locate).

3. The learning outcome or product by which the accomplishment of the objective can be evaluated (e.g., a statement of fact, or a generalization, a contour map, a simple grid system).

4. The conditions under which the behavior is to be performed (e.g., with the aid of an atlas, using data from the 1970 census).

5. The criterion or standard used to evaluate the accomplishment of the performance (e.g., correct to the nearest mile, four out of five correct). (Clegg, 1970, p. 292)

The investigator is in total agreement with Clegg's formula from the standpoint of writing precise behavioral objectives. However, based on experience with the use of behavioral objectives, the researcher has found that strict adherence to this formula can result in student motivational problems. For example, item number 5 many times is interpreted by the student as rote memorization; and too much teacher required memorization may result in motivational problems. When precise amounts of memorization are not specifically indicated by the behavioral objective, the researcher has found that students accept the rote memory task more readily. Writing required rote memory tasks in behavioral terms negatively affects student attitudes much more than teacher implied memorization. Weighing costs against benefits the investigator suggests that behavioral objectives are most useful when item 5 is used sparingly.

Items 2, 3 and 4 are absolutely necessary in behavioral objective writing. In all instances, the author satisfied these criteria. Item 1 is helpful but does not need to be used every time. Students, in most

instances, know intuitively who is responsible for a particular learning behavior.

To enhance learning in both classes, newspapers, educational articles, overhead projections and maps were used as instructional aids for teaching important concepts. These kinds of curriculum aids are standardized and can be located in most college libraries or geography departments.

The curricular instrument used to measure the effect of the behavioral objective treatment was written by the researcher.* It served as a pre and posttest and was given to both the control and experimental groups. The test was used to compare differences and relationships in mean achievement scores among students of the two groups. The instrument was a fifty item, four-option, 50 minute multiple-choice achievement examination. It questioned students on the assigned six geographical units placing emphasis on knowledge and comprehension of regional geographic concepts (see Appendix D).

The investigator also constructed six, ten item, four-option, 10 minute multiple-choice quizzes. Pre-posttest questions were not repeated on the quizzes. These six quizzes were given to students in both groups and each quiz covered one geographical unit (see Appendix D).

The quiz methodology had two purposes.

1. A quiz given at the end of each geographical unit would require weekly student preparation. The investigator wanted to discourage last minute test preparation as much as possible.

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*Available standardized achievement tests for geography are scarce and usually cannot withstand critical evaluation (Wood, 1971, pp. 131-150). This factor plus the author's experimental treatment required that an original testing instrument be developed.

2. When interaction may occur, a single 10 minute, ten question, four-option, multiple-choice quiz is not a large enough test sample to make statistical inferences or test a hypothesis for homogeneous groups. The six quizzes were not used to provide statistical data for testing the hypothesis of the study. The purpose of the quizzes was to compare the group means and standard deviations to determine if experimental bias did occur because students from (T_1) had an opportunity to provide (T_2) with test questions. If (T_2) performed significantly higher than (T_1) the research hypothesis could not be proven.

Test Validity and Reliability

The final 50 items for the pre-posttest were judged for content validity by three professors of geography.* Each had access to the textbook and the behavioral objectives used in the study.

Sixteen University of Oklahoma students enrolled in an introductory physical geography course were each paid $2 to take the pre-posttest. The exam was then scored and analyzed by the computerized University of Oklahoma Item Analysis System (UOIAS). The UOIAS employs the Kuder Richardson Formula 20 to compute reliability. The results are reported in Table 1.

TABLE 1

PRE-POSTTEST RELIABILITY COEFFICIENT AND STANDARD ERROR

Number	Reliability	S.E. of Meas.
16	.41	2.97

*Professors Marvin Baker, Nelson Nunnally and John Steinbrink judged the pre-posttest and six quizzes for content validity.

The author attempted to improve the test's reliability by rewriting questions which were designated as poor by an item analysis. After revision and review, by the three previously listed professors, the test was administered to (T_1) and (T_2) as the pretest. Table 2 lists the results.

TABLE 2

PRETEST RELIABILITY COEFFICIENTS AND STANDARD ERRORS

Groups	Number	Reliability	S.E. of Meas.
T_1	33	.32	3.13
T_2	33	.56	3.14

Questions were not rewritten, and the pretest was administered as the posttest with reliability results reported in Table 3.

TABLE 3

POSTTEST RELIABILITY COEFFICIENTS AND STANDARD ERRORS

Groups	Number	Reliability	S.E. of Meas.
T_1	33	.60	2.69
T_2	33	.69	2.82

The UOIAS indicated that there were four items that were too easy (95 percent or more of the students answered correctly) and no items that were too difficult (5 percent or less of the students answered incorrectly). A revision of the posttest to improve the items that 65 percent or more

answered correctly or that 20 percent or less answered incorrectly would increase the reliability coefficients. Increasing reliability coefficients should not be interpreted as justification for rewriting test questions when behavioral objectives are employed.

Test reliability and behavioral objective application appear contradictory. For example, behavioral objectives, when properly utilized, emphasize that within certain limitations all students will be able to perform a designated objective at a prescribed cognitive level. A test is given to the students to determine if the behavioral objective has been achieved. If test questions are answered correctly, the teacher assumes the objective was accomplished successfully. The statistical reliability of such a test, however, would be unacceptable. A high reliability coefficient dictates that a certain number of students must respond incorrectly to test questions. "No matter how computed, the reliability coefficient is only an estimate of the percentage of the total variance that may be described as true variance, i.e., not due to error" (Kuder & Richardson, 1967, p. 95).

Careful analysis of the above reveals that the contradiction is in the teacher application of reliability coefficients and not test reliability theory. When behavioral objectives are employed, test reliability coefficients should be used to identify concepts that have not been learned because they were taught poorly or were too difficult for students to grasp. A test question which every student answered correctly (especially at the lowest cognitive level) should not automatically be interpreted as a poor question. Interpretation of reliability coefficients in this manner continues to stress the elimination of poor test questions, but the additional dimension of teacher objective accomplishment is added. A meaningful

reliability coefficient would indicate a well written test that could be used to help the teacher to identify concepts that had not been mastered.

The author is applying the theory of mastery learning to the concept of test reliability. It is argued that the two are compatible if test reliability coefficients are used in the manner indicated. When behavioral objectives are employed, differences in student scores continue to occur. The research conducted in the present study indicates that there are few test questions that 95 percent of the students will answer correctly.

> For example, the total score, grade equivalent, or percentile rank on either a standardized or teacher-made achievement test is of little formative value because it does not provide specific enough information about the objectives a student has or has not mastered. The teacher must inspect item response patterns--or at the very least sub-scores on the test--to determine what specific objectives the student has mastered relative to the ultimate objectives of the instruction (Airasian, 1971, p. 85).

Testing Procedures

Testing procedures for (T_1) and (T_2) were uniform. The pre and post-tests were administered by the investigator with the help of a professor. During the tests students were required to have sufficient space between their seats to minimize copying opportunities. Discussions during the exam period were not permitted, and no large time lapse between the testing of (T_1) and (T_2) occurred. (Time lapse was from 8:30 A.M. to 12:30 P.M.) One class period, 50 minutes, was allowed to complete the exams, and answers were machine scored using the Oklahoma Item Analysis System (UOIAS) by the University of Oklahoma Computer Center.

Quizzes were administered at the completion of each geographical unit. Students had 10 minutes at the end of designated class periods to complete a quiz. The examination procedures described above were applied (with the

exception of the spacing between subjects) and quizzes were machine scored.

Hypotheses

One major hypothesis and two subsidiary hypotheses were established to provide direction for the research. These hypotheses were:

Major Hypothesis:

The mean posttest achievement scores of a group taught six geographical units using behavioral objectives (T_1) did not differ significantly (α=.20) from the mean posttest achievement scores of a group taught the identical units without behavioral objectives (T_2).

Subsidiary Hypotheses:

1. The mean posttest achievement scores of (T_1) are significantly higher (α=.20) than the mean posttest achievement scores of (T_2).

2. The mean posttest achievement scores of (T_2) are significantly higher (α=.20) than the mean posttest achievement scores of (T_1).

Statistically the above hypotheses are stated as follows:

$$H_0 : u_1 = u_2$$
$$H_1 : u_1 > u_2$$
$$H_2 : u_1 < u_2$$

Based on the .20 significance level the null hypothesis states that there was no statistical difference between the mean posttest achievement scores of (T_1) and (T_2). The alternative hypotheses indicate statistically that there was a difference and either (T_1) or (T_2) achieved higher mean scores.

Pattern of Logic for Testing the Research Hypothesis

The logic used in the study claims that it is extremely unlikely ($B < .03$) for $\bar{X}_{.1}$ to be equal to $\bar{X}_{.2}$ without the null hypothesis being true. This claim can be considered probable if the treatment is the only variable manipulated. All other variables must be eliminated or held constant.

Personal attributes of the students can be discounted as a probable

cause of differences between the group means. This assumption is based on the randomization factor in the research design. Both the personal attributes of the students and the assignment of the treatment were randomly distributed. It is recognized that the groups are not perfectly matched, but the randomization factor has protected against systematic biases in the data (Hays, 1963, Ch. 7).

The student interaction variable could have caused a difference between group means and biased the experiment. There was no way for the experimenter to maintain satisfactory control of this variable. The classes meeting at 8:30 A.M. and 12:30 P.M. and receiving the same materials and tests presented a problem to the logic of the study. Since the 8:30 A.M. class received the treatment, experimental bias favors the non-objective group. Therefore, if the performance of the experimental group was equal to or higher than the control group, it could be assumed that interaction was not a confounding variable. If the control group performed significantly higher than the experimental, an interaction bias would have been a possibility and the research hypothesis could not be proven.

Student interviews at the conclusion revealed minimal interaction. Four subjects admitted that they had received advance test information. The test information they received, however, helped them on the quizzes and had no effect on posttest results. The investigator planned to report quiz results but only the posttest would be used to test the hypothesis. Evaluating the above situation led the investigator to conclude that interaction was not a confounding variable or a limitation to the study.

The instructor variable could have affected the study logic. Control over this variable was exercised by having either of two professors

attend all classes.* The professors interacted to insure that exactly the same content materials were offered with the exception of the treatment. Occasionally, when scheduling permitted, a professor attended both the 8:30 A.M. and 12:30 P.M. classes. No experimental bias, either for or against behavioral objectives, occurred in the judgment of the professors.

To summarize, if $\bar{X}_{.1} > \bar{X}_{.2}$ the behavioral objective treatment had an effect on the findings. If $\bar{X}_{.2} > \bar{X}_{.1}$ either interaction occurred or the treatment produced a negative effect.

Statistical Analysis

A two independent t statistic tested at the .20 level of confidence was applied to determine if there was a significant difference between the post-test mean achievement scores of the two groups (see Appendix E). The t assumptions were discussed in the "Assumptions" section of this chapter; therefore, this section will describe the unit of analysis, selection of alpha level and power of the statistic.

The group mean was chosen as the unit of statistical analysis because of the independence of observation assumption. In applying the t statistic this is the one assumption which cannot be violated. Independence of test response by individuals was a concern because the research was conducted in intact classes and test interaction was a possibility. Given this situation, the group mean is a better unit of statistical analysis; as it is an average statistic and decreases the negative consequences of test interactions.

The alpha level choice was a difficult decision. Traditionally, alpha for educational experiments is set at the .05 or .01 confidence levels.

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*Professors Nelson Numnally and John Steinbrink attended all classes.

Scientific research demands that alpha be decided a priori. This meant that the investigator had to make a decision concerning Type I and Type II errors.

Type I error is made when the null hypothesis is falsely rejected. Type II error is made when a false null hypothesis is not rejected (Hays, 1963, p. 280). The researcher had to decide conceptually which type of error would be most detrimental from an educational viewpoint.

The research hypothesis was that mean posttest achievement scores of a group taught geographical units using behavioral objectives would not differ from a group taught identical units without objectives. When a Type I error is made, the hypothesis is rejected when it is true. From an educational standpoint saying that behavioral objectives do make a difference when they do not is not a serious error as long as students perform at or above established cognitive levels. A review of the research literature indicated that when behavioral objectives are employed students' test performance levels are equal to or greater than the performance levels of students who did not have the benefit of objectives. (See the empirical studies reported in Chapter II.)

When a false null hypothesis is not rejected, a Type II error has been committed. Thus, if there really is a difference what is the educational cost associated with mistakingly accepting the null hypothesis? The theory of Type I versus Type II error is best summarized in the following quote.

> ...Granting that scientific discretion is commendable, the mistaken conclusion that "something really happened" is not necessarily worse than overlooking a real experimental phenomenon. In some situations, perhaps, we should be far more attentive to Type II errors and the power of our tests, and less attentive to setting α at one of the conventional levels. Furthermore, if the conventional α levels are to be used, a little more thought might be given to deciding exactly what is

> the null hypothesis we want to be so careful not to reject falsely (Hays, 1963, p. 281).

Based on the above, the author concluded that the most serious error that could be made was to reject an innovative educational technique because of a statistical tradition. Therefore, the investigator decided to test the null hypothesis at the .20 level of significance. This means that a difference as large or larger than the designated one could occur by chance 20 times out of 100. Conceptually, the author concluded that for this kind of student/teacher learning situation Type II errors should be minimized.

There are three ways to control the power of the t statistic. They are:

1. Increase the sample size. (The sample size was determined by the number of students enrolling in 2614, so this option was closed.)
2. Use a two-tailed test. (This had already been decided), or
3. Increase the size of alpha. (This occurred when the investigator decided that Type II errors were more costly than Type I.)

Conceptually the writer had to decide the amount of difference that should be detected before the power of the t statistic could be computed. After interviewing several geography professors it was agreed that more teacher preparation time is normally required to prepare for a behavioral objective class than a traditional lecture class. If additional teacher preparation is required, then how much increased student performance must occur for the extra preparation by the instructor to be worthwhile? The professors decided that a 5 percent increase in test performance levels would warrant the use of an innovative procedure. Pooling the standard deviations of the posttest revealed almost a 5 percent difference (4.64) in student performance levels when behavioral objectives were employed. Assuming that

a 5 percent increase in performance levels is an acceptable argument for implementing an innovative technique and given the pooled standard deviation of the posttest as 4.64 percent, it was decided that the power of this test should be based on detecting a 5 percent difference.

The formula for computing the power of a t test (as reported in Appendix E) was then employed. Using a .05 alpha level with 64 degrees of freedom and a phi value of 4.4 the power is reported as .975 (Dixon & Massey, 1957, p. 424). Increasing alpha adds power, so the investigator was assured of power in excess of .975.*

Summary

The study was designed to measure the mean difference in posttest achievement scores of students who were taught introductory college geography using behavioral objectives and those taught without behavioral objectives. The population consisted of 66 female students enrolled in "Geography for Elementary Teachers" during the fall semester of 1972 at the University of Oklahoma, Norman, Oklahoma. Each group was comprised of 33 students, and evidence indicated that the samples were practically homogeneous. The only difference in the treatment of the groups was that (T_1) received behavioral objectives and (T_2) did not.

All subjects were administered a pretest, six quizzes and a posttest. An appropriate statistical analysis of mean posttest achievement scores was conducted, employing the two independent t, to test the null hypothesis formulated for the study.

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*The investigator's choice of alpha could be challenged on the basis of test power theory. With a .05 alpha, .97 power is outstanding. However, from an educational viewpoint the investigator is convinced that failing to reject a false research hypothesis is the most serious error that could have been committed. Also α should be set before the posttest results are analyzed.

CHAPTER IV

DISCUSSION OF RESULTS

This chapter reports and discusses the results of the statistical analysis of the data collected during the experiment. The problem raised in Chapter I was translated into a research hypothesis in Chapter III, and now the data are applied to test the statistical hypothesis.

The problem, research hypothesis and statistical null hypothesis are:

Problem:

This study investigates whether increased cognitive performance occurs when a college geography instructor employs behavioral objectives as an integral component of instructional strategy versus an instructional approach without specific daily objectives.

Research Hypothesis:

The mean posttest achievement scores of a group taught six geographical units using behavioral objectives was significantly higher than the mean posttest achievement scores of a group taught the identical units without behavioral objectives.

Statistical Null Hypothesis

H_o: $u_1 = u_2$

Results

The present study was able to produce evidence which rejected the null hypothesis and supported the alternative hypothesis that using behavioral objectives facilitates the geographic cognitive achievement of female elementary education majors. A two independent t was used to test the statistical hypothesis with posttest group mean achievement scores as

the criterion variable. Behavioral objectives were the treatment which caused the difference in posttest means.

Presentation and Discussion of the Findings

The statistical hypothesis, H_0: $u_1 = u_2$, that the mean posttest achievement scores of a group taught six geographical units using behavioral objectives did not differ significantly ($p < .20$) from the mean posttest achievement scores of a group taught the identical units without behavioral objectives was tested against the alternative hypotheses, H_1 : $u_1 > u_2$ and H_2 : $u_1 < u_2$, that there was a statistical significant difference between the means. The observed t ratio was found to be significant. This led to the acceptance of H_1 and the observed difference was interpreted as a function of the behavioral objective treatment.

The posttest mean of (T_1) was 35 and (T_2) 33.484. Application of the t formula with 64 degrees of freedom revealed an observed t value of 1.32. The tabled value for a t ($\alpha = .20$) with 60 degrees of freedom is 1.296 and for 120 degrees of freedom 1.289 (Hays, 1963, p. 674). Interpolation indicates a statistically significant t at the .20 level of confidence. (See Table 4).

TABLE 4

TWO INDEPENDENT t ON POSTTEST MEAN GROUP ACHIEVEMENT FOR BEHAVIORAL OBJECTIVES

Alpha	Degrees of Freedom	Observed t Value	Tabled t Values
.20	64	1.320	1.296 - 60 df 1.289 - 120 df

Tables 5 and 6 and Graphs 1 through 5 (See Appendix F for Graphs) are offered to compare the test performance of the behavioral objective group (T_1) with the non-objective group (T_2). Table 5 and Graph 5 are directly related to the statistical findings of the study. Non-statistical inferences can be drawn from Table 6 and Graphs 1 through 4.

TABLE 5

MEANS AND STANDARD DEVIATIONS OF THE PRETEST AND POSTTEST

	Pretest		Posttest	
Group	Mean	Standard Deviation	Mean	Standard Deviation
T_1	19.212	3.811	35.000	4.235
T_2	19.696	4.515	33.484	5.057

Table 5 shows, based on pretest means, how evenly matched the two groups were prior to the teaching of the six geographical units. Note that (T_1) did have a slightly smaller mean and variance than (T_2). Comparing the pretest and posttest means indicates that (T_1)raised its mean 15.788 and (T_2) 13.788. (T_2's) pretest mean was .484 higher than (T_1's) but on the posttest it was reversed and (T_1) scored 1.516 higher.* (T_2) had the larger variance on both the pre and posttest. Posttest variances were larger than pretest and (T_2's) variance on the posttest increased more than (T_1's). The statistical inference can be drawn that employing behavioral objectives decreased subject variance.

*If a t test was calculated on the difference of the increase in average mean scores for the two groups (15.788 versus 13.788), the results would be significant.

TABLE 6

MEANS AND STANDARD DEVIATIONS OF THE SIX QUIZZES

	T_1		T_2	
Quizzes	Mean	Standard Deviation	Mean	Standard Deviation
1	7.575	1.256	7.000	1.325
2	7.333	1.318	7.580	1.264
3	6.375	0.992	6.322	0.996
4	6.750	1.520	6.484	1.209
5	5.787	1.665	6.781	1.634
6	7.969	1.487	8.500	1.145

Table 6 reveals the subjects' consistent test performances. Since only 10 questions were asked on each of the six quizzes, statistically significant differences were not expected to occur. The purpose of reporting this data is to provide further proof that the samples (T_1) and (T_2) do represent an identical population.

Since the groups are practically equal, two inferences can be drawn from Table 6. The investigator taught (T_1) first, so it could have been argued that the lecture delivered to (T_2) would be more precise and easier for the students to understand. The statistical data indicate this was not necessarily true as mean scores for the six quizzes varied. Three times (T_1) had the higher mean and three times (T_2) had a higher mean. A plausible inference is that the instructor's lecture methodology was held constant and the subjects were treated equally with the exception of the behavioral objectives.

The second inference is related to student interaction. Questions from the short multiple choice quizzes could have been retained by (T_1) students

and passed on to (T_2). However, as reported above (T_1) had a higher mean than (T_2) on quizzes 1, 3 and 4. The statistical data support the proposition that student interaction was minimal. Student interviews indicated that four (T_1) students had supplied four (T_2) students with quiz questions. The (T_1) students stated that questions for an entire quiz were never provided. Subjects insisted that there was no exchange of posttest information.

Graphs 1 through 5 (See Appendix F) show the raw score frequency distributions for the two groups.* A comparison of these frequency distributions affords the following observations:

1. Using a high to low continuum, (T_2) had subjects with higher raw scores at both ends of the continuum on the pretest and (T_1) had higher scores on the posttest (See Graphs 1 and 5, Appendix F).
2. (T_2) had 17 subjects with raw scores above the mean on the pre and posttest. (T_1) had 13 subjects with raw scores above the mean on the pretest and 15 on the posttest (See Graphs 1 and 5, Appendix F).
3. Raw score frequency distributions of the quizzes varied greatly (See Graphs 2 through 4, Appendix F). This can be attributed to the limited number of quiz questions and further supports the proposition that one instructor teaching both classes and student test interaction had a minimum effect as confounding variables.

Summary

The findings were reported in terms of the effect behavioral objectives had on posttest mean group performance scores. The main treatment effect

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*Because of absenteeism all subjects did not take quizzes 2-6. This is not considered a limitation because statistical conclusions were drawn from posttest data only.

hypothesis of no difference between the (T_1) and (T_2) groups was rejected, and the alternative hypothesis was accepted that mean group performance scores were significantly higher when the treatment variable was employed.

Employing behavioral objectives as an integral part of instructional strategy did result in increased test performances for female elementary education subjects at the University of Oklahoma during the fall semester of 1972. This study should be replicated employing an extended population to determine if the findings can be generalized to all college students required to take an introductory world regional geography course.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Purpose. The purpose of the present study was to analyze the facilitative effect of behavioral objectives on the test performance of elementary education majors enrolled in an introductory college geography course. The need for the study developed from the investigator's personal experience with the utility of behavioral objectives and the lack of empirical evidence delimiting the educational value of performance objectives when teaching introductory college geography. The educational theory that was tested suggested that behavioral objectives are an integral part of three basic theories; learning, communicative and teaching/instructional. Practical application of behavioral objectives to the above theories was expected to provide an answer to the research problem.

The problem posited and examined by this study was: Does increased cognitive test performance occur when a college geography instructor employs behavioral objectives as an integral component of instructional strategy versus an instructional approach where specific daily objectives are not employed?

Procedure. A review of the literature revealed a lack of empirical evidence which either supported or rejected the use of behavioral objectives to facilitate test performance. Experimental research applying the behavioral

objective technique to the teaching of introductory college geography was non-existent. Since information concerning the problem was limited, the writer decided to employ experimentation to answer the research question.

To provide direction in answering the question posited by the study the following research hypothesis was developed: The mean posttest achievement scores of a group taught six geographical units using behavioral objectives would be significantly higher (α .20) than the mean posttest achievement scores of a group taught the identical units without behavioral objectives.

A modified version of Campbell and Stanley's (1963) Pretest-Posttest Control Group Design was employed to provide data for testing the above hypothesis. Elementary education majors required to take an introductory geography course were chosen as subjects.

The subjects were randomly divided into two groups, consisting of an experimental treatment group (T_1) and a control group (T_2). Scores from the American College Test and an investigator written geography achievement pretest were employed to measure cognitive abilities. Analysis of test score data and the similar personal characteristics of the subjects led the experimenter to conclude that the two groups were homogeneous. Each group was composed of 33 subjects, and the behavioral objective treatment was randomly assigned. The investigator taught both groups and all subjects (66 students) were included in the final analysis.

The experiment was conducted over a period of seven weeks. Eighteen instructional lessons were taught with one week used for introduction of the course and pretest-posttest administration. Instructional methodology for both groups was identical with the exception of the behavioral objective

treatment which was written by the researcher and distributed to (T_1) before the teaching of each geographical unit.

The (T_1) and (T_2) subjects were given a specially constructed, multiple-choice, four-option, fifty item geography achievement test as a pre and posttest. The two groups were also administered six identical ten item, four-option, multiple-choice quizzes. The quizzes were used for group comparison inferences while the posttest mean scores were employed for the purpose of statistical analysis.

The two sample independent t was used to analyze statistically the effect of behavioral objectives on the students' test performances. The criterion measure was posttest group mean cognitive performance.

Summary of the Findings. Measuring the difference of the posttest group mean scores at the .80 level of confidence led to the rejection of the null hypothesis. The alternative hypothesis that the employment of behavioral objectives did significantly increase the test performance of introductory geography students was accepted. Since the effect was positive, the behavioral objective technique was concluded to be a desirable educational innovation when teaching introductory college geography.

Several limitations of the present study should be recalled when interpreting the data and drawing inferences. These limitations are as follows:

1. The study was limited to two classes of female, caucasian, middle class subjects between the ages of 18 and 23 from one university in the state of Oklahoma.
2. The instructional period for teaching the content materials was limited to six weeks.
3. The investigator taught both the experimental and control classes.

4. The experimental variable of with (T_1) or without (T_2) behavioral objectives was employed with only one teaching strategy, the lecture method.

Within these limitations, it may be stated that students who were taught geographical concepts with the aid of behavioral objectives achieved higher than students who did not receive the behavioral objectives. Stated differently, observed posttest cognitive achievement scores for the subjects that received the behavioral objectives were significantly higher as compared to the non-treatment subjects at the .20 level of significance.

Conclusions

The experimental population, as previously described, consisted of 66 students taught introductory college geography. Conclusions drawn from the study are applicable to that population and statistical generalizations to other situations are not appropriate. The following conclusions are based on student interviews, the observation of the investigator and the statistical analysis of data collected during the experiment.

Student Interview and Observational Conclusions. The reader is reminded that the following conclusions are not based on empirical data.

1. In most instances the behavioral objective technique requires additional teacher preparation. The extra preparation evolves into precise and often superior geographic content development regardless of the instructional methodology which the teacher employs.

Lecturing is the primary instructional methodology employed by professors for the teaching of introductory college geography. Since employing behavioral objectives requires extra preparation, the lectures

become much more concept oriented and highly structured. Improved lectures cause students to have an increased understanding of content materials and learning goals. Augmenting student knowledge of designated learning outcomes results in increased test performance. When test score achievement is raised, teachers assume learning has occurred. Therefore, the investigator concludes that behavioral objectives aid the teacher as much as the student.

The investigator observed that in (T_2) where students did not have the performance objectives given to them in writing, there were few questions concerning their learning goals. It is suggested that the observed difference between the two group means would have been greater if the instructor could have taught (T_2) without the behavioral objective preparation influence.

2. While behavioral objectives can cause teachers to be better prepared, students use them primarily to study for examinations. The idea that behavioral objectives develop a student's hierarchical cognitive processes is not true. A student develops the cognitive levels when a teacher provides laboratory situations which require the learner to analyze, synthesize and evaluate. Behavioral objectives communicate to the student the teacher's learning expectations and list criteria that can be employed to achieve the learning goal. Improved communication between the teacher and student encourages increased learning and is the educational justification for employing behavioral objectives.

Muehrcke (1972, p. 2) asserts that external influences, such as the emergence of a general theory of communication, are having a direct effect on research methodology. Muehrcke (1972, p. 2) writes, "Ramifications

from the communication and information theoretic approaches now permeate most scientific endeavor."

If Muehrcke is applied to this study, it is concluded that behavioral objectives are a communicative technique because learning is highly dependent on student awareness and understanding of teacher expectations. Accepting the premise that behavioral objectives are a means for improved student/teacher communication suggests that behavioral objective inferences relating to instructional and learning theory are unscientific. In the future experimentation measuring the effects of the employment of behavioral objectives should explore how objectives relate to communicative theory. The behavioral objective technique results in explicit communication, but does not develop a student's levels of cognition or improve a teacher's method of instruction.*

3. One of the primary arguments against behavioral objectives is their proported inflexibility. This is an invalid criticism. Behavioral objectives state explicitly what teachers expect students to learn. They suggest aids for achieving the learning outcomes but do not designate the processes the teacher or learner must employ to arrive at those outcomes. A well written objective contains the following:

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*Muehrcke (1972, p. 2) was concerned with cartography and the application of communicative theory to graphic communication. He argues that applying communicative theory to "mapping" problems has forced cartographers to apply the "systems" approach. Muehrcke suggests that this is causing cartographic methodology to be rethought, and reveals numerous new research and development areas. The writer believes that Muehrcke's proposition can be applied to the use of behavioral objectives. When behavioral objectives are conceptualized in terms of the "system" and their interdependence with all aspects of the education process, they become a communicative technique for improving teacher/student relations. Behavioral objective application within the "systems" framework should be rethought and tested within the parameters of communicative theory.

a. the performer.

b. the required behavior to demonstrate accomplishment.

c. the learning outcome by which accomplishment can be measured.

d. conditions under which the behavior will be performed.

e. the standard used to evaluate the performance.

Use of a particular study or teaching method is not implied by the above criteria. It is therefore concluded that employment of behavioral objectives results in a highly flexible educational program.

4. Classroom geographic behavioral objectives are usually based on the two lowest levels of Bloom's Taxonomy (knowledge and comprehension). This is true because the college classroom has been conducted traditionally within an expository environment. Exposition by a teacher will not develop a student's higher cognitive levels. Geographic lessons and field trips which force a student to use higher mental processes should be developed.

Statistical Conclusions.

1. It is imperative that statistical significance not be interpreted automatically to imply educational significance. For this study it was decided that a 5 percent increase in test performance, resulting from behavioral objective employment, would be accepted as educationally significant.

Employing behavioral objectives to teach elementary education majors specific geographic concepts appears to increase students' posttest achievement scores. Stated differently, employing the behavioral objective technique appears to generate a better prepared teacher who successfully communicates learning outcomes to students; who, in turn, increase their achievement test scores.

A tentative answer has been provided to the question posited by the investigator at the beginning of the study. The question was: "Is there a significant posttest achievement difference between groups when behavioral objectives are employed to teach one group and not used to instruct an identical group?" The research evidence resulting from the study leads to the conclusion that students taught with behavioral objectives score significantly higher statistically and educationally on a geography achievement posttest than students who do not receive behavioral objectives.

2. Statistical data indicate that true variance among students decreases when behavioral objectives are employed. The investigator used quiz and posttest scores to assign letter grades to subjects. This was accomplished to determine what effect the observed smaller variance of (T_1) had on letter grade distributions (See Table 7).

TABLE 7

DISTRIBUTION OF LETTER GRADES

Letter Grades	T_1	T_2
A	6	5
B	11	10
C	13	12
D	3	5
F	0	1

From Table 7 it can be seen that the letter grade distribution was higher for (T_1). Theoretically, behavioral objectives will be of little benefit to the "fast" or "unmotivated" learners. Students who have always earned "A's" cannot improve their grades by using behavioral objectives, and "F" students who have lost interest in a particular class will not benefit from the objective technique. These students will continue to perform as they have in the past, and successes or failures will be influenced very little by the use of behavioral objectives.

It appears that average or marginal students are the ones who profit from the employment of behavioral objectives. A student working to the utmost of his ability, but having difficulty recognizing designated learning outcomes, gains (in terms of letter grades) the most from behavioral objectives.

Based on the research contained in this study the investigator concludes that behavioral objectives are a desirable educational technique for the teaching of introductory college geography.

Recommendations for Geographic Education

Based on the findings, observations and conclusions of the present study the following recommendations are offered.

For Further Research.

1. This study should be replicated using teachers who employ various teaching methods to determine with which method behavioral objectives are most effective (two examples are expository and inquiry).
2. This study should be replicated in its present design to determine if all students required to take introductory college geography

regardless of sex, ethnic background, age, socio-economic levels, cognitive abilities and other criteria would benefit from the employment of behavioral objectives.

3. A study tracing the theoretical and historical development of behavioral objectives and their relationships to learning, communicative and teaching/instructional theories would be a worthwhile contribution.

4. A study should be designed to determine the educational relationships between the behavioral objective technique and test reliability (see page 42).

5. A study should be conducted to determine when behavioral objectives should be distributed to students (daily or weekly).

6. Studies should be designed for geography to measure whether Bloom's hierarchical cognitive levels can be distinguished and measured by employing behavioral objectives.

7. Studies should be designed to measure the effect behavioral objectives have on student attitudes (affective domain) toward geography.

8. Studies should be designed to determine who behavioral objectives benefit the most, the teacher or the student. The findings of the suggested studies should evaluate individual variables such as teacher personality and student achievement.

9. Educators should concern themselves with philosophical questions such as how much increased student test performance must occur before an innovative technique is considered educationally beneficial?

For College Geography Professors.

1. The findings of this study may be of special interest to college

geography professors, especially teachers of introductory geography courses. The evidence supporting the use of behavioral objectives may have instructional implications for classroom and laboratory teaching situations.

2. Education is entering a period in which it will be held accountable for student learning. The California legislature has already passed a type of behavioral objective based accountability bill, and similar legislation has been proposed in the 1973 Oklahoma legislative session. Since accountability is being operationalized, geography professors should become familiar with the behavioral objective technique and how it can be best utilized.

Like most communicative (i.e., educational) techniques, behavioral objectives have strengths and weaknesses and continued research is necessary to recognize the advantages and disadvantages. It should be realized that behavioral objectives have been "sold" as an innovative educational technique to the non-academic world. The public has decided that behavioral objectives will be employed, and it is now the responsibility of all educators to determine how behavioral objectives should be utilized.

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APPENDICES

APPENDIX A

Behavioral Objective/Teacher Preparation Model

BEHAVIORAL OBJECTIVE/TEACHER PREPARATION MODEL

CONTENT CLASSIFICATION	AREA	LEVELS
What is geography	World Regional Geography	1 2 3 4 5 6 7 x

PERFORMANCE OBJECTIVES	TAXONOMY CODE	1.00

Each student employing assigned readings, notes from class discussions and the instructor's comments will be able to demonstrate that he can define geography in his own words.

DO	USE
1. Give examples of definitions of geography.	1. Instructor's definitions of geography.
2. Relate the definitions of geography to the real world and how geography is employed; especially to the questions elementary students will ask in relation to what is geography.	2. Standard educational definitions of geography.
3. Show difference of how a rural and urban elementary student views geography.	3. Pictures to define geography as an elementary student might.
	4. Class members to define geography.

PERFORMANCE CRITERION	PERFORMANCE LEVEL	
Test Item Based on what we have discussed in class and what you have read in your textbook, define geography in your own words. A textbook definition will not be accepted.	EXPECTED	95%
	ACTUAL	?

Permission for use of the above model was granted by Dr. Raymond Bernabei, Assistant Superintendent, Division of Curriculum and Instruction, Bucks County Public Schools, Doylestown, Pennsylvania.

APPENDIX B

American College Test (ACT) and Pretest Data

ACT AND PRETEST DATA*

	(T_1)			(T_2)	
Subjects	ACT Scores	Pretest Scores	Subjects	ACT Scores	Pretest Scores
1.	27	22	1.	29	22
2.	25	18	2.	27	29
3.	25	26	3.	27	23
4.	24	27	4.	26	26
5.	24	23	5.	24	13
6.	23	21	6.	22	21
7.	23	24	7.	21	22
8.	22	18	8.	20	15
9.	22	19	9.	20	16
10.	21	19	10.	20	21
11.	21	25	11.	19	21
12.	21	19	12.	17	24
13.	20	16	13.	17	14
14.	20	12	14.	15	14
15.	19	17	15.	14	16
16.	17	12	16.	12	19
17.	16	19	17.		15
18.	16	21	18.		15
19.	16	17	19.		14
20.	10	17	20.		16
21.		23	21.		21
22.		16	22.		18
23.		18	23.		15
24.		19	24.		17
25.		15	25.		28
26.		18	26.		15
27.		19	27.		23
28.		20	28.		25
29.		16	29.		18
30.		23	30.		21
31.		21	31.		25
32.		11	32.		27
33.		23	33.		21
ACT Mean -	20.60		ACT Mean -	20.62	
SD -	3.94		SD -	4.79	
Pretest			Pretest		
Mean -	19.21		Mean -	19.69	
SD -	3.81		SD -	4.51	

*Transfer students who have acceptable academic grade point averages, are not required to take the ACT. Since many of the subjects in this experiment were transfers, all ACT scores were not available.

APPENDIX C

Behavioral Objectives

BEHAVIORAL OBJECTIVES

Chapter I.

1. Each student based on class notes and textbook definitions will be able to identify the best geographical explanation of the concept, "region."
2. Each student based on class notes and assigned readings will be able to apply the characteristics of regions so that she can identify "functionalism," make conclusions concerning boundary lines, understand regional distinctiveness and explain "perforation."
3. Each student based on class notes and assigned readings will be able to write a definition for "acculturation."
4. Each student based on class notes and assigned readings will be able to define the term "culture realm" and analyze the processes by which a cultural landscape evolves from a "realm."
5. Each student based on the textbook will be able to name and locate 12 world regions and their subregions as identified by de Blij.
6. Each student based on class notes will be able to contrast and compare population densities in de Blij's 12 regions and explain why size, defined as largest amount of land, does not necessarily constitute the region with the densest population.
7. Each student using the concepts she learned from behavioral objective number 4 will be able to apply the concepts and answer questions which relate to de Blij's 12 regions.
8. Each student based on class discussion will be able to write a definition for "gestalt" as it applies to geography.
9. Each student after reading her textbook will be able to define the terms "absolute" and "relative" geographic location.
10. Each student based on class notes and assigned readings will be able to identify the characteristics of the geographic concept referred to as "tropical."
11. Each student based on class discussion will be able to list criteria which could be used to establish geographic regions.
12. Each student based on notes from class discussions and assigned readings will be able to divide the world into several original world regions and justify this division on the criteria of cultural and physical geography. Each student will then compare and contrast her regional concept with de Blij's and discuss which concept is best and why.

BEHAVIORAL OBJECTIVES

Chapter II.

1. Each student based on assigned readings will be able to name three areas where a land bridge between Europe and North Africa may have existed.
2. Each student based on class discussions will be able to compare and contrast the technological and cultural contributions made to society by the Greeks, Romans and Egyptians.
3. Each student based on class notes and assigned readings will be able to write a definition for "areal interdependence" and apply her definition to activities conducted within the Roman Empire and the United States.
4. Each student based on class notes will be able to define the terms "spatial" and "temporal" and explain why regions and cultures should be studied from a spatial-temporal viewpoint.
5. Each student based on assigned readings will be able to write a definition for the terms Paleolithic, Mesolithic and Neolithic.
6. Each student based on class notes and assigned readings will be able to identify three results of "Volkerwanderung."
7. Each student based on class discussions will be able to define the terms "Oscillation" and "Hinterland."
8. Each student based on class notes and assigned readings will be able to evaluate from a list of examples the concept of mercantilism and then show she understands the concept by choosing the best example.
9. Each student based on class discussions will be able to describe the revolutions experienced by Europe during the 17th and 18th centuries in the areas of industry, agriculture and politics.
10. Each student based on class notes and assigned readings will be able to draw a model of von Thunen's isolated state theory and evaluate the application of the model to current geographic patterns.
11. Each student based on class notes and assigned readings will be able to describe and explain the critical elements which comprise Ratzel's organic theory.
12. Each student based on the map on page 35 in her textbook will be able to recognize the 14 major European industrial regions.
13. Each student based on class notes will be able to explain why Europe, a relatively high-latitude continent, experiences such a mild climate.
14. Each student based on class notes will be able to name four productive agricultural soils found throughout the world and list their primary locations.

BEHAVIORAL OBJECTIVES

Chapter III.

1. Each student based on assigned readings will be able to describe the ethnic and religious composition of the island of Ireland.
2. Each student based on class notes and assigned readings will be able to evaluate the cause of the most recent turmoil in Ulster.
3. Each student based on assigned readings will be able to identify the items which comprise the physiographic makeup of a country and apply these principles to England.
4. Each student based on class discussions and assigned readings will be able to describe the relationship between agricultural and industrial pursuits in England and explain how this relationship affects England's trade policies.
5. Each student based on class discussions and assigned readings will be able to list five characteristics of a regional "core" and define and locate the "European core."
6. Each student based on class notes and assigned readings will be able to explain and evaluate the Malthusan theory and apply this theory to modern day population problems.
7. Each student based on assigned readings will be able to compare and contrast the geographical advantages and disadvantages of France and West Germany.
8. Each student based on class discussions and assigned readings will be able to define the geographic terms "site," "situation," and "primate."
9. Each student based on class notes and assigned readings will be able to explain Christaller's use of the terms "spatial" and "hierarchy" in his Central Place theory.
10. Each student based on class discussion will be able to draw a model which depicts Christaller's "central place" theory and explain and apply this theory to the Oklahoma City area.
11. Each student based on class notes and assigned readings will be able to identify the major geographic advantages of the Ruhr industrial complex.

BEHAVIORAL OBJECTIVES

Chapter IV.

1. Each student based on the maps found on pages 117 and the appendix of the textbook will be able to locate and name the countries which comprise Eastern Europe.
2. Each student based on class discussion and assigned readings will be able to define the terms "Balkanization," "buffer state," "shatter belt," "homogeneous region," and "heterogeneous region."
3. Each student based on class discussion and assigned readings will be able to apply the terms defined in behavioral objective number 2 to world situations listing specific examples for each term.
4. Each student based on assigned readings will be able to define "irredentism" and list three world examples of this principle.
5. Each student based on class discussion will be able to explain the geographic value of the Polish Corridor.
6. Each student based on assigned readings will be able to identify the importance of the city of Nowa Huta.
7. Each student based on assigned readings and class notes will be able to explain why Eastern Europe experiences such a vast contrast and division of cultural backgrounds.
8. Each student based on assigned readings will be able to name the Eastern European country that has been most affected by territorial changes and explain how these changes have influenced that country's economic development.
9. Each student based on class notes and assigned readings will be able to explain the economic relationship that exists between Russia and the Eastern European countries listing three examples which lend credence to her explanation.
10. Each student based on class discussion and assigned readings will be able to define the "Balkan" subregion and explain why Hungary is the leading economic state of the Balkan area.
11. Each student based on class discussion will be able to explain how Europe's lack of oil has been a cause of political tensions throughout the world.
12. Each student based on class discussion will be able to write an opinion on whether Eastern Europe should increase or decrease trade relations with Western Europe giving several reasons for her choice.

BEHAVIORAL OBJECTIVES

Chapter V.

1. Each student based on class notes and assigned readings will be able to name the area of the U.S.S.R. where most Russians live and explain why they live there.
2. Each student based on assigned readings will be able to identify, locate and name the subregion of Russia where the most productive soils are found and list the leading agricultural crops of this area.
3. Each student based on class notes and assigned readings will be able to explain how Russia was able to acquire the 8.5 million square miles which comprise de Blij's region defined as the Soviet Union.
4. Each student based on class notes and assigned readings will be able to name the most serious problem limiting agricultural production in the chestnut soils of the U.S.S.R.
5. Each student based on assigned readings will be able to write a definition for the term "permafrost" and explain its relationship to human occupancy.
6. Each student based on class discussion and assigned readings will be able to name the eight regions of Russia and compare and contrast the major physical and cultural differences among the regions.
7. Each student based on class discussion and assigned readings will be able to explain the main causes of Russia's climate.
8. Each student based on class notes and assigned readings will be able to list several advantages and disadvantages of Russian rivers.
9. Each student based on class discussion and assigned readings will be able to evaluate the "planned" Russian economy and explain why Russia has experienced more difficulty in increasing agricultural production than industrial.
10. Each student based on class notes will be able to name the area on the Sino-Soviet border which both China and Russia are claiming and explain how this dispute is influencing political and economic relations throughout the world.
11. Each student based on assigned readings and class notes will be able to compare and contrast the economic policies of Russia, the United States and Western Europe.
12. Each student based on assigned readings and class notes will be able to compare and contrast Mackinder's "Heartland" theory with Spykman's "Rimland" theory and De Seversky's "Area of Decision" theory.
13. Each student based on assigned readings and class discussion will be able to define the term "nation state" and explain why Russia and the United States are or are not good examples of nation states.

BEHAVIORAL OBJECTIVES

Chapter VI.

1. Each student based on assigned readings will be able to name a country which has a higher per capita income than the United States and explain why.
2. Each student based on class notes and assigned readings will be able to identify the major physiographic regions of North America.
3. Each student based on class discussion will be able to recognize a definition for the term "plural" society.
4. Each student based on class notes and assigned readings will be able to explain why slavery was begun in the United States and list 3 myths, concerning slavery generally believed by Americans.
5. Each student based on class notes and assigned readings will be able to define the term "fall line" cities and list and locate three fall line cities in the U.S.
6. Each student based on class notes and assigned readings will be able to define "environmental determinism" and explain why she accepts or rejects this theory.
7. Each student based on assigned readings and class discussions will be able to explain what has had the greatest effect on changing population spatial patterns in the U.S. since World War I.
8. Each student based on assigned readings will be able to evaluate natural resource location in terms of quality, quantity and accessibility.
9. Each student based on class notes and assigned readings will be able to define "economies of scale" and list a local example.
10. Each student based on class discussion and assigned readings will be able to explain rural to urban migration as it relates to technological innovations and farm subsidies and the situation where only three million farm families produce the agricultural products of the U.S.
11. Each student based on assigned readings will be able to define the term "MEGALOPOLIS" and discuss several of its problems.
12. Each student based on class notes and assigned readings will be able to compare and contrast the concepts of "push" and "pull" migration.
13. Each student based on class notes will be able to name the three categories of industrial activity and list an example for each.
14. Each student based on class notes will be able to define sedimentary, igneous, metamorphic and mineral and list an example for each.
15. Each student based on class notes will be able to explain why Chicago is the transportation "hub" of the U.S.
16. Each student based on class notes will be able to name Oklahoma's most important agricultural crop.
17. Each student based on assigned readings will be able to name North America's four leading crops in terms of value of production and acreage and on a map of North America is able to locate the main areas of production.
18. Each student based on class discussion and assigned readings will be able to explain why poverty within urban ghettos is being accentuated and perpetuated.

APPENDIX D

Pre-Posttest and Quizzes

PRE-POSTTEST

An item may have more than one response which appears to be correct. You are to choose the BEST response. Each item is worth one point.

A 1. The broadest possible definition of a region is (A) "an area of specific location which is in some way distinctive from other areas and which extends as far as that distinction extends," (B) "an area with a great deal of general or universal meaning," (C) "an artificial concept used as an organizing construct in geography," (D) none of the above.

A 2. Which of the following form a functional region? (A) A city and its trade area, (B) an area dominated by one religion, (C) an area dominated by one language, (D) both B and C.

D 3. The inevitable conclusion concerning boundary lines between world regions are that (A) they are most often drawn from physical geographic characteristics, (B) they separate different cultures, (C) they represent the separation of different economic systems, (D) they usually represent zones of transition rather than sharply defined boundaries.

A 4. Geographers use __ most often to define world regions. (A) existing political boundaries, (B) transition zones, (C) language and religion, (D) rivers, mountains, and other natural phenomena.

C 5. A culture realm is (A) a pattern of learned behavior which constitute distinctive achievements of human groups, (B) genetically predetermined and self perpetuating, (C) a cohesive functional unit of prevailing ways of life, ideals, and values, having a common heritage, (D) partly the result of social invention and is transmitted and maintained mostly through communication and learning.

D 6. The largest world region in terms of occupied territory is (A) North America, (B) South America, (C) Africa, (D) Soviet Union.

A 7. A mentally perceived configuration involving many different parts. (A) Gestalt, (B) Compage, (C) Acculturation, (D) Multiple region.

A 8. Europe lies approximately between 35 and 75 degrees north latitude and between 10 degrees west and 30 degrees east longitude. These numbers represent Europe's __ location. (A) absolute, (B) relative, (C) areal, (D) political.

D 9. Which of the following according to de Blij is not a subregion? (A) Norway and Sweden, (B) Paris, (C) Amazon, (D) Japan.

D 10. A land bridge between Europe and Northern Africa may have existed at (A) Gibraltar, (B) Sicily, (C) The Turkish straits, (D) All of the above.

__C__ 11. The __ made great contributions to the development of land communications, military organizations, law, and public administration. (A) Greeks, (B) Egyptians, (C) Romans, (D) All of the above.

__A__ 12. The Roman empire constantly imported foodstuffs and exported such intangibles as political unity and ideological productivity. This is an example of (A) areal interdependence, (B) mercantilism, (C) areal dependence, (D) areal independence.

__C__ 13. The __ Principle suggests that human accomplishments are disseminated in various directions from their source and tend to die unless a particular culture keeps them alive and develops them further. (A) Volkerwanderung, (B) Hinterland, (C) Oscillation, (D) Orogeny.

__A__ 14. In Von Thunen's Isolated State theory he determined that __ would be the most important variable in the spatial arrangement of agricultural activities. (A) economic rent, (B) distance from market, (C) uniform soils, (D) uniform climate.

__D__ 15. England's leadership in the industrial revolution was a result of (A) the invention of the steam engine by WATT, (B) large coal deposits, (C) large iron ore deposits, (D) A and B.

__A__ 16. The critical element in Ratzel's organic theory was (A) space, (B) location, (C) politics, (D) boundaries.

__B__ 17. Which of the following has the greatest influence on Europe's climate? (A) Topography, (B) Maritime air masses, (C) Latitudinal location, (D) Continentality.

__C__ 18. Which of the following is usually not an agriculturally productive soil? (A) Loess, (B) Alluvium, (C) Laterite, (D) Prairie.

__D__ 19. The island of Ireland is partitioned into (A) a protestant South and Catholic North, (B) a Catholic South and protestant North, (C) two independent countries called North Ireland and South Ireland, (D) North Ireland which is predominantly protestant and Ireland which is predominantly Catholic.

__D__ 20. Great Britain is one of the world's leading importers of __ and a great exporter of __. (A) coal, iron ore, (B) wool, woolen goods, (C) grains, potatoes and sugar beets, (D) foodstuffs, manufactured goods.

__B__ 21. The basic cause of the most recent turmoil in Ulster is a result of (A) religious differences between Catholics and protestants, (B) mass unemployment and religious discrimination, (C) low wages for Catholics while protestants receive high wages, (D) lack of political representation in parliament.

A 22. Malthus argued that population expands __ while food supplies increase __. (A) geometrically, arithmetically, (B) inversely, proportionally, (C) arithmetically, geometrically, (D) geometrically, inversely.

C 23. The increase in world population is mostly a result of (A) increased birth rates, (B) controlling various "killer" diseases, (C) decreased death rates, (D) the application of the Malthus theory.

C 24. The __ of a city is its position in reference to surrounding or nearby areas of productive capacity, the size of its hinterland and the location of competing towns. (A) site, (B) location, (C) situation, (D) structure.

D 25. Which of the following is not a major advantage of the Ruhr industrial complex? (A) large coal deposits, (B) good accessibility, (C) position near large, high-capacity markets, (D) available petroleum deposits.

A 26. Christaller's central place theory is based on the proposition of (A) a hierarchy of cities, (B) complementary regions, (C) service industries, (D) population, distance from market and purchasing power.

D 27. The largest state of the countries which comprise Eastern Europe is (A) Hungary, (B) Czechoslovakia, (C) Romania, (D) Poland.

B 28. When a region is constantly experiencing political change resulting from internal and external pressures and is located between two very politically stable regions, it is referred to as a (A) buffer state, (B) shatter belt, (C) homogeneous region, (D) heterogeneous region.

D 29. All of the following are buffer states with the exception of (A) Uruguay, (B) Paraguay, (C) Afghanistan, (D) South Vietnam.

C 30. Of the following which is the best example of irredentism? (A) France and Quebec, Canada, (B) Greece appealing to Cyprus, (C) Somali Republic and Ethiopia, (D) Turkey appealing to Cyprus.

A 31. The Polish Corridor, as referenced in de Blij, owed its geographic importance to the fact that it constituted (A) an outlet to the Baltic Sea, (B) an excellent agricultural area, (C) a buffer zone, (D) none of the above.

D 32. A city which is the historic, cultural and political center of a country is called a __ city. (A) capital, (B) central place, (C) hinterland, (D) primate.

A 33. One of the most important iron and steel cities of Eastern Europe created as part of a five-year plan is (A) Nowa Huta, (B) Plzen, (C) Krakow, (D) Brno.

__D__ 34. Which country of Eastern Europe is predominantly of the Moslem religion? (A) Romania, (B) Hungary, (C) Bulgaria, (D) Albania.

__B__ 35. The USSR's planned economy has experienced most of its difficulties in the __ sector. (A) industrial, (B) agricultural, (C) services, (D) commune.

__D__ 36. When standing water appears at the surface and the ground below the surface is permanently frozen, it is a __ area. (A) subarctic, (B) taiga, (C) tundra, (D) permafrost.

__C__ 37. The climate of the USSR is predominantly a result of (A) maritime winds, (B) topography, (C) continentality, (D) none of the above.

__D__ 38. Which of the following is <u>not</u> one of Russia's subregions? (A) Russian Plain, (B) Ural Mountains, (C) Eastern Highlands, (D) Black Sea Basin.

__B__ 39. The early settlement of the USSR was advanced by (A) railroads, (B) rivers, (C) highways, (D) the Cossacks and their love of war.

__D__ 40. The more than 8.5 million square miles which comprise the USSR is a direct result of the (A) communist revolution, (B) Second World War, (C) First World War, (D) legacy of St. Petersburg and European Russia.

__A__ 41. Mackinder's Heartland theory became obsolete with the introduction of (A) De Seversky's Area of Decision theory, (B) Spykman's Rimland theory, (C) Meinig's hydrographic theory, (D) none of the above.

__B__ 42. The major problem hindering the economic development of Eastern Russia is (A) cultural diversity, (B) sparse population, (C) environment, (D) distance from Western Russia.

__D__ 43. A society where there has been extended cultural contact between two or more ethnic groups, presumably within a single political unit, without any real cultural mixing of these groups, is called (A) racial, (B) culturated, (C) homogeneous, (D) plural.

__B__ 44. Environmental determinism says that (A) man's behavior is determined by man rather than the environment, (B) man's behavior is determined by his environment, (C) with minor adaptation to the environment, man determines his behavior, (D) environment in no way determines man's behavior.

__D__ 45. The cities of Richmond, Va., and Columbia, S.C., are fall line cities. The most important reason for the development of fall line cities is (A) water power, (B) break in bulk points, (C) exceptional agricultural areas, (D) manufacturing and processing activities can be most efficiently performed at a freight handling location.

B 46. Which of the following has had the greatest effect on changing spatial patterns in the U.S. since World War I? (A) alterations in agricultural patterns and organization, (B) series of migration flows--South to North, East to West, and rural to urban, (C) increased importance of service activities, (D) revolution in social attitudes.

C 47. The location of resources can be best described in terms of (A) quality, (B) quantity, (C) accessibility, (D) none of the above.

A 48. The maximum utilization of all productive resources can best be referred to as: (A) economies of scale, (B) economies of agglomeration, (C) economies of complementarity, (D) economies of specialization.

C 49. Three million farm families produce the agricultural products of the U.S. The main cause of this phenomena is (A) rural to urban migration, (B) farm subsidies, (C) technological innovations, (D) all of the above.

D 50. The problems facing Megalopolis and other huge urbanized regions are concerned with (A) political viability, (B) livability, (C) accessibility, (D) all of the above.

QUIZ 1

An item may have more than one response which appears to be correct. You are to choose the BEST response. Each item is worth one point.

__D__ 1. Which of the following does not apply to the concept of tropical as defined by your text? (A) hot temperature, (B) high humidity, (C) considerable annual precipitation, (D) dense vegetative growths consistently dominated by one species.

__C__ 2. It is true that geographical regions are (A) unique, (B) unique and independent, (C) difficult to define, (D) all of the above.

__D__ 3. "Types" of regions can be defined in terms of (A) language spoken, (B) political boundaries, (C) climatic zones, (D) all of the above.

__A__ 4. A "perforated" region is (A) an area within a regional boundary that fails to meet established regional standards, (B) an area outside a regional boundary that should be included within the originally established region, (C) an area with numerous subregions, (D) A and C.

__B__ 5. World regions are best defined in terms of __ conditions. (A) physical, (B) cultural, (C) economic, (D) linguistic.

__B__ 6. Acculturation means (A) constantly changing cultures, (B) culture is a continuum that reflects world wide processes as a result of cultural contacts, (C) we do not think of Indians when we say Latin Americans, (D) Western Europe has superimposed her culture upon most of the world.

__D__ 7. A cultural landscape evolves from (A) the physical changes of the landscape induced by natural phenomena, (B) man's perception of how best to exist in a given environment, (C) the forms superimposed on the physical landscape by man's activities, (C) both B and C.

__C__ 8. North America is regionalized in your text to include the countries of the U.S. and Canada. North America could be regionalized to include the countries of the U.S., Canada, and (A) Mexico, (B) the six Central American Republics and British Honduras, (C) either A or B, (D) none of the above.

__A__ 9. Of the 12 regions discussed by de Blij, the one with the largest population density per square mile is __ and the one with the least density is __. (A) Europe-Australia, (B) China-Africa, (C) Japan-Australia, (D) India-Africa

__D__ 10. Using de Blij's concept of 12 regions which one best exemplifies several different cultural landscapes? (A) North America, (B) Africa, (C) China, (D) Europe.

QUIZ 2

An item may have more than one response which appears to be correct. You are to choose the BEST response. Each item is worth one point.

__A__ 1. Geographically, regions and cultures should be studied from a __ and __ viewpoint. (A) spatial-temporal, (B) population-environment, (C) land use-natural resource, (D) historic and anthropological.

__B__ 2. The terms Paleolithic, Mesolithic and Neolithic refer to periods of time in history. What noun describes these time periods? (A) age, (B) rock, (C) man, (D) none of the above.

__D__ 3. Volkerwanderung was a result of (A) attractiveness of other land, (B) forced migration, (C) decline of Roman power, (D) all of the above.

__B__ 4. The best example of mercantilism is (A) the colonization of America by England, (B) the acquisition of Latin America by Spain, (C) the establishment of Haiti as a French possession, (D) the relationship of the United States with Puerto Rico as a result of the Spanish American War.

__D__ 5. During the 17th and 18th centuries, Europe experienced a revolution in (A) industry, (B) agriculture, (C) politics, (D) all of the above.

__A__ 6. Interpreting Von Thunen's theory suggests that man's most important natural resource was (A) wood, (B) iron ore, (C) copper, (D) coal.

__D__ 7. All of the following are major European industrial regions with the exception of (A) Midlands, (B) Benelux-Ruhr, (C) Po Valley, (D) Madrid Basin.

__C__ 8. Friedrich Ratzel laid the foundations for the field of political geography with his __ theory. (A) spatial, (B) biological, (C) organic, (D) physical.

__A__ 9. The theory referenced in question 8 stated that the state was (A) a complex structure of many interrelationships, (B) compelled to have boundaries if it was to exist, (C) limited in growth by its physical geographic conditions, (D) a piece of humanity.

__B__ 10. Most of Europe's rainfall is of __ origin. (A) orographic, (B) cyclonic, (C) convectional, (D) continental.

QUIZ 3

An item may have more than one response which appears to be correct. You are to choose the BEST response. Each item is worth one point.

__D__ 1. The core of a region is where (A) the population is the most dense, (B) the greatest productivity occurs, (C) growth is occurring, (D) all of the above.

__D__ 2. Which of the following is least representative of the physiographic makeup of a country? (A) relief, (B) climate, (C) topography, (D) elevation.

__A__ 3. England is (A) an importer of coal, (B) an exporter of iron ore, (C) a highly industrialized country using in practically all instances the most modern manufacturing innovations, (D) the world's leading importer of foodstuffs, but does export such commodities as dairy products and potatoes.

__C__ 4. Generally speaking from a physical geographic viewpoint England is a __ country. (A) highland, (B) mountainous, (C) lowland, (D) marine.

__B__ 5. According to de Blij the Malthus theory is in many ways becoming a reality and approximately __ percent of the world's people are inadequately fed. (A) 80, (B) 50, (C) 33, (D) less than 10.

__D__ 6. Anti-Malthusians argue that as industrialization increases population will (A) increase, (B) increase very slowly, (C) decrease, (D) level off and become stationary.

__C__ 7. All of the following statements comparing France with West Germany are true except (A) France is larger in area, (B) France borders many more bodies of water, (C) France has more good seaports, (D) France like West Germany sends trade through other European ports.

__A__ 8. In geography a city's site refers to the (A) physical attributes of the place it occupies, (B) location, (C) position of the city with reference to the surrounding area, (D) size of its hinterland.

__D__ 9. A city that is disproportionately large and very representative of national capacity and feeling is a __ city. (A) capital, (B) national, (C) both of the above, (D) primate.

__B__ 10. Central place theory is explained in terms of a model of __ arrangement of towns. (A) regional, (B) spatial, (C) areal, (D) circular.

QUIZ 4

An item may have more than one response which appears to be correct. You are to choose the BEST response. Each item is worth one point.

D 1. Which of the following Eastern European countries is landlocked? (A) Bulgaria, (B) Hungary, (C) Czechoslovakia, (D) Both B and C.

A 2. Balkanization is (A) to break up into smaller and often hostile units, (B) the name of the northern section of a peninsula in Eastern Europe, (C) intense nationalism which results in war of which Serbia and the beginning of W.W. I is a prime example, (D) a region of endless contrast and division, with Slavic and non-Slavic peoples, Roman Catholic, Eastern Orthodox and Moslem religions, and many different languages.

B 3. Currently, disputes between nations of the world develop most over (A) frontier land, (B) establishment of boundaries, (C) mineral rights, (D) none of the above.

D 4. Since 1914 Eastern Europe has undergone several territorial changes. The country most affected by these changes is (A) Rumania, (B) Hungary, (C) Bulgaria, (D) Poland.

C 5. Poland's gains in industrial production since W.W. II are directly related to (A) her recent finds of high-grade iron ore and coal deposits, (B) de-emphasizing agriculture as the main economic activity, (C) the resources she gained as the result of new boundary delimitation, (D) the 1965-1970 five-year plan which emphasized industrial development.

D 6. Czechoslovakia acquires the iron ore for its iron and steel industry mostly from (A) West Germany, (B) Poland, (C) Bohemia, (D) Krivei Rog.

C 7. The leading economic state of the Balkans is (A) Albania, (B) Romania, (C) Hungary, (D) Yugoslavia.

B 8. The country of Eastern Europe that looks to Communist China for ideological and economic support is (A) Bulgaria, (B) Albania, (C) Romania, (D) Yugoslavia.

B 9. Europe's major oil field is located in (A) Russia, (B) Romania, (C) Poland, (D) Bulgaria.

C 10. Which of the following reasons would not support the idea of Eastern Europe continuing to be a "shatter belt"? (A) Eastern European nationalism, (B) uncompatible Soviet planning suggestions, (C) repatriation of former minorities, (D) closed trade with the Soviet Union.

QUIZ 5

An item may have more than one response which appears to be correct. You are to choose the BEST response. Each item is worth one point.

D 1. Most of the people of the USSR live (A) West of the Urals, (B) East of the Urals, (C) in the subregion known as the Russian Plain, (D) both A and C.

D 2. The largest area of fertile soils in the USSR can be found in the (A) steppe climatic zone, (B) subregion from the Romanian border across the southern part of the country to the Altay Mountains, (C) chernozem soil belt, (D) all of the above.

A 3. The most serious agricultural production problem in the chestnut brown soil belt of the USSR is (A) dryness, (B) lack of manpower, (C) extremely cold winters, (D) long hot summers.

C 4. Most of the moisture experienced in the Soviet Union results from (A) air masses moving south from the Arctic Ocean, (B) air masses moving west from the Pacific Ocean, (C) air masses moving east from the North Atlantic Ocean, (D) orographic lifting connected with the Ural Mountains.

B 5. The most inhospitable subregion of the Soviet Union is (A) Siberia, (B) the northern Eastern Highlands, (C) the Central Asiatic Ranges, (D) the Caspian-Aral Basin.

C 6. What physical geographic phenomena could be used to divide Europe from Asia? (A) Siberia Plain, (B) Russian Plain, (C) Ural Mountains, (D) none of the above.

C 7. One of the major problems associated with many Russian rivers is (A) they are swift and not navigable, (B) they cross vast areas of extremely dry land, (C) they flow north into the Arctic Ocean, (D) they are located in underpopulated areas.

A 8. Russia and China are presently involved in a border conflict which has its roots in the Soviet expansionist policy of the 1800's. What is the name of this area annexed by the Russians from China? (A) Amur River Provinces, (B) Northern Manchuria, (C) Northern Mongolia, (D) none of the above.

D 9. Which of the following is not an attribute of the concept of "nation state?" (A) political unit comprising a clearly defined territory, (B) well organized body of people politically and economically, (C) people who express their emotions in terms of law and government, (D) political unity based on an elected form of government in which the will of the majority rules.

D 10. Planned governmental economic legislation is practiced in which of the following countries? (A) United States, (B) Great Britain, (C) Russia, (D) all of the above.

QUIZ 6

An item may have more than one response which appears to be correct. You are to choose the BEST response. Each item is worth one point.

__B__ 1. One of the two countries of the world with a higher per capita income than the United States is Kuwait. Kuwait's wealth is based on (A) uranium, (B) oil, (C) gambling, (D) numerous mineral deposits.

__A__ 2. The Piedmont Region of the United States is located between (A) the Appalachian Mountains and coastal plain, (B) the great plain and Appalachian Mountains, (C) the Ozark Mountains and Texas plain, (D) none of the above.

__B__ 3. Slavery began in the United States to support the __ industry (A) cotton, (B) tobacco, (C) sugar, (D) lumber.

__C__ 4. "Push" and "pull" concepts resulting in the migration of people are best associated with (A) job preferences, (B) future societal expectations, (C) environmental perceptions, (D) "rising" expectations of the very poor.

__A__ 5. The three categories for industrial activity are usually referred to as (A) primary, secondary and tertiary, (B) agricultural, mining and production, (C) unskilled, skilled and technical, (D) both A and B.

__C__ 6. Rocks which have been structurally transformed by tremendous heat and pressure over long periods of time are called (A) sedimentary, (B) igneous, (C) metamorphic, (D) minerals.

__D__ 7. Chicago owes its growth in many respects to its location (A) on the Great Lakes, (B) near the center of the United States, (C) at the western terminal of the manufacturing belt, (D) at the center of the railway freight industry.

__B__ 8. Oklahoma is a large producer of __ wheat. (A) spring, (B) winter, (C) both A and B, (D) fall.

__A__ 9. The most important crops grown in North America in terms of value of production and acreage are (A) corn and wheat, (B) wheat and cotton, (C) wheat and oats, (D) corn and alfalfa.

__B__ 10. The poverty within urban ghettos is accentuated and perpetuated by __ and __. (A) lack of facilities for interaction - lack of jobs, (B) separation and isolation, (C) racial tension - bigotry, (D) lack of education - poor health conditions.

APPENDIX E

Statistical Formulas

THE TWO INDEPENDENT t TEST

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(N_1-1)\ S_1^2 + (N_2-1)\ S_2^2}{N_1+N_2-2} \cdot \frac{1}{N_1} + \frac{1}{N_2}}}$$

Where: $\bar{X}_1$ and $\bar{X}_2$ are the means of the two samples.

N_1 and N_2 are the number of subjects in Group I and Group II.

Power for t Test*

$$d = \frac{u_1 - u_2}{\sigma\sqrt{1/N_1 + 1/N_2}}$$

Where: $u_1 - u_2$ = Difference desired to detect.

σ = Pooled posttest standard deviation.

N_1 and N_2 = Number of subjects in Group I and Group II.

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*Dixon and Massey (1957) suggest that for large sample sizes (66) the error involved in substituting d (based on normal distribution) for Φ (noncentrality parameter) is minimal.

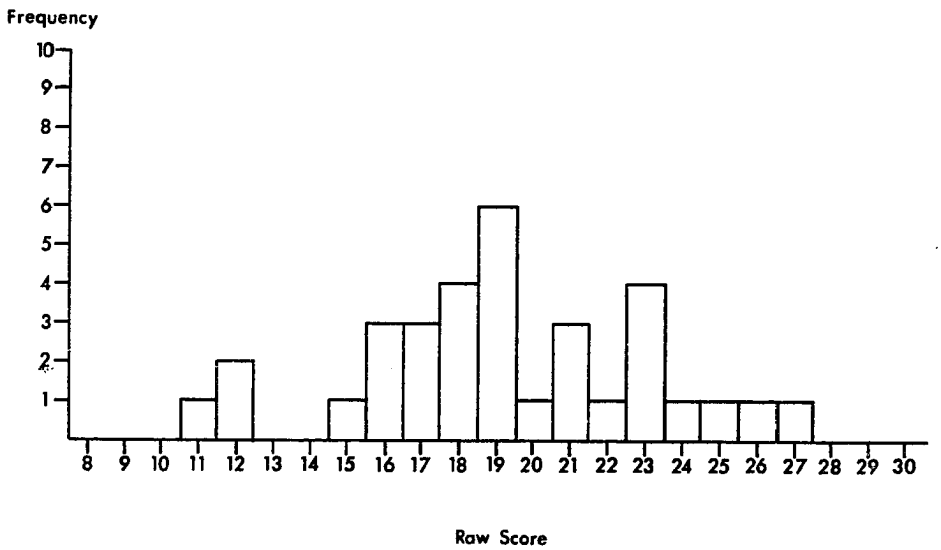
APPENDIX F

Raw Score and Frequency Distribution Graphs

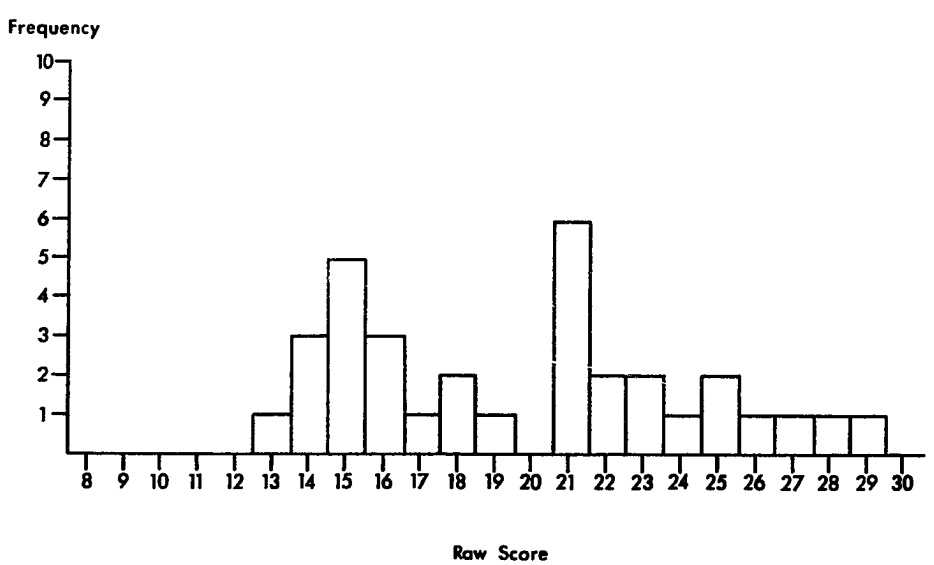
Graph 1

Pretest

T_1

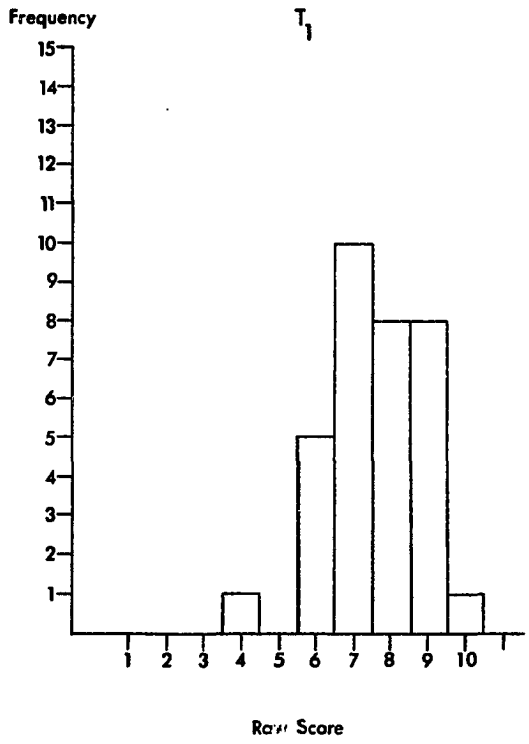


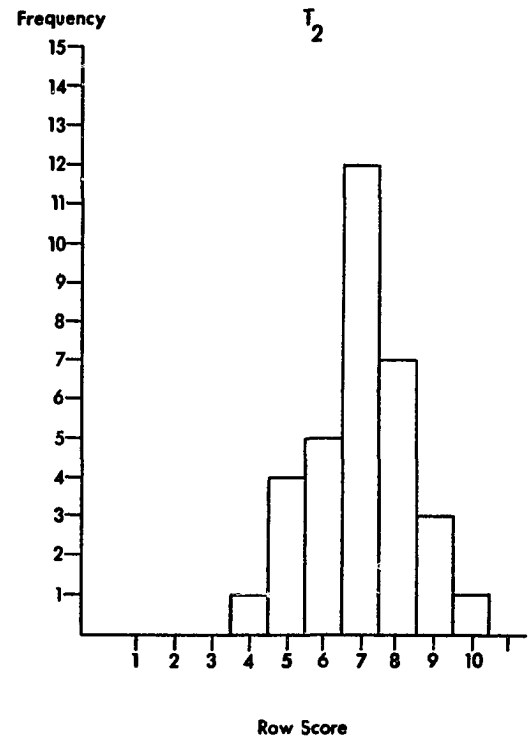
T_2



Graph 2

Quiz 1





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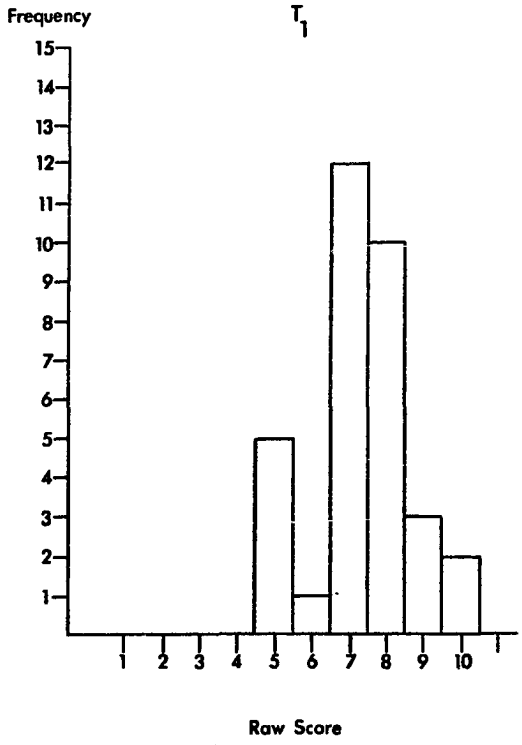
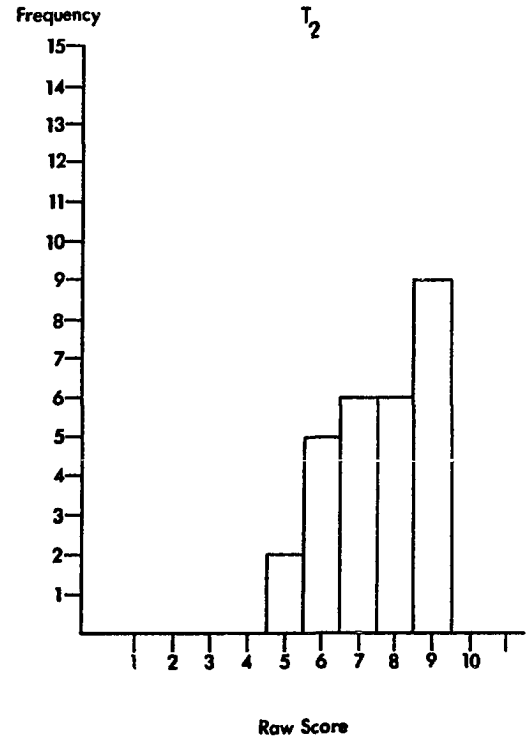
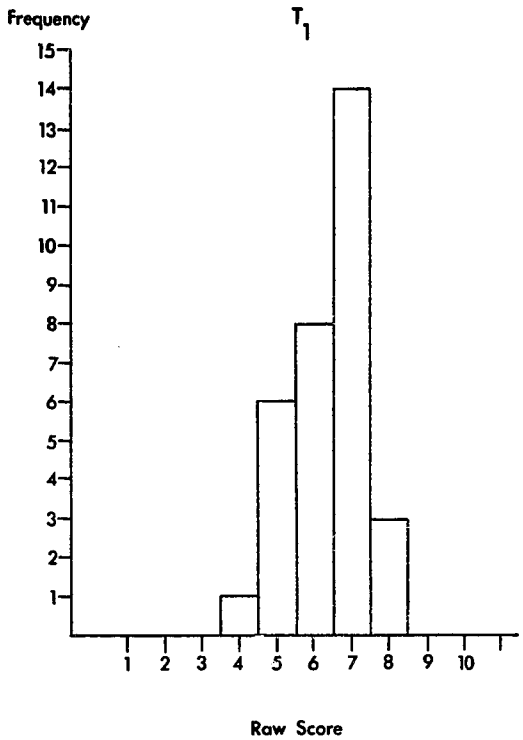
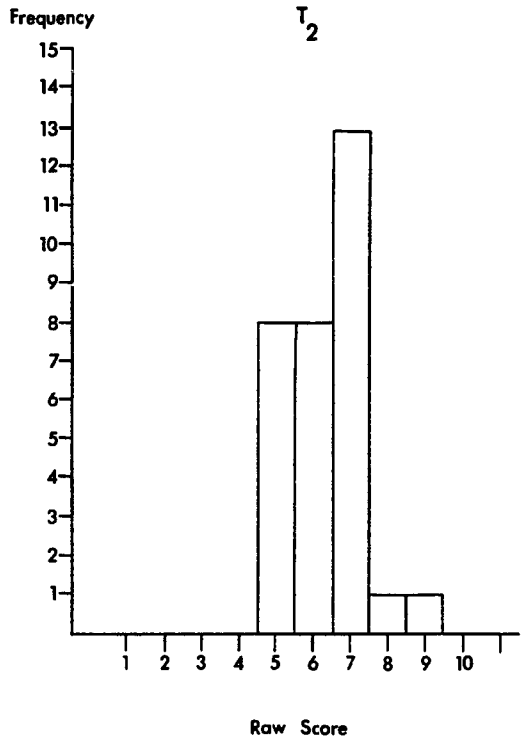




Graph 3

Quiz 3





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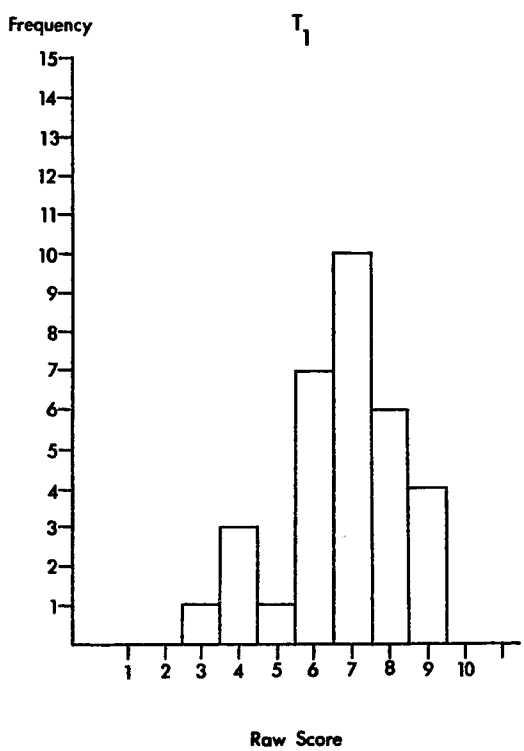
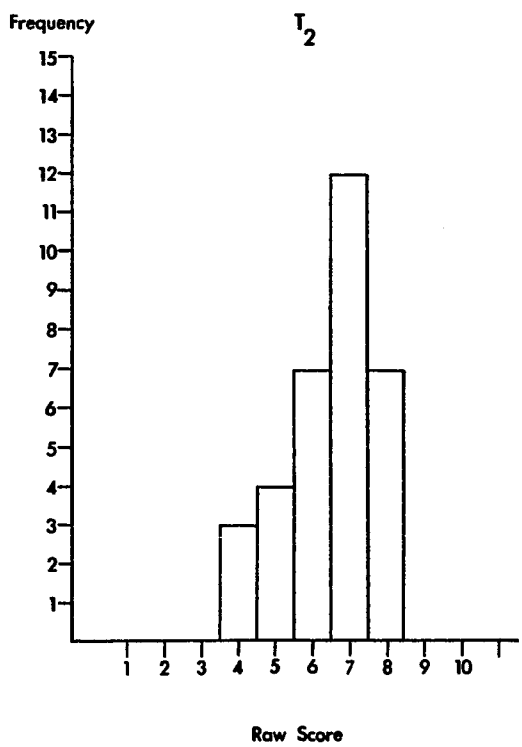
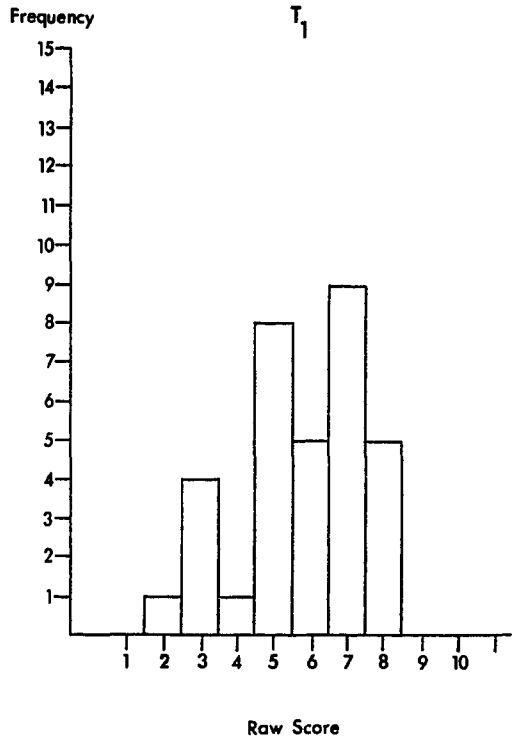
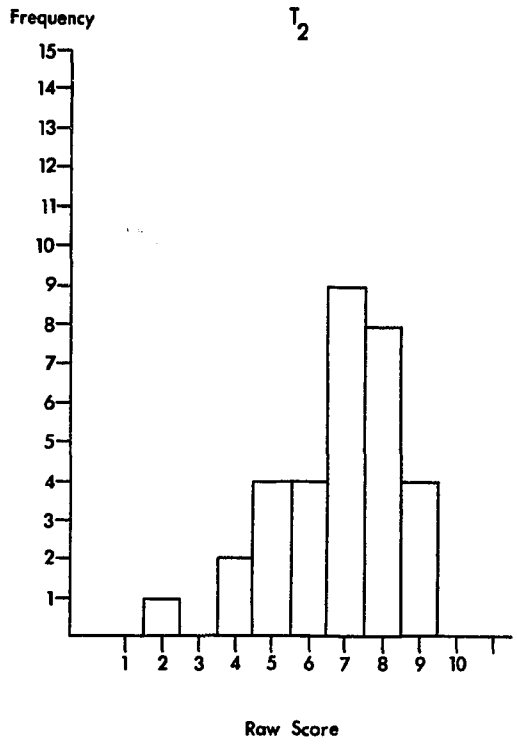




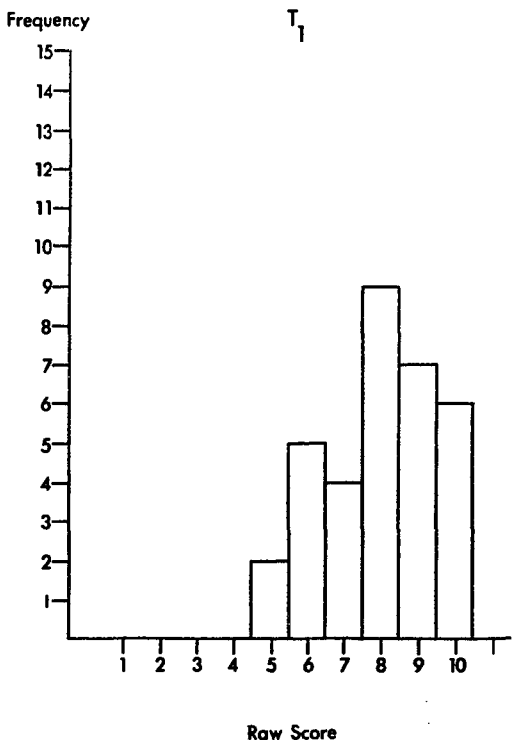
Graph 4

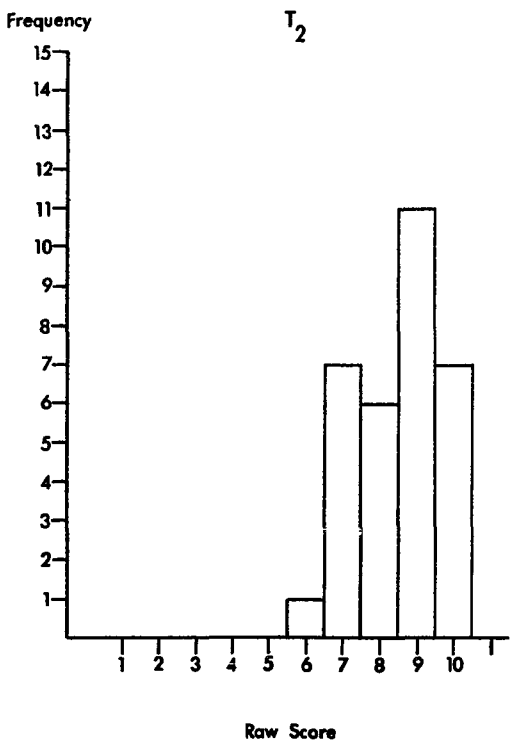
Quiz 5





Quiz 6

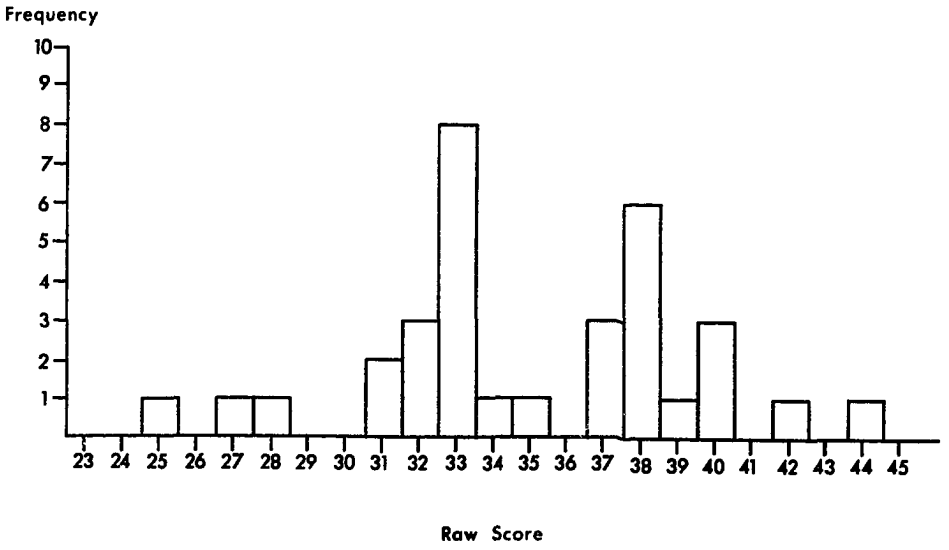




Graph 5

Posttest

T_1



T_2