

AN ABSTRACT OF THE THESIS OF

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Title: AN EXPERIMENT IN THE TEACHING OF BIOLOGY TO SLOW LEARNERS  
IN HIGH SCHOOL

Abstract approved: 

Dr. Fred W. Fox

The purpose of this study was to test in practice the perceptual field approach learning theory with students identified as slow learners. The essential aim was to achieve significant improvement in the self adjustment of the students while not inhibiting their learning of biology. The approaches and techniques of perceptual field learning theory were tested against those of conventional learning theory based upon the psychological theories of reinforcement and conditioning. Criteria for determining effectiveness were pupil growth in self and social adjustment and learning in biology. Two equated classes of students identified as slow learners were selected, and administered the California Test of Personality and the Nelson Biology Test both as pretests and posttests. Significance of difference between means of the control and experimental classes was determined using the t-test with a five per cent level. Learning in the control class was based upon reinforcement and conditioning. The class was teacher-centric and subject oriented. In the experimental class, learning was based upon perceptual field theory. The class was student-centric and perception oriented. Specific techniques used in the experimental class were: (1) concern for personal

reference and freedom; (2) case studies in human relations problem situations; (3) discussions planned to reduce threat, distribute class leadership, increase group we-feeling, and to increase individual sense of belonging and personal worth; (4) nondirective personal interviews to encourage and develop feelings of adequacy; (5) controlled teacher responses to develop an intrinsic force directing student behavior and learning; (6) subject-matter content decided upon by student interest, with no assigned reading and no objective tests; and, (7) self-evaluation procedures. There is no significant difference at the five per cent level between means of the experimental and control classes in either learning of biology or in self and social adjustment. Thus, the null hypotheses are accepted. The data indicate that a teacher using the approaches and techniques of perceptual field learning theory can exert influences on slow learners toward improvement in categories of self-adjustment, and a teacher using conventional methods can exert influences on slow learners toward improvement in categories of social adjustment. The data indicate also that students, identified as slow learners, in a class focusing on problems of apparent and expressed interests, biological or not, do learn as much biology as do students in a class focusing on traditional biology and being taught by conventional methods. Also indicated in this study is the possibility of a difference in the sensitivity of sexes to conventional and perceptual field approaches. All conclusions from this study are considered tentative and should be verified by further research.

AN EXPERIMENT IN THE TEACHING OF  
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IN HIGH SCHOOL

by

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CHAPTER I

INTRODUCTION

1. The Problem

Theoretical aspects leading to the problem.-- This classroom experiment has evolved from a concern about the adequacy of self concepts of slow learners in high school. Evident in current literature is the growing concern for the individual student and his special needs, a concern reminiscent of that of the 1930's when attention was focused upon the individual student and his personal, social and economic needs. The concern today is particularly prevalent in the position taken by the phenomenological psychologists.

It is axiomatic among educators today that education in a democratic society demands an emphasis on the development of individual self-understanding. There is a great need for experimental research on methods of developing skills and the understanding necessary for such development of self concepts. It is generally agreed that proper instructional procedures can do much to foster improvement of self concepts. There is less agreement concerning what constitutes proper instructional procedures.

As interpreted for this experiment proper instructional method is that which focuses on the individual student and his needs rather than on traditional subject matter. The use of proper instructional procedure with slow learners should enhance their self concepts while not inhibiting their learning of traditional subject matter.

The theoretical argument for the emphasis upon enhancement of self concepts, regardless of the student's learning of traditional subject matter, is based upon the possibility that the failure of a student to meet certain developmental needs or tasks leading to a more adequate self concept will inhibit his ability to learn subject matter regardless of how logically organized or how well it is presented. Focusing on the enhancement of self concept might well be even more an important goal to the teacher of slow learners than that of learning traditional subject matter.

The crux of the problem is that the traditional approach of subject-centered teaching might assist the learning of the slow learner but may do little for the enhancement of his self concept, whereas, student-centered teaching might enhance the self concept while inhibiting progress in traditional subject-matter learning.

Significant to the success of student-centered teaching is the employment of appropriate learning theory. Attending adequately to the basic needs of students almost certainly requires a realignment of classroom goals with the total structure of the educational objectives, and, equally important, the development and utilization of an adequate concept of learning accompanied by appropriate teaching methods.

The approach selected as the variable for this experimental study is that which has been developed by the phenomenologists and identified as the perceptual field approach learning theory. This approach has not been thoroughly investigated in classroom research and not at all with groups of slow learners in particular. The conceptual

framework underlying this approach is that learning is only developed when children perceive the significance of change in behavior, and that the quality of their perceptions determines the quality of their behavior. The learning process, then, requires experience as the basic data of knowledge, and involves observing, describing, and analyzing these experiences.

Conventional learning theory, commonly in use in traditional subject-centered classrooms, emphasizes the importance of practice, reinforcement and conditioning, through the provision of successive, systematic changes in the learner's environment to increase the probability of desired changes in behavior. But if much of a person's behavior is the result of his conceptions of himself, then the teacher's role is to help the student to change his perceptions of himself. This is a student-centered approach. And, if the self concept can be taught, then what produces enhancement of self may assist and encourage learning of subject matter as well.

The concern underlying this experiment is not that of how to teach biology to slow learners so much as how the classroom teacher can assist and enhance the development of the self concept of the slow learner and still adequately teach the subject matter. This requires the development of a conceptual model suited to this end.

Statement of the problem.-- The problem is to test the use of perceptual field approach learning theory with students identified as slow learners in high school.

Purpose of this experiment.-- The purpose of this experiment is to test a method of teaching which will enhance the self concept of

slow learners while not inhibiting their learning of biology.

Specific questions.-- Specific questions to be answered are:

1. Can a teacher by employing perceptual field learning theory exert effective influences on slow learners toward a significant self and social adjustment when compared with a group being taught by conventional methods?

2. Can a class of students focusing on problems of apparent and expressed interests, biological and abiological in nature, learn as much biology as students taught by conventional methods with the focus on biology?

Hypotheses to be tested.-- The hypotheses of this experiment are:

1. Slow learning students taught by the perceptual field approach learning theory show no significant gain over students taught by conventional learning theory in their self and social adjustment.

2. Slow learning students taught by the perceptual field approach learning theory show no significant gain over students taught by conventional learning theory in their learning of biology.

## 2. Significance of the Problem

Historical background.-- The curriculum developments of the past decade certainly are not mere proposals for doing more of the kind of things teachers have been doing already. It is becoming increasingly evident "that the information explosion and the scientific developments which have triggered these projects require revolutionary changes in the goals and methods of instruction as well as changes in subject matter" (47, p. 109).

Authors of these recent developments in curriculum seem to agree by implication that the learner must be fully engaged. These authors often seem to take for granted the fruition of, or worse, utterly ignore, the basic psychological concept that states that human needs exist in a hierarchy--that certain needs are basic and must be met before other needs can be developed, pursued, and satisfied. Enough evidence has accumulated to show the needs for love, nurture, belonging and security, are basic, and the need to grow up, to learn and master new skills, is built upon that foundation. It follows then that we can not expect that the need to learn will arise until we have attended adequately the basic needs.

An evaluation of the historical evidence for the focus of education, subject matter versus personal needs, would likely lead to the conclusion we are moving but in a circle with little or no progress being made. As stated by Carmical:

The early historical approach to teaching tended to de-emphasize the significance of the needs of the individual

students. Progressive techniques moved to the other end of the continuum in an effort to meet all needs of all children. In the broad panorama of the American schoolroom today, where is the focal point of teacher responsibility? (7, p. 307)

Occasionally in current literature can be found the thought expressed that direct attention should be given to basic needs and interests of students. There is question as to appropriate methodology.

Concerning this, Dreikurs has stated:

We are witnessing a revolution in the field of education. Rapid changes in concepts and methods occur with varying speed and extent. . . . They reflect a democratic evolution with its far-reaching changes in interpersonal relationships and social settings. The traditional superiority of adults over children is fast disappearing, in line with the disintegration of masculine superiority, the supremacy of the white race, and the power of capital over labor. Democratization implies a process of equalization. Consequently, in our growing democratic atmosphere it is impossible to treat children as inferiors. Neither parents nor teachers can any longer 'make' a child behave or conform; pressure from the outside has lost its effectiveness, and must be replaced with stimulation from within.

Since traditional methods have lost their efficacy, new methods have to be found which can bring results in a democratic setting. Teachers are aware of this requirement, but unfortunately, in their groping for democratic approaches they often become confused. Many suffer from the illusion that to be democratic requires nothing more than to stop being autocratic. They do not realize that avoiding autocratic approaches does not make a teacher democratic, but merely creates anarchy. A democratic atmosphere combines freedom with order, and is thus distinguished from autocracy's order without freedom, and from anarchy's freedom without order (11, p. xv-xvi).

Any learning theory must make certain assumptions concerning the basic moral and psychological nature of man. "Each theory of learning is linked to a conception of the basic nature of man: in basic moral inclination, is he innately good, . . . evil, . . . neutral? . . . in relation to his environment, is he active, passive, or interactive?" (3, p. 18) Conventional learning theory has long

dominated the American scene. Based upon the conceptions of reinforcement theories, man is considered as a neutral-passive organism who learns via reinforced or conditioned responses.

In recent years a new concept of the nature of man and the limits of his potential has come into psychology, sometimes called "a 'third force' in psychology, neither behavioristic nor Freudian" (54, p. iii). "It is a psychology which seeks to understand man in dynamic terms" (2, p. 67). The ideas are not new, but are far from being understood in practice. This "third force" has variously been referred to as the "phenomenological," "perceptual," "interactional," "new look" or "existential" approach. Recently an attempt has been made to develop from this psychology a completely different theory of learning (47). This perceptual field approach learning theory is the experimental variable for this study. (This theory is identified in section four of Chapter II.)

Need for this experimental study.-- Upon attending adequately the basic needs of students, educators might then be better able to at least approach a solution to the perennial problem of every school--of what to do with the academically lower quartile, the slow learners, the students with special problems, the potential dropouts. Possibly then these students might find school more tolerable and begin to master those concepts considered to be important to learning.

It has been estimated that the slow learners represent about one out of four adults (30). Throughout the literature in science education there is apparent concern for what we are or are not doing for these students in our schools. This concern for helping slow

learners is evident. One of the factors outside the area of research which has had an apparent significant influence is the improved understanding by science teachers of individual differences between children, and of the need for science by all citizens (55). It is axiomatic among educators that all students should have a course in biology. The concern for slow learners and the problem of how to teach them is found in current literature, although not frequently. As is recommended by McKibben:

A strong basis in both the biological and the physical sciences (physics and chemistry) should be a part of the general education of all high school students. . . . In spite of all of the activity in behalf of the academically talented, there is little evidence of concern for the interests of those of less than average ability. Science is important to them and they can certainly learn it. The problem is what and how. This is unquestionably an important area for study (33, p. 57).

As stated by Tanzer: "These boys and girls require courses specifically adapted to their abilities and their needs" (52, p. 1). Tanzer indicates that the chief problems as indicated by these students, "in descending order of importance, are: failing grades; dissatisfaction with courses; and dislike of teachers or teaching methods" (52, p. 1).

Considering the behavior of slow learners in programs specifically centered about the needs of these students, programs operating from the philosophy which emphasizes that learning is an active process in which the learner must participate, Johnson states:

Evidence strongly indicates that where programs have been instituted, designed specifically to meet the needs of slow learners, most antisocial, deviate behavior is either materially reduced in intensity or vanishes altogether. Truant and delinquent behavior

and attitudes of disinterest and dislike for school and learning activities are not inherent in the slow learners although they are often considered to be of an intrinsic nature. They are, instead, a reflection of their reactions toward continuous frustration, failure, and subjection to meaningless activities--a perfectly normal reaction (24, p. 56-57).

The implications of this research may far outreach the confines of this study, conceivably having important implications for teacher training programs. "One of the great handicaps to progress in human institutions is the lag which often exists between the production of new ideas in the learned disciplines and their expression in our social institutions" (2, p. 3). There is need to close the gap between our understanding of the nature of human behavior and interpersonal relationships and the utilization of such understandings in the classroom.

### 3. Assumptions and Limitations

Assumptions.-- Assumptions relevant to this experiment are:

1. It is assumed that the subjects of this experiment will be under the supervision of the teacher for an amount of time sufficient for the purpose for which the experiment is designed. The quality of the relationship between the teacher and the student is assumed to be more important than the length of time.

2. The placement of slow learners into these two classes is by random selection, i.e., the experimental and control classes are nearly equal in composition.

3. The population selected for this experiment represents a normal population of slow learners.

Limitations.-- Possible limitations of this experiment are:

1. The difficulty in selecting measuring instruments which are both valid and reliable in measuring objectively self and social adjustment and understanding of biology.

2. The teacher variable introduced by the use of separate teachers for the control and experimental classes.

3. The awareness of the students of the experimental class of being taught in an unconventional manner.

4. The small population size.

5. The reported concern is with only what happens within the confines of the experiment, i.e., the classroom experiment is limited by the lack of control of all student experiences that conceivably

may affect changes in his learning and self concept.

#### 4. Definitions

Terms relevant to this experiment are defined as follows:

Self-adjustment.-- The term is synonymous with the more widely used term, personal adjustment, and is defined generally as what the individual feels and thinks about himself. Components are: (1) self-reliance; (2) sense of personal worth; (3) sense of personal freedom; (4) feeling of belonging; (5) freedom from withdrawing tendencies; and, (6) freedom from nervous symptoms (6).

Slow learner.-- As interpreted for this experiment, the slow learner is a pupil slow in learning intellectual things, having a history of poor academic achievement, and who has exhibited an intelligence quotient in the lowest quartile of the total school population. As stated by Johnson:

The most obvious characteristic . . . . is . . . . inability to 'keep up' with the rest of the class in . . . . rate of academic growth. . . . grasp new skills and concepts more slowly than is expected for children in general. . . . form the group . . . . who receive the majority of the grades in the lowest quartile. Deviate, antisocial, unacceptable behavior in the classroom and school is not rare (24, p. 9-10).

Social adjustment.-- The term is defined generally as the state of the individual's adaptation within his society--how well he gets along with others. Included are components of: (1) social standards; (2) social skills; (3) freedom from antisocial tendencies; (4) family relations; (5) school relations; and, (6) community relations (6).

The term is relevant to this experiment because of the apparent nature of the influence of social adjustment upon self-adjustment.

## 5. Summary

It is generally self-evident among educators today that recognition of the individual is basic to all good human relations practices. There is concern that student's values may be unchanging from the time they enter high school to the time they leave. There is concern that we must build into courses the belief that the course is basically for the individual, that it offers opportunity to develop his strengths, to identify his weaknesses, and to make the individual a better person. If this is accepted, then there is a concomitant principle of responsibility. We must realign the classroom goals with the total structure of the educational objectives and develop an appropriate concept of learning accompanied by appropriate teaching methods.

The traditional approach to teaching is that learning is passed on from someone who knows to someone who doesn't know. Counter to this is a concept concerned about the perceptions that individuals have when they come to a class, and that adequate perceptions of self are significant to the development of a fully functioning personality and to traditional subject-matter learning.

Focus in the recent past has been upon the subject-matter learning of the academically talented students. Increasing concern now is toward the education of all individuals. Concern in this experiment is directed to those students identified as slow learners. Their subject-matter learning might be secondary to the more significant question: how can the classroom teacher enhance the self

concept of the slow learner while not inhibiting their learning of subject matter? Focusing on the enhancement of self concept might well be an even more important goal to the teacher of slow learners than the learning of traditional subject matter.

There is general agreement among science educators that all high school students should be given the opportunity to take a course in biology. There is question concerning how the subject is most profitably presented to slow learning students. Significant to the successful teaching of these students is believed to be the employment of appropriate learning theory. The design of this experiment is concerned with testing a learning theory which might enhance the self concept of the slow learning student while not inhibiting his learning of biology. The approach selected to be tested is that learning theory as has been developed by the phenomenologists and identified as perceptual field approach learning theory. This theory contends that before the student learns, the material to be learned must have some value and personal meaning to the student. Furthermore, consideration is given to student attitudes, habits, knowledge, experiences, purpose, values and assumptions.

## CHAPTER II

## REVIEW OF RELATED LITERATURE

## 1. The Teaching of Biology

Focusing on instructional method.-- Research studies have been conducted to explore methods of presenting high school biology. New programs are concerned primarily with modernizing content and with the preparation of teachers to teach these programs. Some observable trends are toward: (1) student-centered rather than teacher-centered classrooms; (2) increased emphasis on student inquiry and laboratory investigation; (3) open-ended investigations rather than "cookbook" exercises; (4) the use of "real" problems; and, (5) subject-matter depth rather than breadth. Concern is being shown for subject-matter content selection--for knowledge which is familiar and useful in advancing the learner's understanding of the meaning of science and of scientific inquiry, for content which serves not only the present needs of the learner but needs of the future as well. It is questionable whether recent action is including that content (1) which takes full advantage of the relations between science and other disciplines, and (2) which includes concepts that will best promote the welfare of mankind.

Content, however, can only succeed when the theory of instruction is suitable. The question, then, remains: is the current popular theory of instruction suitable to a modern philosophy of education? A theory of instruction must consider (1) the nature of science,

(2) the nature of the learner, (3) the nature of the teacher, (4) the nature of learning processes, (5) the nature of the curriculum, and (6) the nature of the social structure. The current new programs have undoubtedly rendered considerable aid to the teaching of science. Much concern is given to the nature of science. The methods and objectives considered and actualized by these programs seem current and realistic. But, it is questionable whether these programs have been developed with the learner really in mind, particularly concerning the learner's readiness and learning processes. And, even less progress has been accomplished in the development of a program of teaching biology to slow learners. A review of the literature leads to the conclusion that considerably more classroom research must be conducted, particularly in the area of teaching that applies current learning theories, before the real values of the "new curricula" may be seen.

In one such project, the Madison Project (10), an attempt is being made to bridge the gap between theory and reality. As Davis states:

In many fields today one finds on the one hand the 'practical' man on the everyday firing line, and on the other hand, the 'theoretical' man back in the laboratory. . . . I can speak only as the 'practical' man, reporting on the everyday teaching and curriculum planning activities of the Madison Project. . . . We are greatly interested in a 'theory of instruction,' and we wish to contribute to it as much as possible from our admittedly untheoretical position. The theoretical work of Piaget and Bruner gives me considerable hope that our 'practical' decision-making can be related to a broader theoretical perspective (10, p. 146).

Although the Madison Project is being tried in the teaching of

mathematics, grades kindergarten through nine, their concern and the significance of their work is much broader. Their interest in a "theory of instruction" is referred to later in this chapter.

Other research studies of relevance to this experiment have been conducted, some of which date back several decades. Hunter (20) investigated a "rotation technique" using three methods of presenting high school biology. These methods were: (1) by lecture; (2) by textbook; and, (3) by a "developmental method" where students were allowed more freedom to discuss problems. The major concern was student learning of subject matter. Hunter concluded that the method producing best results was that method preferred by the teacher.

Boeck (4) was concerned with the relative efficiency of reading and demonstration methods of instruction in developing scientific understandings. He found that the variance of student response is primarily assignable to differences among teachers. Taylor (53) was interested in the differences among teachers. He concluded that, when considered singly, teacher's attitudes, semester hours of professional education, semester hours of science, and years of experience, do not have a positive correlation with student interest or achievement in high school science courses.

Stafford (50) conducted an experiment using a textbook in one biology classroom and teacher-gathered material in another. Subsequent testing for achievement in subject matter revealed no significant difference.

A multisensory approach was found to be more effective for teaching high school biology than a single sensory approach (1).

Students with low I.Q. and low reading ability are more successful in a lecture-discussion and in-class reading situation than in a lecture-discussion with outside reading or no reading assignments (37).

In summary, these studies suggest that for the teaching of biology: (1) the teacher is most effective when using the method with which he is most comfortable; (2) the nature of the teacher's personality is significant to learning outcomes; (3) whether reading material is bound or not is not relevant, or, is secondary to more significant considerations; (4) students learn best when a variety of activities are planned, utilizing not only hearing but other senses as well-- when the students are actively engaged in classroom activities.

Focusing on the student.-- It appears evident that learning is most effective in situations which actively involve the student, and especially when the course is specifically designed around his expressed needs. For example:

Mohler (34) developed a special mental hygiene unit of instruction to be used in biology classes. The experimental unit was built around the needs and desires expressed by biology students. . . . Classes were taught the unit using regular group instructional techniques. He found that the students' faulty knowledge was corrected and that they gained new insights into their behavior (21, p. 208).

Laton (28) applied principles of learning psychology in an experimental high school biology program. "She found that the effectiveness of student learning was greatest in those classes where the teaching methods had been planned in terms of [then] established psychological procedures" (21, p. 209). The Laton study was reported in 1929.

Concerning research on instructional methodology Hurd provides a summary as follows:

The research on teaching methods is limited and inconclusive for valid recommendations about specific techniques. Few of the studies make clear the objectives sought for and in other instances the investigator confined his judgment of achievement to 'facts' accumulated, or a limited interpretation of the outcomes of science teaching. The following hypotheses about science teaching appear to have support:

1. Methods which most actively involve the learner appear to be the most effective for the acquisition and retention of learning.
2. The logical organization of biology courses in terms of the historical development of its conclusions does not seem to result in the most effective learning.
3. The permanence of student learning in biology courses is dependent to some degree upon the extent to which he is able to conceptualize his knowledge (21, p. 212).

It may be that unless there is an on-going process of consciously attempting to satisfy the student's most immediate personal and social needs (basic needs) his conceptualization of biology may be strongly inhibited. An individual must believe he can learn before he will learn. This has important implications concerning the methods by which pupils identified as slow learners are taught. The student may play the role of "dumb" if he is made to believe that he is "dumb". The teacher must believe in the student's capacity and potential to be adequate. And, in order to help the slow learner learn the teacher must discover the reference-points from which the student starts. "Every effective learning-situation between a pupil and teacher is reciprocal" (9, p. 1).

Certain research findings result in pedestrian conclusions, suggesting that students learn better from teachers who are kind,

warm, cheerful, and sympathetic to the problems of youth. They suggest that teachers be "mature" and understanding. "Training programs for teachers are often influenced by prevalent psychiatric concepts which imply that emotional maturity is sufficient equipment for dealing effectively with difficult children" (11, p. ix). Slow learners require, demand, and deserve more than warmth, understanding, and sympathy. "Personality and emotional stability, regardless of their importance, do not enable a teacher to understand a child and to effect improvement in his ability to deal with problems" (11, p. ix). "At present, training in psychological methods specifically applicable to the classroom is almost unavailable to teachers" (11, p. x). And, "little use appears to be made of established principles of learning in the teaching of science" (21, p. 212). "Teachers also need instruction in and information about new psychological methods for the classroom" (11, p. ix). Evidence is accumulating which indicates that the significant factor governing student learning is the teacher's knowledge of learning theories combined with an understanding of human behavior and psychodynamics.

## 2. The Needs of the Slow Learner

The Developmental Tasks.-- There is no evidence to indicate that the needs of the slow learner are any different from those of other individuals. He needs to grow in his perception of self. But his inability to realize this goal through the channels normally open to average and brighter students may be the factor that motivates much of his purposeful behavior. The means by which this need can be met may necessarily be somewhat different. Direct concentration upon the adequate meeting of his developmental tasks may assist the slow learner in the enhancement of his self concept. Any teacher having taught slow learners is undoubtedly well aware of the significance of the Developmental Tasks of Adolescence (17) to the learning and general behavior of these students. These tasks are listed (17, p. 33-71) as:

1. Achieving new and more mature relations with age-mates of both sexes.
2. Achieving a masculine or feminine social role.
3. Accepting one's physique and using the body effectively.
4. Achieving emotional independence of parents and other adults.
5. Achieving assurance of economic independence.
6. Selecting and preparing for an occupation.
7. Preparing for marriage and family life.
8. Developing intellectual skills and concepts necessary for civic competence.
9. Desiring and achieving socially responsible behavior.

10. Acquiring a set of values and an ethical system as a guide to behavior.

Slow learners typically are students who have found little for which to come to school. They have not experienced academic success, and are seldom involved in school activities. The major topics of their conversations are evidence of their concern about these developmental tasks. Slow learners are most often heard to be discussing social matters, parental problems, and problems indicating behavioral difficulties.

The question as to how a teacher might best use this information is significant, but it remains that if a student is not successfully meeting these tasks then his ability to concentrate on any subject matter might well be inhibited regardless of how logically organized or how well the subject matter is presented. Possibly the concept of developmental tasks shows where these students are and where they are headed, that certain needs are basic and must be met before other needs can be developed, pursued, and satisfied.

Quite possibly helping slow learners in their efforts to meet these tasks may be an even more important goal to the teacher than that of learning of subject matter. And, as the student does meet these tasks and grows toward self-actualization, the subject-matter learning might come more easily for him. Jersild believes that: "education should help children and adults to know themselves and to develop healthy attitudes of self-acceptance" (23, p. 2).

The job of teaching slow learners in biology can be more than merely that of teaching biological facts and concepts and the nature

of science. "To adapt the self concept as a basic concept in education will make the job of teaching more meaningful and significant, and more rewarding" (22, p. 100). Staines (51) hypothesized and concluded that: "It is possible to teach so that, while aiming at the normal results of teaching, specific changes can be made in the Self [sic] picture" (51, p. 97). The experiment by Staines has shown that enhancement of the self concept can be achieved in regular classrooms with no loss of learning in traditional subject matter. The enhancement of the self concept leads to self-actualization (2). The self-actualizing personality is characterized as follows:

When he looks at his self, as he must, he must see that it is enough--enough to perform the task at hand. He must see in his experimental background some history of success. He needs to see process, the building and becoming nature of himself. He must like what he sees, at least well enough for it to be operational (26, p. 10).

The student needs a teacher who can guide him toward self-actualization. The teacher must ". . . . help students to see themselves clearly and realistically and to accept what they see at least as good enough to go on from" (13, p. 144). An adequate, workable self concept is essential if the student is to become a fully functioning member of our democratic society. The problem of teaching subject matter to slow learners may never be solved if the schools continue "with the notion that the school is the place for book learning, that the rest of the organism does not and should not grow in school but should do it somewhere else" (25, p. 136).

Kelley (25, p. 137-140) provides the following factors which he considers as seeming essential if the individual is to develop a

fully functioning (self-actualizing) self:

1. "The first fundamental is other people." He must see his stake in others.
2. "The establishment of facilitating communication." The slow learning student must have at least one adult with whom he can communicate.
3. "The human being must have other people in a loving relationship."
4. "Each person must have a workable concept of self." This includes the acceptance of one's self, and of others. "The unloved and unwanted become crippled and cannot thrive."
5. "Every human being must have freedom." This does not imply anarchy or freedom with license to do whatever he pleases. But freedom with responsibility is necessary in order for one to develop his full potential. Kelley argues: "The capacity to exercise [freedom] . . . . has to be learned . . . . [and] can be learned in an atmosphere of love, democracy, cooperation".
6. "Every person needs the chance to be creative." The slow learner should be provided the opportunity of meeting the problems of living and inventing ways to solve them. This can occur only in an atmosphere of freedom.

The slow learner, living for only a brief time in an atmosphere as described above, might then meet his tasks, develop a more adequate self concept, and grow toward self-actualization. As stated by Kelley:

The most urgent needs of our youth go much deeper than the three R's. Indeed, the three R's cannot even be learned at all unless at least part of the above fundamentals

are met. Some of these needs have to be met in infancy. . . . But most of these needs are continuous throughout life and can be provided by the school (25, p. 140).

The need for adequate teachers.-- A teacher employed to work with slow learners must have not only an interest in working with students who have special problems, but a basic understanding of the learning processes and knowledge concerning the purposes for which young people behave the way they do. In order to guide these youth toward more adequate self concepts, the teacher must be a self-actualizing personality (2).

The significance of the teacher's personality has been suspected but not well investigated (14). It is accepted that the competent teacher possesses certain qualities in addition to those of having subject-matter knowledge and a general education of both breadth and depth (42). These additional qualities are:

1. He understands human growth and development.
2. He understands how learning takes place.
3. He can appraise and guide individuals.
4. He is an expert in group processes.
5. He is skillful in methods of teaching, is stimulating, and skillful in developing creativity and values in young people.

Reinhardt (40) reports on a study where 600 college students were asked to choose the elementary or high school teacher who helped them most. They were asked to state reasons for their choice, the sex of the teacher, grade level taught or subject matter area. The two most frequent reasons given were:

1. The teacher encouraged the student--gave self-confidence;

and,

2. helped the student with personal problems.

Other reasons given with less frequency were those concerned with the teacher's methods of presenting the material, friendly and fair personality, and the teacher's personal example in terms of dress, manners, and morals. It is evident from Reinhardt's study that the characteristic of teachers most remembered for their help centered about "bolstering pupils' self-confidence," providing the student with a sense of belonging, and the general acceptance of all students. Reinhardt's study was concerned with teacher effects upon pre-college students. The question remains: is it likely that slow learners would respond differently to the same questionnaire?

The adequate teacher is described as "open," "warm," "loving," "accepting" (of themselves and others), "confident," "informed," and "secure" (2, p. 239). The first step in the production of students of adequate self concepts, of dignity and integrity, must be that of providing these students with a teacher who feels this way about himself (2).

Developing a course around the concerns of the slow learner.--

Slow learners have realistic concerns which often keep them from fully realizing themselves personally, socially, and intellectually. No attempt can be found in the literature to develop a student-problem centered course in biology. Little justification can be found for not centering a course in biology for slow learners around the student and his immediate needs and concerns, whether biological in nature or not. Consequently, this study is considered to be original in this respect.

The concerns of adolescents.-- Adolescents may not always be aware of the purposes of their behavior, nor of their needs, but they are aware of their concerns. All adolescents face frustrating situations. The developmental tasks of slow learners are essentially no different than those of average and brighter pupils. The problems and concerns they face may be more severe, not because of any intrinsic make-up of the slow learner, but because they are slow learners.

From a study of 245 adolescents utilizing a questionnaire, "over 65 per cent of the concerns reported involved the parents" (43, p. 15). The adolescents were concerned about parental empathy and problems in parent-child communication. The girls were concerned about parents and dating conflicts. The boys were concerned that "parents are sometimes 'phonies' " (43, p. 15). Secondly, they were concerned about their teachers. They felt the lack of closeness with teachers, the lack of some teacher's consideration of students as worthwhile individuals. This could be a feeling damaging to students' self concepts. Inadequate self concepts might lead to poor academic performance. "A positive view of self facilitates high academic performance while a negative view inhibits it" (43, p. 17). A third most frequent reported concern in the study was that of peer relationships--generally those related to values and self concepts.

Consequently, it seems evident that teachers can play a vital role in the positive development of fully functioning adolescent slow learners, in the improvement of their perceptions of their own personal (self) and social adjustments. The problems of learning in the classroom are not separable from the problems and concerns of adolescents.

### 3. Theories of Learning

The need for a theory.-- Attending adequately to the basic needs of slow learners requires the development of an adequate concept of learning. The way we teach slow learners is determined by our attitudes about them. As stated by Johnson:

The slow learners are, by definition, slow in their rate of intellectual development and retarded in their level of intellectual development, as compared to the normal child, at any specified age. They, therefore, deviate widely from the general student population in this facet of their growth. . . . This differential rate of intellectual growth effects their growth in other psychological and educational areas. Due to retarded learning ability, adjustment problems, grasp of academic instruction, and so forth are all affected directly or indirectly. By the time the slow learners come to the attention of the educator it is difficult to determine which characteristics are innate and which ones are acquired. They have had both attributed to them for so long that many educators think that they are all inherent and that little or nothing of a positive nature can be accomplished in dealing with them (24, p. 32).

The teacher must believe that the slow learners can learn before they will learn. Necessary is the teacher's acceptance of their slower grasp of ideas, abstractions and symbols, of their need to meet their developmental tasks, and of the fact that they will learn that which has value and meaning to them.

There is no evidence to indicate that slow learners learn any differently than other groups of students. Studies and research attempts have been conducted to establish laws of learning. The information is of vital importance to educators but apparently little used by teachers. The success or failure of current curriculum developments in general, and of those for slow learners in particular,

may well depend upon how well new information concerning learning theory is put into practice.

Representative theories of learning and their implications for education.-- From Bigge (3), the following outline consists of "concepts involved in ten major learning theories. . . . either prevalent in today's schools or advocated by leading psychologists" (3, p. 18). The ten theories are included here in three groups: the mind substance family--theories with which this experiment is not directly concerned; conditioning theories of stimulus-response (S-R) associationistic family--theories with which this experiment is concerned and opposed; cognitive theories of Gestalt-field family--theories from which the variable of this experimental study is derived.

Four theories from the mind substance family are described as follows:

1. Theistic mental discipline theory. This theory, based upon the work of the faculty psychologists, operates from the assumption that man is bad-active, such mind substance continues active until curbed. The total intellectual behavior (faculties) of an individual can be trained or improved by instruction, study, and practice. As these faculties are trained, the individual becomes more intelligent. The basis for transfer of learning is through exercise of the faculties--the "muscles" of the mind. This theory, supported in the past by St. Augustine and John Calvin, still has strong advocates today, particularly many Hebraic-Christian fundamentalists.

2. Humanistic mental discipline theory. Based upon the psychological outlook of classicism, the contention is that man is

neutral-active and that the mind substance is to be developed through exercise. The basis for transfer of learning is through the cultivated mind or intellect. The emphasis in teaching should be the training of intrinsic mental power. Based upon the thinking of Plato and Aristotle, contemporary exponents are M.J. Adler and St. John's College.

3. Natural unfoldment theory. This theory is based upon the outlook of romantic naturalism--man is good-active, a natural personality is there to unfold. No transfer of learning is necessary. The main emphasis in teaching is through negative or permissive education. Supported in the past by J.J. Rousseau and F. Froebel, key exponents today are the extreme progressivists.

4. Apperception or Herbartianism theory. Based upon the psychological system of structuralism, the assumption is made that man has a neutral-passive mind composed of active mental states or ideas. Transfer of learning is made as the result of a growing apperceptive mass resulting from the addition of new mental states or ideas to a store of old ones in a subconscious mind. Key persons have been J.F. Herbart and E.B. Titchener with many teachers and administrators as contemporary exponents.

Descriptions and criticisms of three theories from the stimulus-response (S-R) associationistic family are as follows:

1. S-R bond theory. Based upon the psychological outlook of connectionism, this theory has probably had as great an effect as any other upon teaching practice. Concerning the basic psychological nature of man the assumption is made that he is a neutral-passive or

reactive organism with many potential stimulus-response connections. The main emphasis in teaching should be the promotion of acquisition of desired S-R connections. Promoted during the early years of this century by Thorndike, contemporary exponents are J.M. Stephens and A.I. Gates.

Criticisms of this significant theory, as seen by this author, are as follows: (1) too much emphasis is placed on trial and error learning (problem-solving), as the learner may not associate a response with a stimulus; (2) continuous repetition can often lead to boredom, as is often the case with slow learners in particular; (3) exponents of this theory contend that if attempts to learn are unpleasant, attempts will then cease and no learning will occur-- probably true only with extreme cases; (4) too much emphasis on the use of rewards and punishment with not enough emphasis upon learning becoming purposeful as meanings increase.

2. Conditioning (with no reinforcement) theory. Based upon the psychology of behaviorism, man is a neutral-passive or reactive organism with innate reflexive drives and emotions. Transfer of learning is through conditioned responses or reflexes. Emphasis in teaching should be by promoting the adhesion of desired responses to appropriate stimuli. Based upon the work by J.B. Watson in the 1920's, a contemporary exponent is E.R. Guthrie.

This is the "child and hot stove," Pavlov-and-his dogs, theory, and in the opinion of this author makes more sense with simple unconscious learning. The theory explains behavior in terms of past experiences and probably makes more sense with rats than with

the complex aspects of goal-directed, purposeful learning in humans.

3. Reinforcement and conditioning theory. This theory is based upon the psychology of reinforcement. The assumption is that man is a neutral-passive organism with innate reflexes and needs with their drive stimuli, and that the basis for transfer of learning is by reinforced or conditioned responses. The main emphasis in teaching is through provision of successive, systematic changes in the organism's environment to increase the probability of desired responses. The key person is C.L. Hull along with contemporary exponents of B.F. Skinner and K.W. Spence.

From the literature it is evident that those individuals currently concerned with the development of programs in biology for slow learners are primarily concerned with the development of program materials, and that their theory of instruction rests heavily upon reinforcement and conditioning theory. Lisonbee, a consultant to the Biological Science Curriculum Study (30), has stated:

One can learn a great deal from Skinnerian psychology in regard to teaching the slow student. Slow learners. . . . are motivated by immediate awards and evaluations, and surely they comprehend best if the things they are given to learn are presented simply in small sequential steps. . . . (29, p. 42).

Most programmed learning materials being produced today are based on some theory of reinforcement. "Skinnerian programming is used in 19 of 20 programs now developed for commercial sales" (35, p. 534). However, psychologist-teacher Sierles reports: "Whatever benefits accrue from it, programmed learning is not a suitable method of teaching the slow learner whose limited reading ability, lack of

power of concentration, and limited motivation are serious obstacles to automated instruction" (44, p. 361).

Snygg offers the following: "If the folklore which passes for common sense were an adequate guide for teaching, the concept of reinforcement would not have been proposed in the first place" (47, p. 110). Nevertheless, reinforcement theory has served as the focus of attention of experimental psychologists, little of whose work has been conducted in the classroom.

Descriptions of three theories from the Gestalt-field family--theories from which the variable of this experimental study is derived--are as follows:

1. Insight theory. Based upon Gestalt psychology, the assumption is that man is a naturally-active being whose activity follows psychological laws of organization. Basis for transfer of learning is through the transposition of insights. The main emphasis of teaching should be the promotion of insightful learning. Key persons are M. Wertheimer and K. Koffka, with the latter as a contemporary exponent.

2. Goal insight theory. Based upon configurationalism, the assumption is that man is a neutral-interactive purposive individual in sequential relationships with the environment. Learning transfer is based upon tested insights with teaching emphasis in the aiding of students in genuine trial-and-error, goal-directed learning. Along with E.E. Bayles as a contemporary exponent, key persons are B.H. Bode and R.H. Wheeler.

3. Cognitive-field theory. Based upon field psychology or

relativism the assumption is that man is a neutral-interactive purposive person in simultaneous mutual interaction with the environment, including other persons. The basis for the transfer of learning is concerned with the continuity of life spaces, experience, or insights. The main emphasis in teaching should be that of helping students restructure their life spaces, i.e., to help students gain new insights into their contemporaneous situations. Key persons are Kurt Lewin, E.C. Tolman, J.S. Bruner, along with contemporary exponents including R.G. Barker, A.W. Combs, H.F. Wright, and M.L. Bigge.

#### 4. The Perceptual Field Approach Learning Theory

Its point of view.-- The point of view underlying this experimental study is a frame of reference which has variously been called the "cognitive-field," "phenomenological," "interactional," "existential," or "perceptual" approach (2). Snygg (47) refers to it as a perceptual field approach learning theory.

The approach stresses the wholeness of the learning process and is more than a psychology--it is actually a philosophy of nature. It is concerned with the individual's report of his perceptions of himself and of his external world. It is concerned "with the cognitions (perceptions or attitudes or beliefs) that the individual has about his environment, and with ways these cognitions determine his behavior" (18, p. 28).

Significant to this approach is the point of view that learning must be a self-awakening, the discovery of personal meaning, growth toward self-actualization. This is considered to be more significant than the mere acquisition of factual knowledge.

. . . . a kind of animal training, which deals with psychophysical habits, conditioned reflexes, sense-memorization, etc., undoubtedly plays its part in education: it refers to material individuality, or to what is not specifically human in man. But education is not animal training. The education of man is a human awakening (31, p. 164).

"The wrong begins when the object to be taught and the primacy of the object are forgotten, and when the cult of the means--not to an end, but without an end--only ends up in a psychological worship of the subject" (31, p. 167-168).

Its psychological basis.-- This perceptual field approach theory of learning includes parts of several psychologies, but has been most influenced by work of phenomenologists. Phenomenological psychology<sup>1</sup> stresses the role of the environment in which behavior (including learning) occurs, the perceptual aspects of learning. Perception is the phenomenon that makes meaningful experience possible. In contrast, it is the basic tenet of conventional or:

. . . . so-called depth or dynamic psychology that behavior is determined by deep unconscious motives, and that in order to understand, predict, or control behavior [including learning] one must understand these motives. This is not a simple matter, since one cannot easily recognize motives. The apparent or obvious motives, or the motives reported by the subject, are not the real motives. Indeed, the so-called real motives are commonly the reverse of these reported by the subject. Thus nothing can be accepted at face value. Nothing is what it appears to be. Reports of subjects are not to be trusted. The widespread acceptance of this point of view, by lay as well as professional people, attests to the influence of Freud and psychoanalysis (39, p. 997).

Opponents of this conventional approach argue that the individual's reported perceptions are important in the learning process. Learning behavior is a joint function of the person and his perceived environment.

The phenomenological point of view suggests:

. . . . that for the purposes of understanding and predicting behavior it is profitable to make the assumption that things are what they appear to be, that the significant determinants of behavior [including learning] are not some mysterious unconscious motives, nor some so-called reality, but the individual's perceptions of himself and his environment (39, p. 997).

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<sup>1</sup>There is, as yet, no formal school of phenomenological psychology. Thus, it is not yet possible to present a statement of a formal outline of the learning theory such as is done with approaches to learning based upon stimulus-response psychology.

Although there is, as yet, no formal school of phenomenological psychology, the Gestaltists are essentially phenomenological in their approach. The first specific treatment of phenomenological psychology was the 1941 article by Snygg (48). Patterson (39) reports that at the present time the most definitive statement of phenomenological psychology is perhaps that of Snygg and Combs (49). Patterson (39) has outlined from Combs and Snygg (8) the ideas of phenomenological psychologists toward behavior. Borrowed from the outline and significant to the development of the learning theory are the following points:

1. The individual is a living, and therefore active, organism engaged in the attempt to organize its world.
2. The individual can act only on the basis of his perceptions, his phenomenal field.
3. The self is part of the individual's phenomenal field.
4. Essentially, perceptions change under those conditions that have relevance to the basic need for the preservation and enhancement of the self. . . . [and] the first condition for perceptual change is an experience which is relevant to the self or self-concept [sic] (39, p. 999-1003).

The educational implications.-- The above perceptual frame of reference provides implications for educational practice. These implications, as identified specifically for a learning theory for teaching students identified as slow learners, are as follows:

1. "Behaving and learning are products of perceiving" (2, p. 67).

The current perceptions of these students must become the center of focus in the classroom. The learning activities must have value and meaning to the students.

2. Learning exists in and can, therefore, be dealt with in the present. Most significant to the learning process is not what has happened to the individual student in the past, but rather what he perceives as happening right now. Little can be done about the past but much can be done in the present. The teacher does need to be open and cognizant of the student's current perceptual world.

3. The teacher need not concern himself with the causes of student behavior. He does need to be aware of the possible purposes of the student's goal-directed behavior. "All people everywhere have a basic drive toward health and actualization" (2, p. 67). The student must be made aware of alternatives to his behavior in order that he may continue to learn and grow toward an improved self concept--toward self-actualization. The teacher must provide experiences for the student in a manner undamaging to the student's self concept.

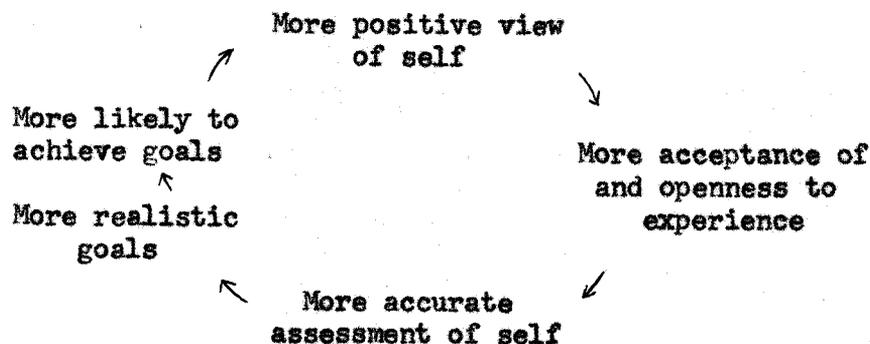
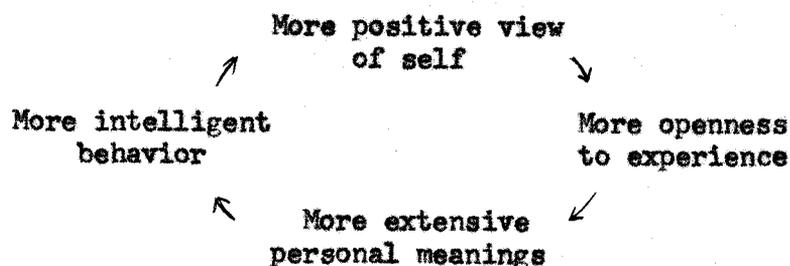
4. "Much of a person's behavior is the result of his conception of himself" (2, p. 67). The teacher's role is to help the student to change his perceptions of himself and his world--to see himself in the process of becoming (2). The student must see himself as a worthwhile individual, and then he may learn those concepts of value and meaning to him.

Into a theory of learning.-- To bridge the gap between these theoretical implications and a theory of learning that will work with slow learners is the essential task of this experimental study. For the purposes of the study, conventional learning theory is rejected.

Conventional learning theory has almost nothing to

offer a curricular planner or a teacher who wants to do more than teach the facts we already know and the solutions we have already worked out. Its most widely accepted form, reinforcement theory, simply attempts to explain why an act is repeated. This question, which was crucial when we were trying to teach children the answers to problems someone has already solved, or to keep on doing something they did not want to do the first time, has no relevance to a teacher . . . who is trying to develop creativity, initiative and the ability to deal with new problems. It is impossible, by definition, to reinforce an act which has not yet been committed (47, p. 110).

The purpose of this experiment is to test a method of teaching which will enhance the self concept of slow learners while not inhibiting their learning of subject matter. Staines (51) has already shown that the self concept can be taught--that adequacy can be learned. "What produces adequacy assists and encourages learning as well" (2, p. 185). The interaction of adequacy and learning is illustrated by Combs (2, p. 185), as follows:



This learning theory contends that before the student learns, the material to be learned must have some personal meaning to the student. Consideration is given to student attitudes, habits, knowledge, experiences, purpose, values and assumptions. We can no longer afford to treat slow learners as passive organisms neutral to their environment. As stated by Combs:

People can learn, to be sure, from situations where they are treated as passive sponges, but this is pretty inefficient learning. It is a horse and buggy approach to a twentieth century problem. We can no longer afford the luxury of such inefficiency (2, p. 71).

If learning is a function of personal meaning, then learning has not really occurred until changes have occurred in the learner's own perceptual field. The function of the teacher becomes that of providing experiences for the discovery of meaning. These experiences take place, then, in a "meaning" oriented classroom.

Combs provides a discussion of "the learning process in a 'meaning' oriented classroom" (2, p. 71-72). An outline of this discussion is as follows:

1. The learning process . . . . becomes that of jointly planned, as well as teacher planned, activities--activities which provide each class member an opportunity to bring facts and information to bear on his perceptual world. . . . Facts and information are important and are the raw materials for new and exciting ways of seeing the world. This calls for teachers who are keenly sensitive to students--how students are, how things seem to them.
2. It means helping students find ways of expressing their needs rather than dictating to them what their needs should be.
3. It means finding ways through which students may experience self-expression as well as seeing the need for self-restraint.
4. It means helping to elicit and clarify the purposes of

the individual members of the class.

5. It means accepting the aims and goals of each class member.

6. It means searching, with students, for activities which will provide opportunities for self-expression and self-clarification.

7. It means developing learning situations based upon exploring and discovering meaning in place of disseminating or 'telling' facts (2, p. 71-72).

The obvious focus of concern in this type of classroom must be that of problems of apparent and immediate concern to the student. The student plays an active role in the decision making processes. Specific teaching techniques are employed which are designed to meet the developmental tasks, basic needs, aims and goals of the individual class members. Discussions centered about the problems of concern to the student and case studies to provide the student the opportunity to test unfamiliar roles and new concepts of self are but two techniques which through experimentation and use have been shown to be effective ways of helping students to learn how to deal more effectively with the frustrations that tangle their lives.

By focusing upon the individual student and his perceptual world of meanings he should develop a sense of belonging, a feeling of importance--a more adequate self concept. Combs states this as follows:

Experiences planned for and with children will be developed so that each individual has an opportunity to experience success and to see others as helping him to achieve. Classroom activities will provide opportunities for each member to make a contribution to the project or activity. Each individual will be able to feel that he has made a contribution; that he has developed new meanings as a result of the experience. He will have

had an opportunity to see himself as one who can do things, as one who can learn and who has learned. He will have had an opportunity to feel that what he does matters; to feel that he is someone who is important in his own right (2, p. 71-72).

Slow learners too often have not had the opportunity to feel that they can do things or that they can learn. Their attitudes in school are too often those of not feeling accepted, adequate, or important. The "meaning" oriented classroom should provide more satisfying learning experiences for the slow learner, thereby resulting in increased self-development and social adjustment.

As mentioned earlier, an attempt is being made with the Madison Project to develop "meaning" oriented classrooms. Their concern is not with slow learners in particular, but with finding an instructional method to teach mathematics to children in the lower grades. The work of this project has been based upon the contributions of such cognitive-field psychologists as Bruner, Tolman, and Piaget. The importance of focusing on the child's perceptions is stressed; helping the child "to improve his own personal internal cognitive structure" (10, p. 156). "The teacher has tried to remove himself from the role of the middleman: he has tried to step out of the way and let the child look directly at the mathematical structure itself" (10, p. 148). To accomplish this aim the Project has developed a set of seven "criteria for choosing appropriate experiences" (10, p. 148-150), and these are as follows:

1. "Adequate Previous 'Readiness'." For teaching slow learners the implication is for the teacher to assist the students in finding appropriate experiences based upon concepts they feel important enough

to learn. It is essential that the students be ready to learn the particular concept to be taught. The experiences must have value and meaning to the students.

2. "Relation to Fundamental Ideas." The Madison Project personnel "made up a list of . . . fundamental concepts and techniques. . . . [requiring] each 'informal exploratory experience' to relate directly to these fundamental ideas".

3. "The Student Must Have An Active Role." Activities are those of "problem-solving, arguing, criticizing, . . . reassuring, estimating, or performing an experiment". Teachers almost never lecture, and make very little use of required reading.

4. "Concepts Must be Learned in Context." Ideas and concepts are developed by the students.

5. "Interesting Patterns Must Lurk under the Surface of Every Task." The students look "beyond the immediate problem," searching for underlying patterns.

6. "The Experience Should be Appropriate to the Age of the Child."

7. "The Sequence of 'Informal Exploratory Experience' Must Seem to 'Add Up' to Something Worthwhile."

Evidence strongly indicates that learners will understand instruction more completely and rapidly when the instruction is attached to a familiar, meaningful situation (24). "Teaching, using activities related to the children's social needs, is the most desirable and most effective method with children who are retarded intellectually" (24, p. 316).

The Madison Project is concerned with finding an instructional method to teach mathematics to children. In contrast, the experimental study being reported in this thesis is concerned with finding, developing, and testing an instructional method which will develop in slow learners a more adequate self concept while not inhibiting their learning of subject matter. However, the psychological basis for these two studies is equivalent--the perceptual field approach.

The basic assumption of this perceptual field approach is that behavior is always appropriate to the situation as perceived by the behavior at that instant. That is, behavior is determined, not directly by reality, but by the behavior's perceptions of the situation (47, p. 110).

Learning is the result of the learner's achieving a clearer, more realistic perception of the situation, and takes place in the following steps:

1. The learner becomes aware of a need or goal the achievement of which will enable him to satisfy his purposes. (Goal)
2. The existence of an obstacle makes it necessary for him to perceive the situation. (Interpretation 1)
3. He attacks the problem (attempts to reach the goal) in a way which is appropriate to his perception of the situation. (Act 1)
4. This act has consequences. If the result is the achievement of the goal and the satisfaction of the need the process is complete, his perception of the situation remains unchanged and he has, therefore, learned little that is new. If, however, the result is not one he sought and expected, (Result 1)
5. a reinterpretation of the situation takes place. (Interpretation 2)
6. The second attack (Act 2) is appropriate to this new interpretation.
7. The consequent result (Result 2), if it is the achievement of the goal, brings the search and

reinterpretation to an end, or if it is not the result expected, causes a

8. re-evaluation of the situation. (Interpretation 3)

The process continues until the learner reaches his goal or perceives another goal as a more practical means of satisfying his need (47, p. 110-111).

This concept deposes both practice and reinforcement as 'causes' of learning. Each repetition of the problem gives the pupil an opportunity to gain a clearer and more accurate perception of the situation but the only pupils who use this opportunity for discovery are those who are trying to discover something (47, p. 111).

Learning then takes place when the students see value and meaning in what is to be learned. Relating the subject matter to the personal and social concerns of slow learners, attempting to increase the adequacy of their self concepts, would then appear to be a more satisfactory manner of giving these students a meaningful learning situation. As stated by Snygg:

The cause of learning, in this conceptual scheme, is the learner's desire to find his way to a desired goal. 'Reinforcement' is not required to explain the stabilization of a successful act. Because he has found a satisfactory path to that goal the learner simply stops exploring the situation. With no more incentive to reexamine the situation, his perception of it and his response to it cease to improve. Once he has either reached or abandoned a goal, no amount of drill will cause him to find cues that he does not want to find. . . . This point of view assumes that education for the unforeseeable, an awkward problem for reinforcement systems, is indeed possible. Transfer of learning from one situation to another occurs when the learner perceives the two situations as similar, when he perceives a solution to one problem as applicable to both or all situations. Personality and character training, which by reinforcement theories would have to be achieved by the reinforcement of a vast number of separate and unrelated behavior acts, are achieved by helping the individual to perceive himself constructively as an accepted and responsible member of society,

as an individual capable of creative insights, and by helping him master the knowledge and learn the skills needed for these roles (47, p. 111).

The above theory is significant to the teaching of slow learners who do not perceive themselves, in relation to other students, as accepted, creative, and potentially constructive members of society. For many of them, by the time they reach high school they have experienced so much failure and frustration that they no longer show desire and motivation in traditional academic matters. They no longer feel adequate and a real part of the academic structure. By this time it may no longer be important that these slow learners be taught the traditional subject matter. It is important that the slow learner be helped to discover more adequate feelings of belonging, of personal worth and value.

Borrowing from Snygg, the steps of perceptual field learning theory are the source of the following implications for teaching slow learners:

1. (Goals) The primary function of the teacher is to help the students to discover problems which demand their personal attention.

Giving students answers to problems they do not have short circuits the whole process of learning by making exploration and reality testing by the students unnecessary and the problem they are intended to solve unimportant. Fundamentally, the curriculum aids the student. . . . by helping him to discover new and more fruitful objectives in his personal campaign for feelings of personal worth and value. . . .

2. (Interpretation 1.) The instructor uses [his knowledge of their perceptions of their problems] . . . to arrange a situation in which the student will have a better opportunity to solve his problems without direct instruction. . . .

3. (Act 1.) It is essential that . . . the situation must give the student the opportunity to test his perceptions of reality by acting on them. . . .

4. (Result 1.) Both perceptual field and reinforcement theories suggest that immediate knowledge of the results of an act is essential to learning. Field theory suggests that the essential factor is the learner's discovery of the relation between the act and the result.

Planned discussions and case studies, rather than rigid lecture and "cookbook" laboratories, offer techniques in which students can explore their own selves in situations which approach reality. The verbal learnings in the classroom will affect a change in behavior outside the classroom. And, the student's own evaluation of his behavior becomes an important factor in the total learning process. Evaluation of the student's progress must be performed jointly by the teacher and the student. The student's own introspection is important and intrinsic motivation may be an important result of this evaluation procedure.

5. (Interpretation 2.) Generally the change in the learner's perception of a situation due to experience is in the direction of increased awareness of details and in breaking the total problem into a number of subproblems and related steps. As long as the teacher does not take over and impose his own solutions, based on his own perceptions, on the student, he may safely call the student's attention to some details in the situation as factors the student might want to consider. [This is the important teacher function of providing alternatives. See discussion of interview technique in chapter three.]

It is essential, however, that the student not be led to feel that the teacher has taken over the problem or that his own work is unnecessary and valueless. Above all the student should not be led to become dependent on the teacher. The teacher should not interfere to prevent the student from making mistakes. . . . The optimum situation for learning is not one in which the learner will make no mistakes,

as in current reinforcement theory. Rather, optimum learning takes place in a situation which allows the learner to test his ideas under conditions in which their results are immediately apparent (47, p. 112-114).

As the teacher of slow learners provides an atmosphere where the students develop the courage to be imperfect, to make mistakes undamaging to their self concepts, they should then progress in their self and social adjustments and learn that subject matter seeming meaningful and important to them.

The teacher of biology can have a unique opportunity to help the slow learners to meet their needs and to gain new perceptions pertaining to their developmental tasks, thereby assisting in the enhancement of their self concepts. The perceptual field approach learning theory provides implications concerning instructional procedure which might assist the teacher striving toward this goal.

CHAPTER III  
DESIGN OF THE STUDY

1. Introduction

Objective of this experiment.-- The perceptual field approach learning theory is tested with students identified as slow learners in high school. The objective is to determine if the application of this approach will enhance the slow learner's self concept while not inhibiting his learning of biology.

Description of the school setting.-- The community is a small university town of approximately 18,000 inhabitants. The large number of university families in the community provides a comparatively high socio-economic background for many of the 850 students of the senior high school. The university community has also provided a rich academic and cultural climate for the students. These two factors have had a definite influence on the program and curriculum of the school and a rather strong college preparatory program has been developed.

Another group with a lower socio-economic level, which includes many of the families of Mexican descent, is an influence which is requiring consideration of changes in program and curriculum. A recent survey (Oct., 1966) provides the following data concerning the racial and ethnic composition of the total school district:

Number of pupils in the school district	= 4236
White with Spanish surnames	= 176 or 4%
Other white	= 3911 or 92%
Negro	= 44 or 1%
Chinese, Japanese, Korean	= 72 or 2%
Other non-white	= 33 or 1%

Major sources of income in the district are: university (approximately 67 per cent); agriculture; and, government employees.

Major occupations are: education and research; farming; and, construction work.

Intelligence quotient data for the high school class of 1964 are as follows (California Test of Mental Maturity: Low, 75; median, 112; high, 147. And, for the class of 1968: Low, 74; median, 111; high, 153.

Approximately 70 per cent of the high school graduates continue on to higher education.

The science program branches out from a single-track to become a three-track program in the tenth grade. The tracks are defined as follows: Track I, non-college preparatory students (which includes the students generally identified as slow learners); Track II, general college preparatory students; Track III, exceptional science students, college preparatory students. Transfer may be made from one track to another.

Although this three-track program, inaugurated in 1963, is a promising administrative approach, much concern remains about the nature of a course in biology that should be provided as an elective for slow learners. And it seems that unless a genuine modification of curriculum and methodology accompanies the change the root causes

of dissatisfaction will probably remain. Dissatisfaction was evident in an accreditation study of 1961 stating that the program for the terminal student does not show the careful planning of the college preparatory curriculum.

The high school does offer a broad curriculum for students desiring courses in biological science. General biology is offered to all students (and to the more capable students at grade nine in the junior high schools). Although courses are offered in advanced biology and physiology, for the slow learners general biology is often their last course in science.

## 2. Procedures Used

The experimental design.-- The design selected for this study is the pretest-posttest control group design (14), illustrated as follows:

$$O_1 \quad X \quad O_2$$

$$O_3 \quad O_4$$

where  $O_1$  and  $O_2$  represent the experimental class pretest and posttest scores respectively, and  $O_3$  and  $O_4$  represent the control class pretest and posttest scores respectively. The experimental variable X is shown as applied to the experimental class.

The experimental process.-- The process of this one semester experiment is identified as follows: pretests, the Nelson Biology Test Form AM and the California Test of Personality, were administered to both the experimental and the control class at the opening of school in September. The two classes were taught for one semester using instructional techniques of perceptual field approach theory in the experimental class and conventional approach in the control class. Posttests, the Nelson Biology Test Form BM and the California Test of Personality, were administered to both classes at the close of the first semester in January. Class mean gains were then analyzed for statistical significance.

The experimental variable.-- This experiment establishes as the significant variable the use of a learning theory of instruction--the perceptual field approach. The design of the experiment involves the

comparative effectiveness of this instructional method--known as the experimental factor--with instruction based on conventional learning theory (reinforcement and conditioning)--the control factor. The criteria are pupil growth in personal (self) and social adjustment and learning of biology.

Difference between the control class gain and the experimental class gain will indicate the superiority of the method showing the greatest class gain.

Using equated groups.-- The design of the study involves the selection of two classes of slow learners for biology. Selection of the 52 slow learners was made by the school counselors. The basis for identification and selection was intelligence quotient and academic history. And, to some extent the placement of students was controlled by schedules of students.

Generally the students were those with grades in the lower quartile of the total school population. There is no significant difference in the means of the control and experimental classes in student age and intelligence quotients (see p. 94-96, Tables I-IV).

The teachers.-- Separate teachers for the control and experimental classes were used in order to counter bias and to control the variable created by teacher competence and enthusiasm for a particular method of instruction.

The two teachers are nearly the same age, males each having Master's Degrees and eight years teaching experience at the time of this experiment, as is shown as follows:

	<u>Control class teacher</u>	<u>Experimental class teacher</u>
Birth date:	1932	1935
Highest degree:	M. Ed.	Master of Arts in Teaching
Graduate major:	biology	botany
Teaching experience:	8 years	8 years

### 3. Description of Methods

The subject-matter oriented control class versus the student-oriented experimental class.-- The conventional classroom is subject-matter centered and the learning process is based on the psychologies of reinforcement and conditioning. The experimental classroom of this study is student-centered and the learning process is based on the quality of the learner's perceptions of situations and things which have value and meaning to him.

The description of methods which follows will illustrate the differences which existed between the control and experimental classes.

Control class course content and activities.-- Topical content was selected by the control class teacher. The content at the beginning of the semester centered about the general understanding of "what it means to be alive" but gradually shifted to an ecological approach. Generally the content closely followed that of the first three units of the school adopted textbook (46).

Subject-matter emphasis and class activities were as follows:

Unit I. This unit was an introduction to the world of living things. Initial focus in the class was given to the person as a living thing, to what it means to be alive, to life processes. Activities involved the students in discussions centered about "your body"--bones, muscles, blood--and activities of a more active nature such as counting the pulse rate and organizing bulletin-board displays.

Students learned how to use the microscope. Following an orientation by the teacher each student was directed to make slides

of human cheek and onion skin cells. The students made sketches of these cells for their record books and were asked questions about the similarities and differences of these plant and animal cells.

As is the case in traditional biology courses, the study of cells led to that of tissues. Prepared slides of animal tissues were studied under the microscopes. Special emphasis was given to bone, muscle and blood tissues to reinforce previous study.

To give further opportunity for practice and reinforcement the above activities were followed by observation of living protozoan cultures brought to class by the students.

This unit was brought to a close the last of September by the administration of the textbook publisher's unit one examination. This is an objective examination consisting of drawings of protozoans to be labeled and of multiple-choice items measuring understanding of factual information in biology. This kind of information is to be found as a part of the Nelson Biology Test (BM) as is exemplified by question number 11, stated as follows: "One of the most marked differences between animal cells and plant cells is that--". The correct answer is given that "plant cells usually have thick, rigid walls".

Unit II. This unit was concerned with "the living things around you". There was a major emphasis on the importance of photosynthesis and partnerships in nature.

Although still using a subject-matter centered approach it was at this point that the teacher began moving away from a strictly textbook oriented approach. With the idea of helping to enrich the

course and to motivate the students he began introducing more detailed and highly structured laboratory exercises. One teacher prepared laboratory exercise instructed the students to "look inside the cells of elodea to discover where the green pigment is located".

It was at this time, in October, that the teacher became somewhat frustrated with the attempts at laboratory investigations. Slow learners probably more than any other group of students need and learn best in activity centered science classrooms. But it is certainly not uncommon in the conventional classroom for the teacher to become impatient and disgruntled over their attempts to perform laboratory exercises which have little meaning to them and to use laboratory equipment for which they see little personal value. It is then predictable that it is the slow learners who are not allowed to practice science and who often get placed in science classrooms where there is little or no equipment for them to use or "to break".

So, in light of this, the above exercise was the last opportunity for the students of the control class to perform any activity involving the use of laboratory equipment.

A laboratory exercise, "experimenting with leaves to determine whether or not the presence of chlorophyll in the leaf is really important in photosynthesis," and subsequent experimentation, were performed by the teacher as demonstrations. The students were assigned questions such as: "what can we conclude about the importance of chlorophyll in photosynthesis?" Although there is little here that can be called science, it is in keeping with what often occurs in the conventional classroom for slow learners, a kind of conditioning

through practice and reinforcement continued until the student has "learned" the facts.

The students were administered an objective test about photosynthesis, chlorophyll, and green plants. They were allowed to use their textbooks and notes in answering the questions. This represented almost total discouragement on the part of the teacher.

Understanding of photosynthesis is an area measured by the Nelson Biology Test (BM) as exemplified by question number 35 which reads as follows: bearing in mind the conditions necessary for photosynthesis to occur, "it should be possible to produce a marked increase in plant growth in a closed greenhouse room by--".

At this point in the semester the teacher concluded the students were not using and receiving well the manner in which the school adopted textbook was being used. Subsequent study was selected and designed by the teacher and followed a format which he believed more suited the interest of the class. Instructional procedure did not change.

Content which followed centered about the "web of life: food chains and pyramids". Teacher prepared work sheets were provided for the purpose of stimulating in-class discussion. The objective of one such work sheet was "to understand the concept of a food pyramid". Students were presented with diagrams of two pyramids and asked to discuss these in class.

The objective of another work sheet was "to understand the concept of food chains and cycles of organic compounds into inorganic compounds and back again". Activity materials included a diagram of pond

relationships with questions to be answered about the diagram. The students completed these drawing arrows pointing from the organisms to other organisms indicating those eaten by those organisms doing the eating. Eventually this reinforcement conditioned in the students the understanding of the concept of the web of life.

This area of understanding is measured by the Nelson Biology Test (BM) as exemplified by questions number 70-72 concerned with predator-prey relationships.

Unit III. Late October activity centered about the concept of classification. Students were taught the use of a classification key. An activity involved the students in "making a key to identify ten members of the class" using the physical characteristics of the students.

This area of understanding is measured by the Nelson Biology Test (BM) as exemplified by question number 39 designed to measure the student's understanding that a scientific name is composed of the genus and species names.

Student activity was by now strictly passive, viewing films, completing duplicated work sheets, and participating in teacher dominated discussions about the subject matter.

Unit IV. In November, the study of biomes was emphasized. Consideration was given to the kinds of animals, past and present, and their habitats. This led to emphasis on types of plants and the effects of their succession upon animal life.

This area of information and understanding is measured by the Nelson Biology Test (BM) as exemplified by question number 14: "all

except which one of the following constitute real homes for living things?".

Discussions and films about the abiotic aspects of ecology brought the semester to a close.

Summary remarks concerning the content and activities of the control class.-- The class was truly subject-matter oriented.

Nearly all activities and subject content were structured and planned by the teacher. Student learning followed the building of factual information into larger ideas. Their learning was evaluated solely by the teacher on the basis of each student's progress and achievement on the objective tests. Grade determination was achieved by the teacher as he compared this achievement with his preset standards.

There is sufficient evidence as indicated by isolated paragraphs in the preceding section that the subject-matter content was representative of what can be called a "traditional or conventional biology program" and that the Nelson Biology Test is an adequate device for the measurement of understanding of this content.

Experimental class course content.-- No single textbook was used nor was reading material assigned by the teacher. Reference books and 25 various textbooks in biology were readily available in the classroom. All students were permitted to remove these from the shelf by signing a posted check-out sheet.

The focus of the course was that of problems of apparent and immediate concern to the students. Simultaneous effort, but with less concern, was made to assist the students in their understanding of some of the major themes of biology. It is believed that many of the

concerns of slow learners can be tied to major themes of biology--the major themes considered to be: (1) the cell; (2) evolution; (3) heredity; (4) development; (5) hierarchy of biological organization; and, (6) man. The purpose of course content selection was that of developing understanding of these themes of biology, and to assimilate them into some understanding of the behavior of man, the expectation being that this understanding would provide the students with new perceptions and consequent growth toward a more satisfying self and social adjustment.

It was anticipated that the problems of concern to the slow learners would be matters of sex, intelligence and physical well-being. This anticipation was supported through personal interviews and, more subtly, through class activities. Immediately apparent in many activities was their concern for parent-child relationships.

The students played an active role in deciding the topics to be studied. Much of the first month was devoted to investigation and discussion of potential topics. There was difficulty in narrowing the topics and it was difficult at times for the teacher not to take a more active role. It was important the students find topics of apparent self-interest. Late in September tentative decisions had been made to study topics as follows: (1) seven chose animal characteristics; (2) six chose sex; (3) two chose human biology; (4) two chose marine life; (5) two chose natural history; (6) two chose forestry; (7) one chose prehistoric life; (8) one chose evolution and genetics. Four students remained undecided.

Subsequently, the students narrowed these topics, some changed

topics several times. At the end of the semester their oral reports were concerned with the following: (1) six chose narcotics and alcohol; (2) seven chose some aspect of animal life (unusual animals; wildlife and hunting; and animal reproduction); (3) six chose topics concerned with insects; (4) three concerning plants; (5) two on cancer; (6) two chose topics which were reports about the lives of famous biologists; (7) one chose human reproduction, primarily concerned with pregnancy and delivery.

Borrowed from Kelley (25, p. 126-135), the following is a review indicative of the general focus of course content in the experimental class:

1. The quality of human inheritance has been unchanged since the dawn of human history. . . . earliest man . . . had as much capacity for intellectual development as modern man.

The slow learners had to be made to feel they are worthwhile human beings and in the process of becoming valued members of society.

They needed assistance in setting goals, in seeing themselves in the process of becoming fully functioning individuals. Their overemphasized hereditary limitations merely represent possible limitations of intellectual potential. Their perceptions of the concept of inheritance were extremely important.

2. We build and are built by our environment. . . . since everything that feeds the psychological self comes to the individual through perception, this becomes the crucial phenomenon in learning. . . .

Upon entering the course these students had misconceptions concerning the concept of heredity versus environment. They were of the opinion that the life of an organism is fixed, predetermined by its inheritance,

that there is little an organism can do to improve upon this situation. Focus on the importance of the environment and their ability to change their environmental picture provided them with new perceptions concerning the importance of environment to the behavior of plants, animals, and human beings. Transfer of learning obviously occurred as the students would often shift discussion to the social and physical conditions of their own lives. They showed a developing understanding of the significance of these conditions in the shaping of their own life styles. They seemed to develop an understanding similar to that as stated in Manas:

. . . the social and physical conditions in which the child lives, the amount of affection he receives, the encouragement of teachers and parents, the opportunity to learn and use a wide vocabulary, intellectual and aesthetic stimulation in the environment, the mental and emotional health of the child--all these are involved in the development of intelligence (56, p. 5).

The students seem to become aware that they were not simply reactive organisms to their environment, but that they had the power to act upon and mold their lives in almost any way they desired.

As stated by Dreikurs:

Discussions of heredity and environment usually raise the question of which one is more important in molding the individual. Such discussions miss the essential point: the individual is not simply a reactive mechanism, but an active participant in the solution of conflicts around and within himself. His behavior and development are not directly affected by either his inner or outer environment but only by his perception and evaluation of them (11, p. 3).

3. Each human being in the world is unique; that is, he is significantly different from every other person. . . . it is therefore not our similarities but our differences which make us valuable.

Contributions made by each member of the class were acknowledged and emphasized. On one occasion a class discussion began from the question: "How can people with essentially the same biological equipment look so different?" This question evolved into a discussion of not only inheritance but that of personality, grooming, dress and use of cosmetics.

4. Every living thing possesses the dynamic of growth-- physical growth is only a part of the story. Physical growth is temporary, ceasing with adulthood. . . . The growth which is little understood is that of the psychological self. It is fed by the process of perception. . . . [and] goes on continuously throughout life. . . .

There is little if any justification for studying, in biology, physical growth and not personality growth. Growth is a dynamic process involving the whole organism. Treating but only a part of this process in the name of science is dishonest, possibly indicative of lack of courage to tackle the less known. To tackle the less known is science. It does require courage. Courage is a characteristic of the fully functioning self.

5. Maturation is a scientific fact which must be taken into account. Since the individual starts as a single cell with nothing but potentialities and grows until death, there is a point where it cannot comprehend anything, and the ability to comprehend is a gradual process, differing in each individual because he is unique. The ability to do abstract thinking is a highly developed mental process and comes later than the ability to comprehend concrete things. In some people the ability to think in the abstract never develops very much. It is not known whether or not these people could have, in the proper environment, developed this ability, but what is known about learning would indicate that they could.

Consideration was given to the concept of development, physical and mental. Students could see the importance of proper environment to

the healthy development of plants and animals. Transfer of learning occurred as they discussed the cases (referring to the case studies) and the environmental factors in their own lives.

6. The human organism works as a whole, not in parts. A person is made up of a physical body and a psychological self so inter-related as to be inseparable. Functionally, an attitude is as much a part of structure as a hand.

Consideration was given to student attitudes, habits, knowledge, experiences, purpose, values and assumptions. The students were to develop the attitude that they had something important to contribute.

Summary remarks concerning the content in the experimental classroom.-- It was important that the focus be not on subject matter so much as on the individual student. The students were made aware through the study of biology that they are in the process of becoming and that by molding their own environments they could become almost whatever they wish.

Summary remarks concerning differences in content between the control and the experimental classes.-- Major differences in content and content related procedures are summarized as follows:

1. Content organization in the control class was more highly structured than was that in the experimental class.
2. Members of the experimental class were more involved in subject-matter oriented individual and small group project studies.
3. The learning process in the control class followed more closely practice and reinforcement schedules.
4. Textbooks and reading materials pertaining to the subject were assigned and distributed to students often in the control class

and seldom in the experimental class.

5. Subjective instruments of evaluation were more frequently used in the experimental class while objective instruments were more frequently used in the control class.

6. Teacher-prepared biology work-sheets were more frequently used in the control class.

7. Subject-matter oriented individual oral reports were frequently used in the experimental class while seldom in the control class.

8. Focus of course content in the control class was upon subject matter while that of the experimental class was upon the individual student and his attitudes, habits, knowledge, experiences, purpose, values and assumptions.

The control classroom atmosphere.-- The major concern was that the students learn the subject matter. Consequently, the classroom atmosphere was such so as to expressly be concerned with subject-matter learning. This meant concern for right answers, use of objective tests, and evaluation based upon the correct answers. The classroom attitude became that of: "the subject matter is important". Discussions centered about the subject-matter topics provided by the textbook and teacher.

No time was needed to develop this kind of atmosphere. Students are typically oriented to subject-matter centered classrooms.

For a while there were major problems of discipline. Quickly, though, the students learned the teacher would "stand for little chaos". The teacher quickly gained full control of the class and a

teacher-centered atmosphere became the rule.

The classroom was generally neat and orderly. Discussions were dominated by the teacher. There was little verbal interaction between members of the class.

The teacher did not attempt to get to know his students well, but he did develop with the students a friendly relaxed atmosphere. He was apparently liked by the students.

The experimental classroom atmosphere.-- A major concern was that the students discover they are acceptable persons. This did not imply the condonation of their every act of behavior. It does not imply a "permissive" atmosphere if this means permission to do whatever one wishes. It did require that the classroom atmosphere be such so as to expressly be concerned with personal reference. This meant less concern for right answers, use of objective tests and problems solved by the rules. The classroom attitude became that of: "what you feel is important." Discussions centered about things "you don't get grades for." The idea conveyed was that people rather than things are important.

It took time in the experimental classroom to develop this kind of an atmosphere. It took several weeks for the students to become convinced that this was really their class, that they could do and say whatever they pleased as long as the rights of others were not infringed upon.

For a while there were minor problems concerning discipline. At first the students seemed skeptical, to believe the teacher to be "some kind of nut" (as was one student's description). Convincing

the students that there really was something of value and of personal importance going on seemed to result directly from the personal interviews (a technique discussed on p. 74-76). Eventually the students seemed to begin to realize an understanding of the meanings of frankness, openness, and freedom with responsibility. Student confidence was won after what appeared at times to be the brink of chaos.

Success in this experiment relied upon students being able to make real decisions--decisions to what they would study, whether they were to be evaluated and graded, whether they wanted tests, homework and a textbook. The students were presented new experiences in freedom. They discovered the difficulties encountered in group work, of not having a teacher dominate their thinking and decision making. They survived all this, not without difficulty, but with a feeling of belonging and importance (see Table VII, p.           The atmosphere of the experimental classroom was not always so neat, quiet and orderly, but, more important, did seem productive.

As the teacher illustrated trust and faith in the students they began to trust themselves (see examples one and five of the experimental class, Appendix D). The students did make occasional mistakes but these were not handled by force, threat, ridicule or humiliation (see examples seven and nine of the experimental class, Appendix D).

The students were provided opportunities to practice skills of cooperative procedures, through the defining of goals, planning of class activities, and the interaction of deliberately planned discussions, in both small and large groups.

Summary remarks concerning other differences between the control and the experimental classes.-- Differences in procedures used in these two classes, but not directly related to course content, are:

1. There was much more emphasis in the control class upon skills of reading and writing.
2. The students in the experimental class were provided more freedom to raise and discuss questions about any topic.
3. In the experimental class there was more interplay between all members of the class.
4. Evaluation in the experimental class was more often by student-teacher than by teacher alone as in the control class.
5. Individual student-teacher conferences were more frequent in the experimental class. These conferences were a planned technique in the experimental class whereas in the control class they usually arose only as the result of a classroom incident and a teacher felt need for disciplining the student.

A description of methods used in the experimental class.--

Important to any future attempt to replicate this experiment is an understanding of the methods used in this experimental classroom. The methods developed and used are the significant factors of the experimental variable. Consequently they are described here in some detail.

1. The human relations case study technique provided the students the opportunity to test unfamiliar roles and new concepts of self in the security of action "as if" the situation were true. Perceptions of self and others could be learned as the student took part of

another person in the study of an actual case (2). This technique provided an opportunity for students to explore and discover meanings in situations which approached reality. It provided opportunities for self-expression and self-clarification, and an opportunity to perceive similarities between what was discussed and what is reality. "Cases . . . provide the 'similar' situation which makes transfer much more likely to occur" (12, p. iii). "Through the medium of group discussion [of cases], most participants broaden their points of view, develop new perspectives, and discover many implications which they as individuals might miss" (12, p. iv).

Six case studies were written for the experimental class (see Appendix A for a presentation and analysis of the case studies). Case number one was presented and discussed the first day of class, the students' first experience with the case study method. The teacher did not insist upon a logical stepwise approach because "that would be likely to destroy the permissive atmosphere necessary for effective learning" (12, p. 1). A free discussion was permitted with all case studies.

The purposes for which the first case study was used were those of: (1) assisting the students and teacher in becoming acquainted; (2) providing a stimulus for class discussion; (3) providing a situation for learning to relate with other individuals in the class; and, (4) for determining some basic needs of the individuals in the group. (See Appendix A for specific objectives and an analysis of case number one). The first case study assisted in the "insight period," simply an introductory period lasting several days

and designed for the purpose of becoming acquainted (15).

In order to get the students to feel self-reliant and to rely upon their own resources the role of the teacher was nondirective in case study discussions and most other class activities. It was important that the students recognize early that the emphasis of the course was theirs.

2. Deliberately planned discussions was the technique most frequently used. It replaced that in conventional classes of lecturing. There were a few instances when the students insisted upon having lectures. This insistence was probably a demonstration of awareness and concern of not being taught in the traditional manner.

Purposes of this discussion technique were those of: (1) reducing threat by establishment of pleasant interpersonal relations; (2) distribution of leadership within the class by involving students; (3) increasing group we-feeling and individual student sense of belonging; and, (4) establishment of the importance and sense of personal worth of each member of the class. Benefits of this group identification are described as follows:

Gradual breaking-down of people's attitudes of uniqueness of their problems takes some of the fear and aloneness away from their problems. To feel that others perhaps face the same types of frustrations, failures and handicaps may perhaps lessen fears, guilt feelings and insecurities. . . . Desires for status with peers, for some recognition, for some success in the eyes of others are other needs which can be satisfied at least partially in group interaction. . . . Self insight and knowledge of the self are also gained. . . . by some kind of checking of the self picture against the reactions that other people make (15, p. 14-15).

3. The insight period, or introductory period of the first several days, afforded the opportunity for the teacher and students

to become acquainted, to reach levels of informality and reduction of defenses (15). Traditionally, in the conventional classroom, the first day is devoted to formal activities (as was the case in the control class of this experiment)--taking role, distributing textbooks, and explaining the procedures and requirements of the course. But, "devoting the first hour to desk work is a mistake" (11, p. 38).

Prior to presentation of case study one, the initial activity was that of forming a circle and having the students (and teacher) introducing the person to their right in a humorous manner. This procedure carried off with humor and tended to break the ice quickly. The teacher received some valuable insights concerning members of the class.

Introductory activities for the next several days were planned as informal discussions for the purposes of becoming further acquainted and planning individual and group goals.

4. The multi-activity approach. Typically there were two types of classroom activities: those which involved the entire class in discussion, and those where members were simultaneously involved in a variety of activities. Within the 50 minute period some students might have viewed a film while others worked in the library or project room. This might have been followed by a teacher or student demonstration, a discussion period, or the division of the class into independent work-study or discussion groups. The students were active and generally not required to sit for long lengths of time.

5. Discussion centered about problems of concern to the students. Before class on the second day, one student asked: "What is the study

of biology?" He was undoubtedly puzzled by the nature of the class discussion the previous day, and his question provided the topic for the beginning of this period.

Teacher planning for each day's class was of course important, but also important was that the program remain flexible and ready to give to apparent student interest of the day. It seemed possible for the teacher to often "read" the class at the beginning of each period, to foresee just when the students would be receptive to certain types of activities. The orderliness with which students came into the room and the expressions on their faces seemed excellent keys.

Class discussion evolved in one instance into student likes and dislikes about people. In this discussion, the first of many concerned with the nature of human behavior, the students exhibited a keen interest and seemed quick to comprehend the dynamics of the topic. Discussion of problems of behavior apparently filled a need.

Safeguards were observed particularly when discussions centered on human behavior. Interpretations made by the teacher were with possible goals (purposes) for behavior, not causes. Purposes can be discussed in a nonpsychoanalytic manner with new perceptions obtained. Behavior may then change as a result of these new perceptions. Discussions centered about immediate perceptions.

The students decided that each would choose an area in biology to investigate, and would report periodically his findings to the rest of the class. Interesting discussions often followed these oral reports. Defenses and insecurities seemed to break down. Feelings of adequacy, of worth, importance, and belonging seemed to grow. The

reports were not scientific nor thorough, but this did not seem to matter so much.

6. The nondirective (open-ended) interview technique has an apparent significance and importance that cannot be overemphasized. During the first few weeks, out-of-class time was set aside and each student met privately with the teacher. Although all students were eventually interviewed some failed to keep their original appointments.

The interviews lasted from 30 to 60 minutes each. Several students showed sharply altered and improved behavior in class, seemingly resulting from these interviews. Some indicated no desire to continue with the teacher in this one-to-one relationship, while still others continued to show interest in further private talks. The teacher undoubtedly appeared discouraging to some students, probably because of the teacher's rigorous schedule and difficulty of always being in a receptive mood. This is considered here because of its apparent significance in determining the effectiveness of the interview technique.

The interviews were private and confidential. The students were encouraged to discuss freely their experiences, feelings, attitudes, goals, values, home and social lives. There was no difficulty in getting most of the students to open up to this type of discussion. They seemed eager and gratified to find the teacher had a personal interest in their lives.<sup>2</sup> This is not to imply that there were none

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<sup>2</sup>Personal communication through private interviews can encourage development of adequacy (2, p. 241-243; 11, p. 46-48).

who were skeptical and defensive. But, for the most part skepticism and defenses broke down quickly.

Certain rules were established for this technique. These are as follows:

1. taking a friendly attitude, conveying to the student the idea that the interviewer likes him and enjoys talking with him;
2. encouraging him to talk freely and, so far as is possible, without interruption;
3. keeping him on the track with a question that comes back to the heart of the problem if he strays too far;
4. resisting the impulse to tell him a long story of what the interviewer did in a similar situation;
5. occasionally offering a tentative or alternate suggestion in question form, i.e., "Could it be that ...?", or, "Had you thought of . . . ?";
6. allowing the student to do most of the talking;
7. asking questions for which he can see purpose;
8. trying to see through the student's eyes and remember that his attitudes are not necessarily identical with those of the interviewer;
9. accepting what he tells, understanding why he feels as he does, neither criticizing nor yet giving approval;
10. giving direct attention to the student, not taking notes or tape-recordings during the interview;
11. bringing the interview to an end tactfully but

definitely, allowing the student to leave feeling satisfied;

12. keeping all confidences.

7. Student writing in class was a technique used primarily for the purpose of providing a source of understanding of each student's progress and perceptions--"for spotting and assessing problems. . . . personal makeup, his life style" (11, p. 229).

Information provided by students on sensitive topics was kept confidential. Most often the information provided the background for interesting group and private discussions.

Writing activity followed a variety of approaches, e.g., short essay, word association, and sentence completion. An example of a sentence completion activity is as follows:

Complete the following sentences with your first thought:

- A. I . . . .
- B. I am . . . .
- C. My greatest asset is . . . .
- D. My biggest problem is . . . .
- E. Biology is . . . .

Class discussion of student replies followed. Discretion was used.

Student replies were duplicated and distributed for discussion.

Twenty-five students were present the day of this activity, and their replies to sentences C and D are as listed below.

<u>Student</u>	<u>My greatest problem is . . . .</u>	<u>My greatest asset is . . . .</u>
1	being able to save money.	good luck in things I do.
2	boys.	my personality.
3	pimples on my face.	my long hair.
4	things which I can't mention.	transportation.
5	nothing.	
6	(a boy's name).	(same boy's name).
7	thinking about (a boy's name).	my eyes.
8	I am self confident.	my personality.
9	my mother and father.	none.
10	boys.	I like to be myself.
11	my sisters and brother.	my hair.
12	I don't have one.	my hair.
13	reading.	
14	how to get a car.	my personality.
15	school.	
16	gas for the car.	me.
17	girls.	I think for myself.
18	getting along with Mom when I drive the car.	to challenge the unknown.
19	forcing myself to do homework.	(mentioned a hobby).
20	doing school work.	my new bike.
21	holding my head up and fighting for myself.	my self pride.
22	self pity and interest.	
23	smoking.	my hair.
24	my hair.	I am tall.
25	concentrate on study.	(mentioned a hobby).

Enthusiasm for this type of activity was high. The students gained new insights about concerns of their peers and possibly new perceptions of their own selves. There is no reason to doubt the sincerity with which they approached this activity. They seemed open and frank, apparently because of their recognition of personal meaning in these experiences and because any threat of punishment was diminished or absent.

There was constant student evaluation of their own activity as well as that of others in the class. This was another aspect of the writing. They were asked to write statements on such topics as:

What have you learned thus far in this course?  
 How has your behavior changed as a result of this class?  
 Give a brief evaluation of your project report presentation.  
 What was the aim of the film shown today?  
 What is the meaning of a good life to live?  
 In whom do you have faith?  
 What is the meaning of heredity?  
 What is the importance of environment?

For most of these questions there were no right or wrong answers.

Attention was focused on big ideas, change of perceptions, the value of helping the student test and extend his own perceptions by creating opportunities for him to clarify his current needs, to develop immediate purposes for learning and to set more realistic individual standards.

8. The individual student project study technique was suggested by the students and accepted as an approach to learning biology. Guidelines were established and accepted by the students. Duplicated and presented to the students for discussion and acceptance, the guideline is as follows:

Focus of this course: the idea has been stressed that this course is basically for you--to develop your strengths, to identify weaknesses. We will develop strong convictions, set goals, and work toward these goals. You must give your attention for something you believe in--this is a goal.

Guidelines for our work: eight have been accepted and should serve as our "railroad track" for reaching our goals.

- (1) we work as individuals and as members of the group on problems that are significant to us
- (2) the same people who work on these problems formulate goals and plan how they will work
- (3) opportunities are developed for us to relate with one-another
- (4) an atmosphere must be created that is conducive to building mutual respect, support, permissiveness, and creativeness
- (5) many resources are available for use
- (6) evaluation is an important part of all our activities

- (7) the facts of individual differences among members of our group are accepted and utilized
- (8) continuous attention will be given to the interrelationship of different groups within the class.

Goals: each student has established for himself a goal. We now need to look closer to determine whether the goals are realistic, obtainable, and clearly defined.

Assignments: aside from the fact that each student will establish his own schedule of assignments the following major assignments will help to unify our thinking about some of the big ideas:

- (1) proposed and briefly annotated reading list for first quarter
- (2) oral progress report on project
- (3) written self-evaluation on effectiveness of presentation of number two
- (4) final reading list--annotated
- (5) oral progress report on project
- (6) written self-evaluation on effectiveness of presentation of number five.

Oral reports: These might be organized as follows:

- (1) a statement of your problem of interest to you
- (2) a statement of how your own problem might be of interest to others in the class
- (3) what you have done so far
- (4) what you have found so far
- (5) a demonstration of some kind
- (6) your plans.

Class time was given for project work. Students would use the school library or remain in the classroom utilizing the reference materials and facilities there. Emphasis upon competition, upon what they ought to do (pressure), and general demands by the teacher were kept minimal. Some of the students followed through well on their chosen projects. Others gave up early. It was evident some students became frustrated after obtaining a little knowledge about their topic and how encompassing it really was. As this occurred the teacher assisted these students in redefining their goals in terms more

meaningful and readily obtainable. Students finding success in their project work were generally those causing fewer behavior problems in the classroom.

There were in both classes students who had police records and who had been classified as juvenile delinquents. Common among offenses were shoplifting, drinking, curfew violations, traffic violations, and running away from home. Generally, the students involved were also those exhibiting classroom "misconduct." In the experimental class these were the students who exhibited the greatest enthusiasm for the case studies, and less enthusiasm for the project work. Their concern for human relations problems and their lack of concern for subject matter and project work was predictable. In academic matters these students perceived themselves as inferior, but in social matters they seemed to thrive even though in the eyes of adults their social behavior would not often seem constructive. As Dreikurs states:

Frustrated overambition is perhaps the most frequent cause for giving up. Children who are trained to believe that it is important to be ahead of others will shy away from any activity which does not provide them with the opportunity to prove their superiority (11, p. 158).

This kind of "thwarted overambition is often at the core of juvenile delinquency" (11, p. 19).

The evidence from this experimental study leads to this researcher's conclusion that as was evident in this experimental class (and also in the control class) there are two distinct groups of slow learners. There are those who for reasons of intellectual slowness, difficulty in reasoning, have not experienced much academic success but who still are anxious to learn; and, there are those who for

various reasons have developed obvious psychological problems and are enthusiastic about the study of human behavior. For the latter group the project technique was not as successful, although it is believed that projects in terms meaningful to these students could be developed.

9. Other techniques more closely related to traditional topics in biology were: the use of 15 films selected from topics chosen by the students; filmstrips chosen in the same manner; and, occasional demonstrations by the teacher.

10. The spontaneous reaction of the teacher to classroom incidents is another technique important and significant to the perceptual field approach. Knowing that the self concept is learned and people learn who they are and what they are from the ways in which they have been treated by those who surround them, the teacher of the experimental class was probably too apprehensive during the early weeks of the study. This fear of making a wrong response probably was perceived by the students and created an unrest. Although this was eventually overcome it is probable that it did slow the initial effects of the experimental variable.

The teacher was aware of the importance of the feelings and attitudes he communicated to the students by both verbal and nonverbal action. He was sensitive to the impact of his own actions in facilitating and encouraging the growth of the students. Consequently he evaluated his behavior in terms of its effect, as it appeared to be, upon the self concepts of the students. The significance of nonverbal action is often overlooked by the teacher

using conventional methods. But, as stated by Combs:

The words that a teacher uses, the way he looks at children, become important. A word, a look, a bit of sarcasm or ridicule can be very humiliating, a crushing experience for a child, and although such tactics may subdue the child or the group, it may have a traumatic, negative effect on the feelings that students have for themselves (2, p. 96).

The teacher attempted to respond slowly, thoughtfully and unemotionally. He tried to discover the true meaning of each situation, the purposes for which the student was behaving in the manner he was. The students had to be made to believe the teacher saw them as worthwhile individuals. This meant "fewer comparisons, less competition, and no capsule descriptions such as, 'He is lazy'; 'She has no interests'; 'He's from a broken home--what can you expect?' " (2, p. 128). The student had to be made to feel he was accepted. "The teacher who cannot accept the child makes it impossible for the child to accept himself" (2, p. 121).

A technique of responding found to be successful was that of pausing and allowing group pressure to work.<sup>3</sup> Once good relationships were established, pressure from peers became a prime technique for reacting to various types of classroom situations.

Direct teacher reaction to classroom situations assisted students with finding alternative ways of learning and behaving, and in understanding the purposes--not causes--for their behavior. As one student observed: what she liked most about this class was that the teacher did not "jump all over" the students every time they made

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<sup>3</sup>The use of group pressure is distinctive from the use of rewards and punishment as is common in the conventional classroom, and is a significant factor in the perceptual approach (11).

mistakes, but instead tried to help them understand their mistakes.

11. Evaluation in the experimental class differed from that in the control class. Evaluation in the control class was, as mentioned previously in this chapter, a process solely carried out by the teacher as he set standards and then measured each student's progress and achievement against these standards. Measurement of this achievement in the control class was achieved through the administration of objective examinations. The role of evaluation in the experimental class was a process of helping each student discover and develop his potential, of helping him test and extend his own skills, of creating opportunities for him to clarify his current needs, of developing immediate purposes for learning, and of setting realistic standards.

Grades were not a kind of threat held over the students' heads. Permission had been granted by the administration to not give grades to students of the experimental class if so desired. The topic of grades was not discussed until raised by the students. When the students did raise the question of grades on the third day the teacher replied with the questions: "Do you want grades?", and, "How do you think you should be evaluated for grades?" The teacher left the room to allow the students to discuss these questions. They decided they did want grades but left the question of how to the teacher. It was finally agreed that evaluation for grades would depend upon (1) the students' evaluations of themselves, (2) private conferences with the teacher, (3) classroom participation, and (4) the completion of the required assignments.

In contrast to the control class no objective tests were

administered for grading purposes in the experimental class. Instead, questions were asked for which there were often no sure right answers, open-ended questions allowing for divergent as well as convergent thinking. The use of open-ended questions is believed to contribute to more satisfying self-evaluation (2). The function of these was not to label the students but to enhance the students' own perceptions. "Children need evaluation but not labels" (2, p. 136).

Sample open-ended questions used in the experimental class, questions for there were no right or wrong answers but which are believed to contribute to self-evaluation and the enhancement of personal perceptions, are as follows:

1. Who did the best job of reporting? Why do you think so?
2. What is the most important thing you have learned in this class so far?
3. Was your thinking influenced in any way by the discussion in your group about the case study?

An instrument designed for student self-evaluation was administered twice during the experiment after being reviewed with the students early in the semester. This instrument is included with this thesis (see Appendix B).

Evaluation was a continuous on-going process, significant toward the improvement of students' self concepts. As was observed by one student (see example number nine of the experimental class, Appendix D):

I checked out one or two books on evolution--can't remember the names. I see myself better. I am starting to understand different things I do and why . . . and I understand other people better also. I think this class has taught me more than any class I have ever had and it's only the first quarter. I haven't turned in one assignment. . . . and I haven't learned anything about evolution. I do know a

little about narcotics though [the topic of a special report he gave to the class]. But I've learned things you can't put down on a report card, your friends know it, your teachers, anybody else closely related to you knows. And I think the things I've learned 1000 times more important than an "A". It's just hard to write what I've learned, and I can't, so just take my word for it.

This boy had been a serious problem in school, but school officials agreed with the boy's evaluation of himself and that this class was a major factor contributing to his improvement. As stated by Combs:

Evaluation processes are significant factors in the development of the person who accepts and understands the process of becoming. . . . evaluation should be a continuous examination of immediate experience rather than a procedure used at the end of a unit of work or at a specified time. Efforts to focus on the processes of the classroom, to observe the teacher and learner in action, to sample work over a period of time, to record the relationships between the learning climate and the effect on children and between what the teacher says and does and how the children respond, are consistent with the concept of the individual as a growing, dynamic organism. The idea that the individual is the instrument and not the subject of his becoming lends support to the efforts to shift the direction from evaluation by others to self-evaluation (2, p. 249).

As was explained to the students, the teacher was more concerned with what they had to say and the manner in which it was said than with whether what they said was right or wrong.

The almost exclusive use of objective tests which present limited choices and require the selection of single right answers must also be questioned. If the exploration of ideas and the development of personal meanings are important to learning, evaluation practices should be consistent with these goals. Testing procedures need to be more open-ended to allow pupils to express their understanding and interpretation of information. While essay tests are hard to grade and records of observed behavior do not lend themselves well to standardization. . . . they may contribute more to the student's understanding of his progress in learning than does

comparison with a norm (2, p. 249-250).

Perceptions, good or bad, right or wrong, are logical if seen in the totality of the situation. And the slow learners learn in accord to the perceptions and personal meanings existing for them at the moment of action.

Learning behavior is seen in the conventional classroom as a matter of forces exerted upon the student, and teaching is a matter of controlling those forces. But if learning behavior is a function of personal meanings, as is the concept of the perceptual field approach theory, then perceptions become the center of the teaching-learning situation. Evaluation of student progress then takes on this new meaning of helping the student to clarify his current needs, to develop immediate purposes for learning, and to set realistic standards.

12. An indirect technique was that of record keeping by the teacher. Samples of work collected, students' self-evaluations, and teacher-kept comments were maintained by the teacher in individual student files. "Such records provide valuable assistance to the teacher as he seeks to understand children's behavior" (2, p. 244). These records were valuable to the teacher during the interviews. They presented the teacher with information regarding changing attitudes and feelings. "The conditions which help a person see himself in process may be established in pupil-teacher conferences. . . . which encourage free, personal communication . . ." (2, p. 249). "Discussions with children about their changing attitudes and feelings can help them understand the process of change" (2, p. 245). The records were valuable to the students as an aid to the teacher in

helping the students to seek full knowledge about themselves, their abilities and achievements, and progress.

Anecdotal records were kept by the teacher by use of a dictaphone for the purpose of having records of minor incidents which might have otherwise been forgotten. This technique provided valuable assistance as a means of continuing evaluation of progress being made by each student. (Anecdotal records of selected students from both the control and experimental classes are included with this thesis--see Appendix D). The dicataphone also provided an easy method for recording teacher comments concerning daily activities, information vital to this experimental study. (A resume' of daily activities of the experimental class is included with this thesis--see Appendix C).

13. A social party was held at the teacher's home on two occasions. About half the class was in attendance at each party. The purpose of the party was to become acquainted in a less formal situation than provided by the classroom setting. All but four students did attend one of the parties. The students strongly advocated additional parties but circumstances did not permit.

Summary remarks concerning methods used in the experimental class.-- The aforementioned methods specifically designed and used in the experimental class are techniques particularly relevant to the purposes for which this experiment was designed. The ideas, development and use of these techniques evolved largely from the suggestions offered by Combs (2) and Dreikurs (11).

#### 4. Sources of Data

Self and social adjustment data.-- The California Test of Personality (1953 Revision, Form AA, secondary) was administered to students of both classes as a pretest in September and as a posttest in January.

Learning of biology.-- The Nelson Biology Test<sup>4</sup> (Form AM) was administered to both classes as a pretest in September and an alternate form (Form BM) was administered as a posttest in January.

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<sup>4</sup>This test was revised and Forms E and F (copyright 1965) are now available. The revised forms were not available at the time of this study. The revision was an attempt to reflect the changing content of modern biology instruction.

## 5. Methods of Gathering Data

Administration of tests.-- Pretests and posttests were administered by the school psychometrist.

Scoring.-- The test of self and social adjustment was machine scored whereas the biology test was hand scored.

## 6. Description of Data-Gathering Instruments

The California Test of Personality.-- This test "is a teaching-learning or developmental instrument. . . . its purpose is to provide the data for aiding individuals to maintain or develop a normal balance between personal [self] and social adjustment" (6, p. 2). The test "is organized around the concept of life adjustment as a balance between personal and social adjustment" (6, p. 3). It is divided into two parts, each having six components. Components of the personal adjustment half are: (1) self-reliance; (2) sense of personal worth; (3) sense of personal freedom; (4) feeling of belonging; (5) freedom from withdrawing tendencies; and (6) freedom from nervous symptoms. Components of the social adjustment half are: (1) social standards; (2) social skills; (3) freedom from antisocial tendencies; (4) family relations; (5) school relations; and (6) community relations.

Reliability and related data for the California Test of Personality.-- Reliability coefficients for the various components of the personality test used in this experiment are reported (6) as follows:

Components	r	S.E. Meas.
1. Personal adjustment	.90	3.72
A. Self-reliance	.70	1.64
B. Sense of personal worth	.77	1.20
C. Sense of personal freedom	.84	1.00
D. Feeling of belonging	.91	.75
E. Withdrawing tendencies (Fdm.)	.86	1.31
F. Nervous symptoms (Fdm.)	.82	1.49

Components	r	S.E. Meas.
2. Social adjustment	.89	3.48
A. Social standards	.84	.60
B. Social skills	.86	1.31
C. Antisocial tendencies (Fdm.)	.84	1.00
D. Family relations	.91	.90
E. School relations	.73	1.43
F. Community relations	.78	1.29
Total adjustment	.93	5.56

Concerning the validity, "as a measure of self concept. . . . this test is as valid as most such instruments" (45, p. 102). It is reported that this test correlates more closely with clinical findings than any other personality test (6).

Evidence also supports the opinion that the question of slanting answers or beating the test has little significance (6). The slow learners were apparently sincere and anxious to unburden themselves with their feelings and problems.

The Nelson Biology Test.-- Forms AM (1951) and BM (1952) were administered to the classes as pretest and posttest respectively. The test is a good one for the purposes for which it was designed (19). The general objectives of the test are reported (36) as follows: (1) knowledge of biological facts, concepts and principles; (2) understanding of biological facts, concepts, and principles; (3) ability to recognize cause-effect relationships; (4) ability to interpret data and to draw sound conclusions therefrom; (5) ability to recognize and to test hypotheses, to recognize and solve problems; and (6) ability to evaluate critically experimental procedures and real situations having scientific implications.

Content coverage includes the following areas: (1) living organisms--kinds, characteristics, classification, composition, and adaptations; (2) processes essential to life--food manufacture and its utilization (photosynthesis, respiration, metabolism), circulation and excretion, nervous and endocrine coordination; (3) conservation of biological resources; (4) parasitism, disease, and health; (5) mechanisms and social implications of reproduction and heredity; and, (6) history of life on the earth--how organisms have changed through past ages.

Reliability and related data for the Nelson Biology Test.--

Corrected split-half reliability coefficients of .87 and .88 are reported (36). The standard error of measurement is 4.3. The two forms are comparable and "any differences found between results of [administration of the two forms] . . . are accurate reflections of changes that have taken place from one administration to the other" (36, p. 3; supported by Horton and Johnson, 19).

The Nelson Biology Test was standardized with a normative group consisting of 4993 students in 63 schools representing 27 states (19). The median chronological age of the normative group is 16 years-1 month. The median I.Q. of the normative group is 104, using the Terman-McNemar Test of Mental Maturity (36).

CHAPTER IV  
PRESENTATION AND ANALYSIS OF DATA

1. Introduction

The purpose of this study was to test in practice the perceptual field approach learning theory with students identified as slow learners. The study was designed to test the approaches and techniques of this learning theory against those of conventional learning theory, using criteria of student achievement in self and social adjustment and learning of biology. With learning theory as the significant variable, other variables were kept constant within the limits set by classroom research.

The essential aim of the study was to achieve significant improvement in the self adjustment of the students being taught by the perceptual field approach, while not inhibiting their learning of biology.

Significance of difference between means of the control and experimental classes was determined using the t-test with a five per cent level. A statistic t close to zero indicates the means are equal, conversely a t value much larger or smaller than zero indicates greater difference in the means. The choice of a five per cent significance level reduces the probability of rejecting a true hypothesis.

## 2. Using Equated Groups

Grade level distribution.-- The majority of the students of this study were of the tenth grade, as shown in Table I.

TABLE I  
GRADE LEVEL DISTRIBUTION FOR STUDENT  
POPULATION

Grade	Experimental Class		Control Class		
	No.	% <sup>a</sup>	No.	%	
Ten	22	81	20	80	
Eleven	4	15	5	20	
Twelve	1	4	0	0	
	Total	27	100	25	100

<sup>a</sup>Percentages rounded to equal 100%

Age level distribution.-- The mean age of the students in the experimental class was 15.33, and in the control class 15.56. The t value for this mean age difference is 0.01, not significant at the five per cent level. The distribution of ages is shown in Table II.

TABLE II  
AGE DISTRIBUTION FOR STUDENT POPULATION<sup>a</sup>

Age	Experimental Class		Control Class	
	No.	%	No.	%
14	1	4	2	8
15	18	67	12	48
16	6	22	8	32
17	2	7	2	8
18	0	0	0	0
19	0	0	1	4
	<hr/>	<hr/>	<hr/>	<hr/>
Total	27	100	25	100

<sup>a</sup>Age distribution at pretesting.

Sex distribution.-- The distribution of males and females is illustrated in Table III.

TABLE III  
SEX DISTRIBUTION FOR STUDENT POPULATION

Sex	Experimental Class		Control Class	
	No.	%	No.	%
Male	14	52	15	60
Female	13	48	10	40
Total	27	100	25	100

I.Q. level and distribution.-- Intelligence quotients were determined by the California Test of Mental Maturity. The t value for the difference in means for the two classes is 0.02, not significant at the five per cent level. The distribution is shown in Table IV.

TABLE IV  
I.Q. DISTRIBUTION FOR STUDENT POPULATION

	Experimental Class	Control Class
Mean	93.96	91.04
Females	91.30	94.90
Males	95.00	88.40
Range	75-112	59-110

Knowledge of biology as determined by the Nelson Biology Test, Form AM, data.-- The difference between class means on this pretest showed no significant difference in knowledge of biology. Test scores and data are shown in Table V.

Equivalence of personal and social adjustment as determined by the California Test of Personality pretest.-- On the pretest there was no significant difference between the means of the two classes in total adjustment, total personal (self) adjustment, or total social adjustment. See Table VI, page 100.

Of the 15 areas of this test, there was a significant pretest difference between the two classes in only one area--freedom from nervous symptoms. The experimental class was more free from nervous symptoms than was the control class at the beginning of this study. This significant difference showed again on the posttest; however, on the posttest the control class showed even stronger symptoms of nervousness (see Table VI, p.100).

TABLE V  
PRETEST AND POSTTEST DATA FROM THE NELSON BIOLOGY TEST

	Experimental Class	Control Class	t score of difference
Pretest (Form AM) Mean Standard Score	90.58	88.92	0.59 <sup>b</sup>
Posttest (Form BM) Mean Standard Score	92.00	93.92	0.63 <sup>b</sup>
Mean Standard Score <sup>a</sup> Gain for Class	1.42	5.00	
t Value for Class Gain	0.86 <sup>c</sup>	1.32 <sup>c</sup>	
Class Standard Score Range			
Form AM	69-114	71-112	
Form BM	75-104	55-113	

<sup>a</sup>The standard scores of this test have a mean value of 104 and a standard deviation of 13.5.

<sup>b,c</sup>Differences not significant at the five per cent level.

### 3. Posttest Analysis

The Nelson Biology Test data, (Form BM).--- As shown in Table V, the difference between mean standard scores (t value of 0.63) is not significant at the five per cent level.

The difference between the means of the experimental class on the pretest and posttest is not significant (t value of 0.86).

The difference between the means of the control class on the pretest and posttest is not significant (t value of 1.32).

However, as is shown in Table IX (page 105), the pretest-posttest average gain difference between females of the two classes is significant (t value of 2.1). The females of the control class achieved significantly better than did those of the experimental class.

Analysis of posttest means in personal (self) and social adjustment.--- The only significant difference between the two classes was in freedom from nervous symptoms. (This also was the only significant difference at the initiation of the study.) There is no significant difference in any other area (see Table VI).

Analysis of pretest and posttest differences existing between means within each class.--- The data (Table VII, page 102) were analyzed to determine any possible significant differences between means of each class. Although none of the differences are significant the plus t values indicate an improvement and the negative t values indicate a negative adjustment. Accordingly, the largest gains of

TABLE VI

PRETEST AND POSTTEST DATA FROM THE CALIFORNIA TEST OF PERSONALITY:  
A COMPARISON OF MEAN RAW SCORES AND THE *t* VALUES OF MEAN  
DIFFERENCES BETWEEN THE EXPERIMENTAL AND CONTROL CLASSES

Category	Pretest			Posttest		
	Exp.	Control	<i>t</i> Value diff.	Exp.	Control	<i>t</i> Value diff.
<b>Personal Adj.</b>						
Self-reliance	9.2593	9.4286	0.20	9.4615	9.5200	0.09
Personal worth	10.5185	9.8571	0.83	11.1923	10.4800	0.80
Personal fdm.	10.4185	9.9643	0.60	10.6538	10.0800	0.60
Belonging	10.0000	10.0714	0.08	11.0385	10.4000	0.60
Withdrawing Tend. (freedom from)	9.8148	8.4643	1.67	10.0385	9.6000	0.40
Nervous symptoms (freedom from)	9.6667	8.0714	2.17 <sup>a</sup>	10.0385	8.0400	2.33 <sup>a</sup>
Total pers. adj.	59.7407	55.8571	1.13	62.4231	58.1200	1.05
<b>Social Adj.</b>						
Soc. standards	12.6667	12.3704	0.40	13.1154	13.2800	0.19
Soc. skills	9.8519	9.6154	0.28	9.9615	10.2800	0.40
Antisoc. tend. (freedom from)	10.0000	8.2000	1.90	9.5769	9.4000	0.20
Fam. relations	10.0000	9.5833	0.40	9.1923	9.8000	0.55
Sch. relations	9.8750	9.3333	0.80	10.0000	10.4000	0.64
Com. relations	9.6667	9.4783	0.06	8.8462	9.3600	0.65
Total soc. adj.	61.7500	59.2174	0.60	60.6923	62.5200	0.50
Total adjustment	121.6250	112.4783	1.36	123.1154	120.6400	0.31

<sup>a</sup>Significant at five per cent level.

the experimental class were those of (1) sense of belonging,<sup>5</sup> (2) freedom from nervous symptoms, (3) feelings of self-reliance,<sup>6</sup> (4) sense of personal freedom, and (5) sense of personal worth. These indicated gains over the control class are all in personal (self) adjustment.

The control class made gains over the experimental class in all areas of social adjustment, and in one area of personal adjustment-- freedom from withdrawing tendencies.

Analysis of pretest and posttest sex differences in categories of personal and social adjustment.-- Data were arranged to determine the possibility of a difference in response (sensitivity) of sexes to the techniques of this study. Table VIII summarizes the data.

An outstanding gain (100 per cent) was made by females of the control class in freedom from withdrawal tendencies. This gain was undoubtedly important in determining the marked gain made by females of that class in total personal adjustment--70 per cent. This is compared to a 46 per cent gain made by females of the experimental class.

In the category of sense of personal freedom, females of the experimental class showed a gain while males showed a loss. In the control class the results were reversed.

Females of the control class showed a distinctive loss in social standards and a gain in school relations.

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<sup>5</sup>See discussion on p. 127, Appendix A.

<sup>6</sup>See discussion on p. 127, Appendix A.

TABLE VII

PRETEST AND POSTTEST DATA FROM THE CALIFORNIA TEST OF PERSONALITY:  
A COMPARISON OF *t* VALUES DETERMINED FROM PRETEST AND POSTTEST  
DIFFERENCES IN MEANS WITHIN EACH CLASS

Category	Change Within Class		Difference, showing class with best gain	
	Exp.	Control	Exp.	Control
Personal adj.				
Self-reliance	+0.30	+0.12	+0.18	-----
Personal worth	+0.80	+0.76	+0.04	-----
Personal fdm.	+0.20	+0.14	+0.06	-----
Belonging	+1.05	+0.40	+0.65	-----
Withdrawing tend. (freedom from)	+0.24	+1.29	-----	+1.05
Nervous symptoms (freedom from)	+0.48	-0.03	+0.51	-----
Total pers. adj.	+0.66	+0.66	0.00	0.00
Social adj.				
Soc. standards	+0.70	+1.50	-----	+0.80
Soc. skills	+0.10	+0.74	-----	+0.64
Antisoc. tend. (freedom from)	-0.48	+1.30	-----	+1.78
Fam. relations	-0.70	+0.20	-----	+0.90
Sch. relations	+0.20	+1.60	-----	+1.40
Com. relations	-0.95	-0.14	-----	+0.81
Total soc. adj.	-0.29	+0.90	-----	+1.19
Total adjustment	+0.18	+1.20	-----	+1.02

TABLE VIII

PERSONAL AND SOCIAL ADJUSTMENT: PRETEST AND POSTTEST ANALYSIS  
OF SEX RESPONSES, SHOWING PERCENTAGES OF STUDENTS WITHIN EACH  
CLASS ACHIEVING POSITIVE OR NEGATIVE ADJUSTMENTS

Category	Class	Female			Male		
		+	0	-	+	0	-
Pers. adj.							
Self-reliance	Control	40	40	20	33	13	54
	Exp.	62	7	31	50	29	21
Pers. worth	Control	50	30	20	60	20	20
	Exp.	54	23	23	29	21	50
Pers. freedom	Control	20	30	50	54	26	20
	Exp.	54	23	23	29	21	50
Belonging	Control	40	20	40	60	13	27
	Exp.	54	15	31	64	7	29
Withdrawal tend.	Control	100	0	0	54	26	20
	Exp.	62	15	23	36	14	50
Nervous symptoms	Control	30	30	40	60	7	33
	Exp.	31	38	31	50	14	36
Total P.A.	Control	70	10	20	54	26	20
	Exp.	46	39	15	57	14	29
Soc. adj.							
Soc. std.	Control	40	10	50	47	33	20
	Exp.	46	39	15	43	21	36
Soc. skills	Control	30	40	30	54	6	40
	Exp.	46	8	46	36	21	43
Antisoc. tend.	Control	50	30	20	47	20	33
	Exp.	39	22	39	21	36	33
Fam. relations	Control	40	10	50	27	40	33
	Exp.	31	15	54	7	50	43
Sch. relations	Control	60	10	30	54	26	20
	Exp.	23	54	23	43	28	29

TABLE VIII--Continued

Category	Class	Female			Male		
		+	0	-	+	0	-
Com. relations	Control	20	40	40	33	27	40
	Exp.	23	31	46	14	29	57
Total S.A.	Control	40	10	50	47	33	20
	Exp.	31	31	29	43	36	21
Total Adj.	Control	40	40	20	40	40	20
	Exp.	31	30	39	36	35	29

This analysis of data indicates a greater positive response in personal adjustment by females in the control class. Also indicated is a greater negative response in social adjustment by females in the control class.

Student sensitivity to teacher personalities and/or techniques of this study.-- These data (Table VIII) indicate a greater variation in test scores by female students of the control class. This may possibly indicate a greater sensitivity (compared with males of either class, or females of the experimental class) to the control class teacher personality, his techniques, or both. The female students of the control class scored the highest gain in personal adjustment, and the lowest (greatest loss) in social adjustment.

Further evidence, shown in Table IX, indicates the greatest per student gain in knowledge of biology was achieved by the female students in the control class. The lowest per student gain (a loss)

was that achieved by the female students in the experimental class. The difference in average gain between females of the two classes is significant (t value of 2.1).

TABLE IX  
AVERAGE GAIN<sup>a</sup> IN KNOWLEDGE OF BIOLOGY, BY SEXES,  
AS MEASURED BY THE NELSON BIOLOGY TEST

Class	Females	Males
Control	+5.8 <sup>b</sup>	+4.3
Experimental	-0.6 <sup>b</sup>	+3.1

<sup>a</sup>Gain is determined by averaging the standard score differences from the pretest and posttest.

<sup>b</sup>The average gain difference between females of the two classes is significant at the five per cent level (t value of 2.1).

## CHAPTER V

## SUMMARY AND CONCLUSIONS

## 1. Restatement of the Problem

The purpose of this study.-- It was the purpose of this study to test in practice the perceptual field approach learning theory with students identified as slow learners, in high school biology.

The specific questions to be answered were:

1. Can a teacher by using the approaches and techniques of perceptual field learning theory exert strong and effective influences on certain students toward significant self and social adjustment when compared with a group being taught by conventional methods?

2. Can a class of students focusing on problems of apparent and expressed interests, biological and abiological in nature, learn as much biology as students taught by conventional methods with the focus on biology?

The hypotheses to be tested were:

1. Slow learning students in high school biology taught by the perceptual field approach learning theory show no significant gain over students taught by conventional learning theory in their self and social adjustment.

2. Slow learning students in high school biology taught by the perceptual field approach learning theory show no significant gain over students taught by conventional learning theory in their learning of biology.

## 2. Description of the Procedures Used

The significant variable.-- This study established as the significant variable the use of a learning theory for instruction-- the perceptual field approach. A comparison of this teaching method, known as the experimental factor, was made with instruction in an equated class based on conventional techniques, the control factor. The criteria for determining effectiveness of the two factors were pupil growth in personal and social adjustment and learning in biology. Difference between the control class gain and the experimental class gain would indicate the superiority of the instructional method showing the greatest class gain.

Using equated groups.-- Two classes of slow learners (27 in the experimental class, 25 in the control class) were selected by the high school counselors. The students were selected on the basis of their intelligence quotients and academic history.

Methods used in the control class.-- The conventional methods were those based upon the psychological theories of reinforcement and conditioning. The class was teacher centered and subject oriented. Teacher selected materials to be learned were presented as a series of simple sequential steps. Desired student responses were obtained through the teacher's provision of successive, systematic changes in the students' classroom environment. Student learning of biology, the focus of the instruction, was achieved as students passively learned answers to problems already solved and presented as facts and concepts. Teacher prepared units of instruction followed the

conventional practice of the presentation of simple, sequential facts, leading to a scope of larger, more complex concepts.

Members of the control class were not involved in individual or small group project studies. Evaluation of student progress was performed by the teacher through the use of objective tests in biology.

No individual student-teacher conferences were held. The control class teacher made no attempt to "get to know the pupils on a one-to-one basis".

Methods used in the experimental class.-- The focus of attention was on problems of apparent and immediate concern to the students. Direct attention was given to the basic needs and concerns of the students, whether biological in nature or not. With the students' current perceptions as the force for directing activities, the major concern in the experimental class was that of student improvement toward a more adequate concept of self.

The techniques considered to be most significant are:

1. The atmosphere was such so as to expressly be concerned with personal reference. In the experimental class there was less concern for right answers, the use of objective tests, and problems solved by rules. The attitude was, "What you feel is important." Discussions centered around things difficult to give grades for. The essential idea was that people rather than things are important. The students were provided the freedom to raise questions about anything. The atmosphere was one of acceptance.

2. The case study technique was used to provide the students the opportunity to test new concepts of self in situations which approach

reality.

3. The technique most frequently used was that of deliberately planned discussions, for the purposes of reducing threat, distributing class leadership, increasing the group we-feeling and individual sense of belonging, and, to increase each individual student's sense of personal worth.

Discussion topics were those of concern expressed by the students, and often centered around the nature of human behavior.

4. Considered to be an important technique was that of the non-directive personal interview, selected for the purpose of encouraging and developing student feeling of adequacy.

5. Another specific technique in the experimental approach was that involving the spontaneous reaction of the teacher to classroom incidents. The purpose of thoughtful verbal and nonverbal reactions was that of assisting students with their understanding the purposes of their behavior and in finding alternate ways of behaving.

In the conventional classroom the teacher responds almost immediately, and this response serves as the force directing student behavior. This extrinsic control of behavior and learning is rooted in the concept of importance of rewards and punishment of reinforcement and conditioning psychologies.

In the experimental classroom the teacher would attempt to discover the true meaning of the incident--to understand the perceptions of the student behaving. The response would often be that of pausing and waiting for group pressure to work. The force directing student behavior and learning was thus one of intrinsic

control. The student would then find new perceptions of self through the responses of his peers.

6. The role of evaluation in the experimental class was different from that in the control class where its purpose was to set standards and then measure student progress and achievement against them. In the experimental class the student played an active role in all aspects, from whether grades were to be given to how grades were to be determined. But, the immediate purposes for evaluation were for assisting the student in developing his full potential, in clarifying his needs, and in setting realistic standards.

Grades were determined by the subjective judgment of the teacher, based upon pupil self-evaluation, perceptions gained from student-teacher conferences, classroom participation and completion of assignments. No objective tests were administered. Evaluation in the experimental class was a continuous examination of immediate experiences.

Sources of data.-- The sources of statistical data for this study were the California Test of Personality (Secondary Form) for measurement of personal (self) and social adjustment, and the Nelson Biology Test for measurement of learning in biology.

A subjective questionnaire was used as a posttest instrument to determine possible differences between the two classes. This instrument and data (Appendix E) are not included in the statistical analysis of effectiveness of this study. The information is included only as subjective evidence.

### 3. Principal Findings and Conclusions

Learning of biology.-- There is no significant difference between the experimental and control classes in learning of biology, as determined by the statistical analysis of the pretest and posttest data collected from administration of the Nelson Biology Test. This finding is considered important in this study since it offers additional evidence that attention in the classroom may be directed to techniques which reportedly lead to student self-actualization while experiencing no loss of learning in traditional subject matter.

The learning theory being tested, the perceptual field approach, does contend that before the student learns, the material to be learned must have some value and personal meaning to the student. It is significant that the students in the experimental class achieved no differently in subject matter than did those of the control class. This is significant because the Nelson Biology Test items were studied more thoroughly by the control class than by the experimental class. It would not have been unreasonable to expect the control class to achieve significantly better on this test. A cautious conclusion that might be drawn then is that because of the difference in actual time spent on the subject matter of the Nelson Biology Test the experimental class did in fact achieve better in the learning of biology.

Self and social adjustment.-- The primary concern was to investigate a technique for facilitating student growth in self-adjustment, particularly in the areas of sense of personal worth and

belonging. Although differences between the experimental and control classes are not statistically significant, there is evidence that progress toward this goal was achieved. As indicated in Table VII (page 102), the experimental class achieved gains over the control class in all but one of the areas of personal (self) adjustment. The control class achieved gains over the experimental class in all areas of social adjustment. These data seem to indicate that the conventional methods of teaching as used in the control class do attribute to an improvement in social adjustment, whereas the methods used in the experimental class lead to an improvement in personal (self) adjustment.

Sex differences as a possible significant sidelight problem uncovered in this study.-- There is evidence indicating a greater sensitivity of females to the techniques and/or teacher personalities of this study. This could be important to the outcomes of the study. However, the descriptive statistics of this study concern numerical description of the two classes and no valid conclusions are intended to be drawn concerning the nature of groups within the classes.

Conclusions to the specific questions of this study.--

1. The data obtained in this study indicate that a teacher using the approaches and techniques of perceptual field learning theory can exert influences on certain students (slow learners) toward improvement in categories of self-adjustment, and, a teacher using conventional methods can exert influences on an equated group of students toward improvement in categories of social adjustment. This is a tentative conclusion and should be verified by further research.

2. The evidence indicates that students, identified as slow

learners, in a class focusing on problems of apparent and expressed interests, biological or not, do learn as much biology as do students in a class focusing on traditional biology and being taught by conventional methods.

Conclusions to the hypotheses of this study.-- Both hypotheses are accepted as stated. There is no significant difference between the means of the experimental and control classes in either learning of biology or in self and social adjustment.

Although this inference is supported by the statistical analysis of data, it is considered as tentative. This judgment is based on the fact that in bringing this experimental study into the classroom it is unlikely that all variables were controlled. This recital of less-than-perfect experimental conditions is not intended to deprecate this experiment. The purpose for which the study was designed, and the techniques used in the experimental classroom, are worthy of further investigation.

#### 4. Recommendations for Further Research

Recommendations considered as promising areas for further research are as follows:

1. Research to determine the significance of certain variables to the teaching of self-actualization. Classroom research concerned with improvement in self concept is lacking. There is little or no experimental evidence concerned with teaching self concepts and the relation of this teaching with effective measuring instruments (if any are available), the length of time necessary for significant results, the correlation of teacher personality with teaching methods, and the potential long term effects upon self concept afforded by teaching techniques reported in this study.

This study indicated a difference in the sensitivity of sexes to conventional and perceptual field approaches. Further studies should verify or nullify this suggestion.

2. Studies to determine the setting which best facilitates the improvement of self concept. There is little controversy concerning the importance of providing students the opportunity to explore their problems--academic, peer, family. However, there is little experimental evidence suggesting how this is accomplished. It is suggested that conventional pressures of force, coercion and threat, must be substituted for with guidance, understanding, and freedom with responsibility. Psychologically significant social residence groups could be established on a school-wide basis, providing small discussion groups where students could test the self in an unthreatening

atmosphere, possibly achieving the repair of any feelings of lack of belonging, and providing for the improvement of feelings of self-reliance and self-worth. From a small pilot study, or a school-wide study, both short-term and long-term follow-up studies would be factors necessarily considered in the design of such a study.

3. The psychometrist of this study observed during the posttest administration of the California Test of Personality what appeared to be "a remarkable difference in attitudes between the two classes". In the experimental class the students seemed "less serious" about the test, as they were observed "laughing and joking about certain test items". The control class students appeared "just as serious on the posttest as both classes were during the pretest". Any attempt to evaluate this observation would be a conjecture, but it does suggest that further research might be more adequately supported by the use of more than one instrument for the measurement of personality factors. The California Test of Personality is considered a Level I projective test. For further studies, the recommendation is the use of not only Level I tests, but also Level II tests such as the Thematic Apperception Test, and possibly Level III tests such as the Rorschach. Use of such tests as these would increase the difficulty of interpretation, and possibly lessen the validity.

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## APPENDICES

APPENDIX A  
PRESENTATION AND ANALYSIS OF CASE STUDIES  
USED IN EXPERIMENTAL CLASS

Objectives of the case study technique.-- The objectives for this study were to provide students the opportunities to:

1. test unfamiliar roles by projecting their own selves into these roles,
2. test new concepts of self in "as if" situations,
3. explore and discover meanings in situations which approach reality,
4. express and clarify the true self,
5. provide a mechanism which makes transfer easy from "as if" situations to those of reality.

Case study number one.-- The specific objectives for the use of this case were to:

1. provide a technique for motivating group discussion on the opening day of the experimental study,
2. demonstrate the difficulty in seeing the real problem in a human interrelationship situation,
3. illustrate the importance of effective communication in human relations.

Much discussion was stimulated by the use of this Case of Jane and Dick. The students related well to the situation, but experienced difficulty in reasoning through the situation to seek what might be

the true problem. But, then, difficulty in reasoning was not unexpected. And, in any case, this difficulty is not unusual with any group experiencing its first analysis of a case study. The students did seem to enjoy trying to analyze the situation in the case, and the teacher was pleased with their first attempt.

### Case Study No. 1

#### THE CASE OF JANE AND DICK

Jane and Dick had been going together for some time. They had sort of an understanding that they would be engaged sometime soon and would probably marry within the next few years. Since they both had the same class schedule, they had the opportunity of seeing a great deal of each other. In fact, they also ate lunch together.

On this particular day Jane and Dick had lunch, discussed the morning's events, and talked with some of their friends in the quad.

While walking across the campus, the following conversation took place between Jane and Dick:

1. Dick: "What are you going to do tonight?"
2. Jane: "Study, I guess."
3. Dick: "You got a test tomorrow?"
4. Jane: "No, just some reading."
5. Dick: "Guess I had better let you study!"

Dick walks off angrily. Jane is left disturbed.

Case studies two and three.-- The specific objectives for the use of these cases were to:

1. provide experiences in seeking possible purposes of behavior,
2. provide experiences in seeking possible alternatives to behaving,

3. provide a mechanism for an open discussion of situations showing distinct antisocial and withdrawal tendencies.

These cases were apparently quite close to reality for certain students--so close that certain students were of the opinion that the cases were their own. The three male students who seemed to relate most closely with The Case of John showed no losses on the test of personality in either categories of withdrawal or antisocial tendencies--actually, gains were achieved by each of these students in at least one of the two categories.

Three female students seemed to relate closely with The Case of Mary. Again, no losses with these students in categories of withdrawal and antisocial tendencies. Actually, a gain was made by two of these students in both categories, and the third student made a gain in the category of freedom from withdrawal tendencies.

On the basis of the above evidence these two cases were effective instruments. Additional cases of this nature should have been written and used in this study. However, at the time of their use the students did not appear to be receiving the cases well. Later in the semester the students were requesting a return to this technique.

#### Case Study No. 2

#### THE CASE OF JOHN

Background: John was considered by his peers as one of the "tough" guys. He was 15 and in grade 10 at \_\_\_ High School. John was prone to bullying, frequent quarreling with his fellow students and teachers, was considered as disobedient by his parents. He had a record of minor offenses which ranged from truancy to drunkenness, offensive behavior, and destruction of property. In general, John got his satisfactions in ways that were damaging and unfair to others.

It was obvious to school officials that John was beyond parental control. He was frequently beaten by his father. John's mother had no apparent ability to control John's behavior.

John was not a member of any school organization of an extra-curricular nature. His mid-quarter progress showed he was failing in three subjects.

The situation: Where is the problem? Where is John heading? What can and should be done, if anything? By whom? What is the role for John? His teachers? His peers? The school administration? His parents? Society in general? Is it too late for John?

### Case Study No. 3

#### THE CASE OF MARY

Background: Mary has been characterized by her peers, and by her teachers, as lonely, disinterested, and generally unhappy. She avoids both students and teachers. She will lie and cheat to avoid attention. Her "close" friends describe her as thoughtless and unkind. She often uses damaging remarks about members of her class, calling them conceited, teacher's pets, etc. She considers members of her class as thoughtless, unkind, and disinterested in her.

Mary will do what she has to do in order to achieve average success in her studies. Her association with adults, her parents and teachers, would be described as one of "merely getting along", doing what "I have to do in order not to get too much attention".

The situation: One of Mary's friends is another 15-year-old girl, Judy. Judy is an above average student, seemingly well-adjusted, interested in people, and has gotten to know Mary because "they are neighbors and walk together to school". Because of Judy's interest in other people and her closeness to Mary, she has become interested in "trying to bring Mary out of her shell".

Mary has told Judy she feels her teacher's are unreasonably severe. Mary said, "The teachers are only interested in the popular kids". Judy disagreed. Mary said, "You only disagree because you are pretty and popular". At this point the conversation was broken by a boy running up and saying, "Hey, Judy, you're late for the council meeting".

Case study number four.-- The specific objectives for the use of this case were to:

1. stimulate discussion concerning student-parent communication,
2. provide the opportunity for the students to project themselves into parental roles and achieve new perceptions of what it means to be a parent.

The discussion of this case was lively. The students were quick to defend Bill and to condemn his father. The students were not reluctant to introduce into the case their own similar situations as they saw them at home.

It is doubtful that objective number two was achieved. The discussion of this case allowed the students the opportunity to really "let off steam," to compare their personal situations--and, it probably provided a negative reinforcement for their own family relations. This reinforcement, from comparing family relations problems with peers, undoubtedly develops naturally from student's out-of-class discussions. A possible advantage of this in-class discussion may be that of having a teacher present to assist the students in directing their thinking. However, it is the opinion of this researcher that discussions of this type were not effectual in stimulating gains in family relations as measured on the test of personality, but were effectual in reinforcing the students' perceptions of any already existing home relations situations, good or bad. This analysis does not conclude that these discussions were bad, only that they were not going to lead to improvement in the category of family relations as measured by the test of personality.

The most that could be accomplished was that these students would become tolerant of parental ambiguity, find new and improved perceptions about the impermanence of living with parents, and conceivably develop positive attitudes about their own roles in developing themselves as fully functioning individuals. With these objectives in mind, one could reasonably expect an improvement in personal adjustment-- particularly in the areas of self-reliance and sense of belonging-- and, a lessening in social adjustment--particularly in the area of family relations.

#### Case Study No. 4

##### THE CASE OF BILL AND HIS FATHER

"No, Bill," Dad says, "No movie for you tonight!"

"But why?"

Eager to get back to his newspaper, Dad doesn't bother to remind Bill of their agreement that until his grades improve, he'll limit himself to one movie a week. Instead, Dad just repeats:

"No, I said, no movie tonight!"

Case study number five.-- The specific objectives for the use of this case were to:

1. openly identify problems in human behavior,
2. provide possible alternatives to behavior,
3. provide a mechanism for seeing problems of behavior as a part of the on-going process of maturation,
4. provide a mechanism whereby students could see themselves in the process of becoming, and that this process is dependent upon their

perceptions of their environment,

5. provide a summary review of the semester's work.

The case was approached by the students with a kind of indifference. Possibly the case was too highly structured. It may not have fit into the thinking of the students at the time. After the Christmas holidays the students seemed droggy, tired of school, lacking in motivation. The reality of poor grades (in most of their subjects) may have affected their attitudes in this class. Evidence for this hypothesis might be afforded by the frequency of mention of certain items of parts one and two of this case study.

### Case Study No. 5

#### BIOLOGY AND HUMAN BEHAVIOR A Study of Personal Problems

#### PART 1

Directions: Some of the areas in which high school students are most likely to have problems are listed below. Number these in the order in which you believe the problems occur most frequently, beginning with the number one with that problem you believe to be most frequent.

#### Frequency

- |   |   |
|---|---|
| 8 | A. Poor study skills.   |
| 4 | B. Personal problems: health, money, trouble in family.   |
| 0 | C. Bothered about things he has learned in school.  |
| 1 | D. Getting along with other students.   |
| 0 | E. Getting along with opposite sex.   |
| 2 | F. Lack of motivation--doesn't seem to care about school.   |
| 1 | G. Feelings of inadequacy--doesn't seem to feel he can do the work.   |
| 3 | H. Confusion over educational and vocational plans-- isn't sure of what he wants to do with his education.  |
| 0 | I. Too many extra class activities.   |
| 0 | J. Too much outside work--has to work.  |
| 1 | K. Student is fed up with school and will drop out when of age.   |
| 0 | L. Student is having trouble with a particular teacher or course and doesn't know how or where to get help. |

- 0 M. Student has schedule problems--appears to have too heavy a load.
- 1 N. Other problems not listed above.

## PART 2

Directions: Students who are bothered by the problems above may have one or more of the following characteristics. Determine the order in which you believe these characteristics are most frequent among students whom you know and number them beginning with number one for that characteristic you observe most often.

## Frequency

- 3 A. Seems to spend too much time in idling, talking, movies, etc.
- 1 B. Keeps too much to himself.
- 5 C. Has adopted a nonchalant attitude toward low grades.
- 3 D. Has refused to (or neglected to) make use of help sources such as counselors, interested teachers, school psychologists, nurses, etc.
- 2 E. Has trouble concentrating.
- 0 F. Refuses to cooperate in class activities.
- 0 G. Constantly finds fault with other students, faculty, surroundings, etc.
- 0 H. Shows disregard to school regulations.
- 0 I. Does not make an effort to take advantage of cultural opportunities such as field trips, lectures, exhibits, assemblies, etc.
- 0 J. Unfriendly, disagreeable, minding everyone's business, or has other unpleasant personal traits.
- 2 K. Excessive drinking.
- 1 L. Doesn't seem to be getting anything out of school--doesn't study or participate in school activities.
- 0 M. An immature student--seems to be following the wrong sort of person.
- 2 N. Doesn't seem to care about more than minimum performance.
- 0 O. Other characteristics not listed above.

Parts one and two, above, served to identify symptoms of problems observed by these students. Furthermore, these lists served as a reminder that problems of behavior are part of the on-going process of the maturation of youth.

Parts three and four of this case study served to reemphasize

that behavior is dependent upon the behavior's perception of the situation at the time of behaving, and when perceptions change, behavior changes. These parts of the case are included here only as a brief outline, and were used as the focus of discussion in class.

### PART 3

Scientific facts concerning the human organism (25, p. 126-135):

1. We build and are built by our environment.
2. Each human being in the world is unique.
3. Every living thing possesses the dynamic of growth. Physical growth is only part of the story, and ceases with adulthood. Growth of personality is continuous, and is built on courage rather than on fear.
4. Maturation is a scientific fact.
5. The human organism works as a whole, not in parts. An attitude is as much a part of structure as a hand.
6. Man molds his own self. The individual can modify his environment into almost anything he wishes. In other words, the individual may rise above his inherited environment, sink below it, or grow with it.

### PART 4

A review of the fundamentals without which an organism cannot thrive (25, p. 136-140):

1. The first fundamental is other people.
2. We need good communication.
3. We must have other people in a loving relationship.
4. Each person must think well enough of himself that he can operate.
5. Every human being, in order to develop his full potential, must have freedom. With freedom, comes responsibility. Freedom is learned in an atmosphere of love, democracy, and cooperation.

6. Every person needs the chance to be creative. This involves meeting the problems of living and inventing new ways to solve them. When one is free, he will create. When the individual is creative he feels good, and when he feels good he thrives.

Case study number six.-- The specific objectives of this case were to:

1. stimulate discussion concerning student-parent communication,
2. provide a mechanism for identifying problems in human behavior,
3. provide a mechanism for discussing possible alternatives to behaving.

Discussion of the case went well. The students were apparently capable of identifying with some of Herbert's situations. The students seemed anxious to suggest possible alternatives to Herbert's behavior, placing much of the responsibility for changing on Herbert's shoulders. They seemed optimistic about the possibility of Herbert's managing his own affairs.

#### Case Study No. 6

#### THE CASE OF HERBERT vs. SOCIETY

Herbert is a 15-year old sophomore at \_\_\_ High School. His school work has been below average since early grades. He seems to have lost interest in trying to do better school work and consequently very seldom if ever attempts to do any studying. He does not participate in any extra-curricular activities. Herbert and his parents no longer discuss his school work. His attendance is fairly regular. He does not cause any particular trouble in his classes, but actually appears to be withdrawn from class activities.

Herbert has indicated that he feels teachers are not interested in him. He feels he has no friend on the school faculty.

Herbert has poor communication (in his opinion) with his parents, particularly with his father. He sees his father only seldom, mostly on weekends whenever they both are around home. He says his father and he mostly argue. Herbert has the feeling his father is unhappy that Herbert is "not a better student". Herbert's father is an aggressive, hard working man, and has "made his success thru his own hard work". "You've got to work hard for what you want, boy!" "Like I did." Herbert feels that his father restricts him too much, and Herbert looks forward to when he can get a job that will pay him enough so that he can afford his own car. "This will enable him (Herbert) to come and go as he wants."

Herbert's mother (according to Herbert) is weak. She is constantly pleading with Herbert (over various matters), and seems to always succumb to her husband's commands. Herbert "is sick and tired of her weakness and his dad's commands".

Herbert's peer friends are small in number, mostly of boys older than he who also are unsuccessful in their school work. Whenever possible they get together in a friend's car and "ride around". Usually on the weekend they find time to get together to "shoot a little pool", "mess around", maybe take in a movie. Recently they have begun to buy beer and go to the drive-in movies. Neither Herbert nor his friends have steady girl friends. During the past few months they have been able to find "pick-ups" though. They have "fun" "messing around" with these girls, and laughing and joking about this later.

It seems to Herbert that the relationship between he and his father has grown worse during the past few months. His father has actually threatened him.

Yesterday, Herbert was arrested for petty theft. He was alone at the time. He had stolen cigarettes.

APPENDIX B  
STUDENT SELF-EVALUATION FORM<sup>7</sup>  
USED IN EXPERIMENTAL CLASS<sup>8</sup>

Students frequently remark, "My tests didn't show it, but I learned a lot from that course, really, I did." Or they make some other comment indicating that what they learned in a course is different from what the instructor judged their learning to be. There is suggested in such remarks that the students are capable of rendering judgment about courses outcomes, and that these feelings of accomplishment are not considered by the instructor.

What are your judgments about yourself and the course you are now completing? Rank yourself with checkmarks in the spaces at the right using 5 as high rank and 1 as low.

1. How would you compare the work you have done in this course with that done in comparable courses?

- |  |           |
|--|-----------|
|  | 5 4 3 2 1 |
| a. Amount of time spent on the course . . . . .                            |           |
| b. Number of resources encountered (e.g., books and journals . . . . .     |           |
| c. Effectiveness of use of time in accomplishment of assignments . . . . . |           |
| d. Other (write in) . . . . .  |           |

2. How valuable have your efforts been to you?

- a. Familiarity with reference material in the library and in the classroom . . . . .
- b. New knowledge gained: facts, principles, general concepts . . . . .

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<sup>7</sup>This form is adapted from one designed by Dr. Fred W. Fox, Associate Professor, Department of Science Education, Oregon State University, Corvallis, Oregon.

<sup>8</sup>Referred to on p. 84.

5 4 3 2 1

- c. New attitudes developed regarding yourself, your interests, capacities, potentials, etc. . . . .
- d. Developed (or exercised) skills in organizing my thinking, expression, writing, to the extent apparently expected or encouraged in the course . . . . .
- e. Other (write in) . . . . .
3. How do you rate yourself on your major assignments?
- a. Knowledge gained . . . . .
- b. Organization thorough, treated all aspects of the assignment . . . . .
- c. Extensive research in preparation, didn't just rehash old thinking, but added constructively to it. Tried new ideas . . . . .
- d. Class presentations were such that it was evident that I was familiar with the field studied . . . . .
- e. Other (write in) . . . . .
4. How adequately did you contribute to the progress of the daily class meetings?
- a. My remarks contributed directly to the topic under discussion and were not too often irrelevant . . . . .
- b. In view of the amount of participation which seemed to be encouraged in the class and in comparison with others in the class, I participated reasonably well . . . . .
- c. Other (write in) . . . . .
5. With reference to 2.a., cite some references (author and title), and indicate the important ideas which you got from the source or make some brief comment about the reference.
6. State two or three viewpoints you now hold regarding yourself which are new or which differ from what you believed when you first came to this class.
7. Aside from things you have done in this class or as requirements for this class, what examples can you cite

of things you have done which exemplify your interest in, or knowledge or application of, concepts of this class, since the term began?

## APPENDIX C

## RESUME OF DAILY ACTIVITIES OF THE EXPERIMENTAL CLASS

The first ten class days are discussed here in some detail. All of the major activities of the experimental class are included in Table X, p. 139-143.

September 7.-- The first day of school. Class periods were shortened. It was planned that the teacher would not meet with this class until September 13, after the formal activities of opening school and administering the pretests had been completed. The first day was awkward--one of the school administrators had agreed to meet with the class but was late by ten minutes. Consequently, the teacher met with the students for the first ten minutes. After careful planning of the study this unforeseen event resulted in a somewhat awkward situation. The teacher attempted to appear at ease and explained to the class that he would have to be absent from this class and that the class would formally get underway on September 13. "The school counselor will be working with you for the next two days during this period." The administrator arrived and conducted the formal activity of role-taking and form completion.

September 8.-- The Nelson Biology Test, Form AM, was administered by the counselor.

September 10.-- The California Test of Personality was administered by the counselor.

September 13.-- The teacher met with the students, immediately

requesting that they form a circle with their chairs, for the purpose of making introductions and getting acquainted. A few of the students complained of the difficulty of forming a circle (in part because of the difficulty encountered from the permanently fixed lab desks), and so were instructed to merely find a comfortable position so that all class member's faces were visible. Duplicated copies of case study no. one were presented to the students, with the intention that getting the student attention directed to reading might ease some of the mounting tension. The students read the case, with some giggling and comment. The teacher, seated with the students in the circle, sat quietly observing student reactions. After ten minutes he suggested "we put the case aside for a few minutes and introduce ourselves". The students were asked to become acquainted with the person to their right, and then to introduce that person to the class. The teacher participated. This activity went well, was often humorous, and seemed to ease the tension.

Discussion of the case study followed. The teacher played a nondirective role, allowing a free and open discussion. The students, although obviously confused, were receptive to this discussion. More than one-half of the students participated in the verbal discussion. After 20 minutes the discussion began to wander and became isolated among small groups. The teacher then began to direct the discussion. He asked the students if they could see a problem in this case. Some of the students eluded to the problem of communication between two individuals who have never really learned to communicate. Ensuing discussion centered about "how to learn to

relate with one another?", and "how to relate with one another in a group?".

The teacher concluded the class period with what he saw as a summation of student comments. He attempted to credit individual students with the following summarizing thoughts concerning the basic needs of people in groups:

1. The individual needs the feeling of being welcome, that nobody objects to his presence--in short, a sense of belonging.

2. He needs a share in planning the group goals, and that the goals make sense to him.

3. He needs a share in making the rules of the group, with clear knowledge of what is expected of him.

September 14.-- The three activities of this day were:

- (1) individual student completion of an interest and activity form;
- (2) group discussion of "What is the study of biology?"; and,
- (3) sentence completion. The sentences students were asked to complete (on paper) were: "I took this course because . . . .," and, "The things I would like to learn about in this class are . . . ."

September 15.-- The three activities of this day were:

- (1) discussion of, "How do you want to be evaluated for grades?";
- (2) discussion of class procedures; and, (3) browsing through classroom text material. An interview schedule was established.

September 16.-- Individual student-teacher interviews began on this day. The class activity included a group discussion of "What does it mean to be alive?" This discussion continued the entire class period.

September 17, 20-21.-- During these three days the students were allowed to work individually and in small groups, in the library and in the classroom, for the purpose of probing areas of biology that students might wish to investigate in depth. The teacher worked with individuals and small groups during this time.

By now the teacher felt he was beginning to know each student in the class. Table X summarizes activities of the experimental class.

TABLE X

## CHRONOLOGICAL SUMMARY OF EXPERIMENTAL CLASS ACTIVITIES

Date	Activity
September 7	Teacher not present. Formal activities of first day of school.
8	Teacher not present. Biology pretest administered.
10	Teacher not present. Personality pretest administered.
13	Formal initiation of experimental variable--case study, group discussion.
14	Interest and activity form completion, group discussion, sentence completion.
15	Discussions and investigations of text material.
16	Discussion.
17, 20-21	Individual and small group work.
22	Teacher led discussion of student proposed areas of interest in biology.

TABLE X--Continued

23	Teacher led group discussion evaluating work done. Teacher complimented students. Discussion of group procedures, importance of patience, cooperation and group planning.
24	Discussion of unifying threads of chosen topics. Discussion of cells--"What are they?"--use of slides and microprojector. Students asked to answer questions: (1) What each had accomplished so far?; (2) Why?; (3) "going to do the next two weeks?"
27	Assignment schedule distributed. Discussion of the schedule. Discussion about people--their behavior. The students were asked what they liked and disliked about people, why some people were small, bossy, noisy, slouched--final discussion concerning physical appearances.
28-29	Individual and group work on projects.
30	Students asked to write telling about "yourself," "class members," or, "the teacher." Sentence completion. Informal party held in the evening at teacher's home.
October 1	Two films: Introduction to biology and reproduction in animals.
4	Examination and evaluation of goals. Discussion of Sept. 30 sentence completion results.
5	Two films: Life in a pond and ecology. Some students allowed to use library rather than view films.
6-7	Individual and group work.

TABLE X--Continued

8	Discussion of party at teacher's home. Discussion of "why some people feel a lack of belonging to any group?"
11	Discussion of assignments.
12-14	Individual and group work.
15	Film: heredity.
18	Small group work.
19	Discussion of difference between plants and animals, about smoking, and a demonstration of elodea in water under light.
20	Group work. Students were asked to discuss in small groups what each individual was learning from his investigations.
25	Discussion of assignments.
26	Presentation and discussion of second case study.
27	Discussion of our reactions to foreigners and strangers. Small group work.
28	Presentation and discussion of third case study.
29	Discussion of ecology, alcohol, and study habits.
November 1	Requested lecture on taxonomy. Discussion of differences between plant and animal life.
2	Filmstrip concerning drug manufacturing.
3	Presentation and discussion of fourth case study.
4	Discussion of personality development. <u>Coming of Age: Problems of Teen-Agers</u> (27) was read to the class.
5	Discussion and evaluation of work done.

TABLE X--Continued

8	Observation and discussion of photographs of insects and mammals.
9	Individual and group work.
10	Two films: ecology and fungi.
15	Film and discussion of ecology.
16	Film and discussion of protozoa.
17-18	Individual and small group work.
19,22	Discussion: behavior control. The discussion centered about responsibility, cheating and vulgarity.
23	Film and discussion: population and information explosion.
24	Use and discussion of word associations.
29-Dec. 13	Cancer study. An in-depth study was requested by the students. Films, filmstrips, student reports, lectures, and discussions were used.
December 14	Evaluation of work done. Discussion of those activities that have been liked and those disliked.
15	A biological cross-word puzzle.
16	Discussion concerning what to do during vacation--alone versus with others. A tree-game was worked on in class. Discussion of juvenile delinquency in California. <sup>9</sup>
17	Film: carnivorous plants. Discussion concerning class procedures, likes and dislikes. Students were requested to evaluate (written)

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<sup>9</sup>Read to the class were parts of the report: Delinquency in California, (5).

TABLE X--Continued

		the class.
January	3	Discussion of principles of biology studied thus far.
	4-6	Individual and group work.
	7	Discussion of making order out of chaos, the work of a scientist. Case study number five.
	10-14	Student project reports (oral). Two films: problems of disease and over-population.
	17	Student reports. Discussion of significance of factors of heredity and environment.
	18-21	Presentation and discussion of sixth case study.
	24	Student evaluation of semester's work.
	25	Biology posttest administered.
	27	Personality posttest administered.

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## APPENDIX D

## ANECDOTAL RECORDS OF SELECTED STUDENTS

## 1. Control Class

The teacher of the control class was asked to provide comments about some of the students of his class, especially those students with whom he anticipated progress (of any sort) was achieved. What follows are his comments with added comments by this teacher.

Example 1. Male, age 19. No I.Q. score available.

J--- talks a little more than he did at the first of the school year. His work has improved considerably. He is more willing to participate in the class discussions. He wouldn't do this at all last September. His pencil sketches on a note pad have attracted the attention of some of his classmates. They are quite good and are usually western scenes. J--- laughs only rarely but does enjoy a good story.

Comment: The teacher's acceptance of this boy's behavior apparently paid off. The boy showed improvement in the area of personal adjustment, particularly in the category of "belonging. His percentile score in this category moved from 20 to 70. In addition, his biology test score improved from 71 to 97.

Example 2. Female, age 15. I.Q. 89.

M--- exhibits more self-control than she did earlier--she doesn't seem to need to make comments on everything. Her flirtations with the boys are not as obvious as before. She reads rather well and volunteers to read when a classmate shows a filmstrip. When I ask her to follow directions she doesn't argue and pout like she did last fall. Her less talkative behavior has been welcomed by me and probably by some of the students.

Comment: Personal adjustment, 40 to 50. Social adjustment, 70 to 60. Total adjustment, 50 to 60. Biology test, 90 to 92. It seems

clear that this girl's behavior was an annoyance to the teacher--she read his response and responded by becoming less talkative. Her test scores show little improvement in either personality adjustment or knowledge of biology.

Example 3. Female, age 14. I.Q. 107.

D--- just transferred to one of my regular biology classes [at the end of the semester of this study]. She realized she could do better work. This was her choice. I never mentioned this course of action to her. The behavior of her . . . classmates 'bored' her. I believe she will succeed in the regular biology class. D--- responds very well to praise. She solicits it.

Comment: Personal adjustment, 10 to 20. Social adjustment, 20 to 5. Total adjustment, 10 to 10. Biology test, 112 to 112. From these scores it seems very little was being accomplished by this girl. It appears that she is a bright girl with adjustment problems. There does seem to be a problem in the area of family relations. It appears that the teacher did attempt to encourage the girl.

Example 4. Male, age 15. I.Q. 103.

P--- is intelligent. He may not show this on standardized intelligence and achievement tests. He has responded favorably to my friendliness and firmness. He is a sensitive boy and appears to be hurt (emotionally) easily. P--- is quite immature at times and at other times shows remarkable understanding. He has read more than most of the students in this class.

Comment: Personal adjustment, 1 to 1. Social adjustment, 1 to 1. Total adjustment, 1 to 1. Biology test, 106 to 106. It is interesting to note that the teacher obviously has shown acceptance and regard for this student, but still the student showed no gain in personality adjustment (and a very low adjustment), nor in knowledge

of biology. As in example two, the teacher may have misunderstood the student's response to firmness as an indication of learning.

Example 5. Male, age 15. I.Q. 106.

R--- has become very cooperative. He likes to hand out and take in papers. This small boy tells his peers to 'cool it' when I call the class to order and they do not respond immediately. He thrives on praise and solicits it. He does not appear to be intimidated by the presence of his older and larger brother, P---.

Comment: Personality adjustment, 5 to 60. Social adjustment, 1 to 30. Total adjustment, 2 to 40. Biology test, 75 to 100. This student achieved considerably in all areas. He was given a role in the class, and responded well to this responsibility.

Example 6. Male, age 16. I.Q. 83.

P--- tries to intimidate others in the class. He has been in trouble with the juvenile authorities. He talks about those experiences. He likes to shock me and his classmates with statements about fighting, marijuana, and alcohol. He has done fairly good work in this class when he has been kind enough to grace us with his presence. This is the kind of boy we all want to 'help' but are unqualified to do so. At least, the training of the high school teacher does not qualify him for this type work. P--- is no problem in this class. If the teacher steps out of role, he can reach a workable agreement with P---.

Comment: Personality adjustment, 30 to 10. Social adjustment, 5 to 5. Total adjustment, 20 to 10. Biology test, 75 to 87. From test scores it is evident that little or no gain was made with P---. Certain phrases used above by the control class teacher would seem to indicate something concerning the teacher's attitude about working with students with special problems. But, he obviously felt the necessity here to "step out of role" if for no other reason than to merely live with this student 50 minutes a day.

Example 7. Male, age 15. I.Q. 91.

A--- is a very suspicious boy. He expects teachers and other authority figures to do 'the right thing'. He tells me that teachers 'have it made'. A--- likes to argue with his classmates and will argue over practically anything. Perhaps it is because I know and understand him better, but it appears he is more willing to listen to the opinions of his classmates than he was at the beginning of this year. A--- is quite moody. He'll be very friendly to me and others one day and will be withdrawn and unfriendly the next. Some of his classmates 'bug' him. He has stated that 'they should treat me as an equal like you treat me'.

Comment: Personality adjustment, 40 to 50. Social adjustment, 50 to 70. Total adjustment, 40 to 60. Biology test, 93 to 103. With this student, the teacher correctly predicted that achievement was made. Students grow toward self-actualization when they feel they are acceptable persons.

Example 8. Male, 15. I.Q. 86.

D--- needs a great deal of attention. He likes to sit on the floor while films are being shown. This doesn't bother me and when some student steps on his fingers he wants me to admonish the student for it. I laugh at him and tell him floors are for feet, not for fingers. He laughs good naturedly about this. D--- likes to play the role of the tough guy. Most of his colleagues don't let his attempt to bully bother them much. At least it appears that way. D--- doesn't turn in work any better than earlier in the semester. When he does, it isn't much below what I expect of him.

Comment: Personal adjustment, 20 to 60. Social adjustment, 2 to 70. Total adjustment, 5 to 60. Biology test, 84 to 89. As was predicted by the teacher, much improvement was made by this student as shown by his scores, particularly in personality adjustment. Apparently, the teacher correctly satisfied D---'s attention seeking behavior. The teacher did not use threat or coercion to attempt to

control the boy's unusual behavior, but rather showed some understanding, acceptance, and guidance.

Comment by control class teacher concerning his experience with teaching slow learners.-- Several times during the year the teacher commented that he felt that for the good of the teacher and the students, the teacher should be given a new group of students after only one semester. He felt that "a full year's exposure is too long." He further commented as follows:

All of the students in this class are 'challenging students'. Working with them has been both rewarding and frustrating. There is a great range in their academic abilities. Some of them have not mastered the basic skills beyond elementary grade levels. Others can read up to grade level. Many of them manifest mild to probably serious emotional problems. Some of these problems probably go back very far in their lives.

The only way I can get them to work and proceed with any sort of learning program is to plan their activities carefully. I have used a variety of techniques and materials. If the instructional material is reasonable, general in nature, not over one period in duration, and varied, they will go along with it. If I were not an experienced teacher, I would probably not have 'survived' this experience. I challenge anyone to have this experience and not have many feelings about it.

## 2. Experimental Class

This section of this appendix includes the researcher's comments concerning ten students in the experimental class.

Example 1. Male, age 14. I.Q. 95. P.A. 5 to 1. S.A. 10 to 2. T.A. 5 to 2. Biology test, 95 to 86. This boy's scores dropped in nearly every category, particularly in the areas of personal freedom and family relations. He also showed increasing symptoms of withdrawal and nervousness. His scores improved in the areas of self-reliance and freedom from antisocial tendencies. D--- was tall and awkward for his age. He also had a poor skin condition. He was considered "psychotic" by his classmates, had been blamed for attempted arson while in junior high school, and was apparently at serious conflict with his father. The boy took an apparent liking to the teacher and spent many hours in the classroom, outside of class time. He was energetic and displayed an inquisitive nature. He was quick to get interested in projects, but almost as quick to lose interest. This may be attributed to his feelings of inadequacy (his sense of personal worth was measured at the first percentile). He usually was quite busy during class with his various projects, e.g., treatment of plants with growth hormones, raising of hamsters, building of a smoking machine, and, he also liked to run the film projector. He did not like to participate in discussions with the rest of the class, or in small groups. He did like personal chats with the teacher. He felt that other students laughed at him. The major concern of the teacher became that of helping this boy to improve his self-confidence.

The teacher talked frankly with the student about his gangliness and his acne. The teacher felt that progress with this student was achieved (this is verified by the boy's improved scores in self-reliance and freedom from antisocial tendencies). Other evidence is supported by an analysis of the following material written by the student:

Sept. 30: . . . I want to make the best out of the time I am on this earth, I want to be somebody not just exist either. . . . the members of this class influence me and what I think of doing. . . . they also make me feel real low. There tasing me has changed me . . . [the spelling errors are his]. . . . the teacher of my biology class has helped me very much. . . . my greatest problem is in holding my head up and fighting for myself . . .

Oct. 25: . . . I have made a lot of headway in the past . . . weeks I think I have done a good choice in the subject I am studying. . . . I also think that by Mr. K's actions toward me, that we may get to be very good friends, and may learn a lot to know that teachers are human too, that they also have problems to solve and goals to head for.

Nov.: I don't have to fear anybody or anything on the idea of getting up and saying what I feel I have accomplished in this class and I have learned to make my own dissisions on what I will study or maybe de when I get out of school.

Dec.: I have learned that I have confidence in others only when I have confidence in my self.

Jan. 11: I gave my reoport on the afect of geabriilic acid on plants. . . . I told (the class) about all my failures and they were quite interested I told them that I had failed four times. . . . that my biology teacher told me I should not give up at this point and that a seintice [scientist] does not give up. I had no longer stated that fact and they all seemed like they could help in some way. I think the report went over well.

So, the student developed courage to stand in front of his class, "holding his head high," and confidently reporting to the class how he kept at his plant experiment, even after four failures. He was proud

of what he had learned about the work of a scientist. And, he was even more proud that students no longer teased and laughed at him.

Example 2. Female, age 15. I.Q. 88. P.A. 30 to 30. S.A. 50 to 50. T.A. 40 to 40. Biology test, 82 to 77. This girl's personality scores dropped slightly in all but a few areas, but improved from 30 to 90 in sense of belonging, and from 50 to 98 in community relations. This girl was very quiet, seldom participating in discussions, but conscientious about doing her work. Although not shown on the test of personality, she did seem to show strong feelings of inadequacy. Because of her quiet nature, the teacher did not become well aware of this until quite late in the semester. However, she did seem to benefit from this class, as is illustrated from her writings as follows:

Oct. 18: I have learned about other people, and myself mostly. I've learned about myself from the test you've given us. My faults and many things deep in me. I have learned how to think for myself.

Oct. 25: I don't think my report went over so well. . . .

Oct. 28: . . . new ideas came to my mind as I listened to other members of the class. I felt a little different after I heard the other students in how they thought. . . .

Dec. 3: I want to be happy. Live and be health. . . . Our family is happy, all together. . . .

Dec. 17: This course is easier [than others]. It's more interesting to me. I enjoy it more and look forward to going to class.

Jan.: I'm not sure what I've learned about myself. I've learned to express myself more. I feel I've changed since I've been in this class. I'm not sure in what way. . . . This class effects me more outside. For example when we had done the study of cancer and smoking, it effected me more. I talked about it for days. I was also interested in my parents smoking habits. . . .

Example 3. Male, age 17. I.Q. 84. P.A. 40 to 50. S.A. 10 to 5. T.A. 20 to 20. Biology test, 75 to 95. This boy made strong gains in the areas of belonging and social standards (knowing right from wrong). He showed a major drop in family relations. R--- attempted to be a major discipline problem during the first few days of the semester. Immediately following his interview with the teacher he was from then on a completely changed and improved personality in the classroom. R--- was the only senior in this class. He and his girl friend (also in the class) chose as their project the raising of houseflies. The teacher suggested this project after both students had expressed an interest in insect study. The teacher took the two of them on an after-school field trip to the University to observe a fly culture laboratory. From that time until the end of the school year these two students, almost religiously, took care of their flies. This project seemed to give R--- prestige and recognition of which he was very proud.

Example 4. Female, age 17. I.Q. 85. P.A. 70 to 98. S.A. 70 to 90. T.A. 70 to 95. Biology test, 65 to no score on second test because of absence. This student made superb gains on the personality test in all areas of personal adjustment, and in all areas of social adjustment but two (scores in these two areas remained stationary). This girl was extremely quiet, seldom participating in the discussions. All that can seem to be said is that this girl was well-adjusted before coming into this class, and even more so upon completion of the study. Possibly her success is best explained by her own words.

Jan. 17: I think your surrounding at home have a lot to do

with what kind of a person you are. . . . what you inherit from your parents and what kind of environment is very important. I think environment is a little more importance than heredity.

Example 5. Female, age 15. I.Q. 107. P.A. 20 to 80. S.A. no score to 60. T.A. no score to 70. Biology test, 100 to 93. M--- achieved superb gains in all areas of personal adjustment, particularly in the category of sense of personal worth. At the beginning of the study M--- was so shy she would blush at even a glance toward her. By the end of the semester she was more open, and during second semester she was taking daily attendance for the teacher.

Oct. 25: I can't talk to well up in front of a class. I have always been afraid to get up in front of people.

Nov.: [I have learned] how to study on my own and how to get along with other people in my group, that are studying with me. . . . most kids have a problem with trying to turn in papers but I think if I would try harder I could turn in all of my papers and get good grades on all of them.

M--- developed into being the top student of this class by the end of the school year.

Dec.: We have more freedom in this class than any of the others. I think I have changed quite a bit but I don't know quite how.

By January, several of the students of this class reported new feelings about themselves, better feelings, feelings of greater adequacy.

Example 6. Male, age 15. I.Q. 108. P.A. 30 to 30. S.A. 20 to 20. T.A. 30 to 20. Biology test, 86 to 90. This boy showed an increase in sense of belonging but a decrease in school relations. His school relations became so poor toward the end of the first semester that he was suspended from school, and subsequently enrolled in another high school. M--- was small for his age. He also wore braces on his

teeth which were not noticeable to the teacher. The striking thing about his appearance was that he actually seemed to try to appear "moronic". This observation was made by a psychologist who visited the class and who knew none of the students. The following are observations as recorded by the teacher:

Early September: Night of open house at school, M---'s mother told the teacher how pleased she was that M--- seemed to enjoy this class so much. She also reported that M--- and his father did not get along.

Sept. 20: M--- was creating a disturbance in the class for the second time in a week. The first time the teacher merely discussed his behavior with him after class. This time when the teacher asked him to behave the student answered the teacher with a "wise" remark to gain laughter from the students. The teacher took the matter into hand by "urging" M--- out of the seat and ushering him to the door, sending him to the attendance office to wait until class was over. M--- came back at the end of the period, obviously seared. The teacher did not talk about the situation but rather asked M--- why he never showed for his scheduled interview.

October: His behavior in class was still that of seeking attention of class members by "wise" remarks and disrespect to other students and the teacher. Neither non-directive or directive techniques, from this teacher, seemed to affect any permanent change in behavior from this student.

November: The Principal called a conference involving the student's counselors and teachers, as a result of M---'s continued worsening behavior in school. However, his behavior in this particular class had shown improvement during late October and early November.

January 18: M--- was expelled from this class. The incident in class was minor, but was compounded by the boy's seeming desire to be removed from the class. He later blamed the teacher for the incident. He was also involved in at least one other incident of misbehavior during the day. He was referred by the administration to the school psychologist, suspended from school for three days, and placed in another biology class. At the end of the semester, his father transferred M--- to another high school.

The observations suggest that M--- felt unaccepted by his father and over-protected by his mother. His poor grooming and utter disrespect

for others suggested to this researcher that M--- had little respect for himself. The teacher eventually lost patience and tolerance for the boy's behavior.

Example 7. Male, age 15. I.Q. 109. P.A. 70 to 80. S.A. 60 to 70. T.A. 70 to 80. Biology test, 89 to 100. The greatest gains made by B--- were in the areas of freedom from withdrawal tendencies, sense of personal worth and belonging, and in school relations. This student attempted to gain recognition through negative attention seeking devices, such as antagonism toward other students and the teacher. He was the most unpopular student in the class. The teacher had several discussions with B--- concerning the purposes for which B--- attempted to antagonize others. Many times during the semester, B--- would later apologize for his unacceptable behavior, and would promise to do better. And, he would do better, for a brief time.

Example 8. Female, age 16. I.Q. 112. P.A. 2 to 20. S.A. 5 to 10. T.A. 2 to 20. Biology test, 71 to 92. The personality adjustment of this girl was quite low at the beginning of the semester. She made improvements in all areas except those of social standards and community relations. She became pregnant later during the school year. P--- was not popular with other students in this class. She was very quiet and reported several times that she disliked this class. She was the oldest of many children living with her working mother, who was separated from the father. P--- was frequently absent from school. The teacher talked with her about her reasons for her truancy. Subsequent to that interview, but not necessarily because of it, her absenteeism was less frequent. On one occasion

P--- was accused by another student of having stolen a coat. The accuser asked that this teacher talk with P--- about the coat. P--- denied having stolen the coat. Both P--- and her accuser were sent to the Vice-Principal to get the matter settled. P--- finally admitted having stolen the coat. She was sent home from school for the remainder of the day. Wearing the coat to school the day after she had stolen it seemed to indicate that P--- either consciously or unconsciously wanted to be caught and punished, possibly hoping to be expelled from school. From an analysis of P---'s writings, it seems that she utterly hated school and was preoccupied with work, money (or lack of it), and her situation at home.

Nov. 23: [This film] . . . showed how we could live. It was showing . . . that the I.B.M. machine is smarter than any human alive. But it was showing . . . an example of what it is going to be like . . . that some of us aren't going to have jobs, because of the . . . machines . . .

Dec. 3: . . . a good life is to have all the fun you can while you can.

Example 9. Male, age 15. I.Q. 99. P.A. 30 to 60. S.A. 20 to 30. T.A. 20 to 50. Biology test, 93 to 87. The boy made strong gains in the areas of personal worth, sense of belonging, freedom from withdrawal tendencies, social skills, and school relations. This student was handsome, and well-built for his age. Other students in the class seemed to look to him as a leader. Some of the other boys were obviously afraid of him. Teacher observations and quotations from the student are as follows:

Sept. 21: A--- seemed to want to talk a lot but not about the subject. Everything seemed amusing to him. He was busy trying to impress G--- and the rest of the group with his comedy routines. I asked A--- if he would like to start the

discussion. He liked to talk while the teacher was talking or when other students were talking, but as soon as attention was focused on A---, he became quiet, turning red in the face. I said, "A---, why are you bothered when you are given the floor? Why are you uncomfortable?" He was made angry and defensive by these questions. A--- is the kind of boy that would scare many teachers. He looks as if he might hit you any minute. It was difficult to get A--- in for an interview. He finally came without reluctance when asked to come in to tell the teacher about a couple of the girls in the class, one of whom had been A---'s girl friend, and still was except for the fact her parents would not allow her to go with A---. After the interview, A--- was quite cooperative in class.

Oct. 8: A--- was seen by the Principal drunk at a football game. He was chased by the police, took a punch at a policeman, was suspended from school for three days.

Oct. 11: A--- returned to class--it seemed by his glare of defiance that all of the progress that had been made before was now lost. I talked with him about his situation--this seemed to renew his interest in me.

Oct. 15: A--- telephoned the teacher at home, asking about some bibliography materials for his project.

"What I have learned in this class, more than anything else, is self-control." He was proud of this progress.

Oct. 25: "I feel my report [oral] was very poor, it was not interesting, and I was very nervous."

Nov.: A--- came to teacher's home, brought some deer steaks, to just talk. His best friend had just been expelled from school. A--- was concerned about his relationship with his father. It concerned his father's reported inconsistent punishment. His father had just beaten A---. A--- said he was now afraid that he might hit his father in return.

Dec. 6: A--- had difficulty today controlling himself in class. After class, he requested that I write him an excuse to go home. When asked why, he said he just knew that before the day was over he would be in trouble, and that he didn't want that. I told A--- that this then was the time to face up to the situation, to decide whether he would stay here, face it, and control himself, or, run home, knowing he would have to face up to himself sooner or later. He decided to stay at school, and he finished the day with no problem.

Dec. 17: "I enjoy this class very, one of the reasons is that it is different, another reason is that I like you and I get

along with you real well. One way this class is different is that you can say what you want to say. I like the case studies because there problems that most of us have . . .

It seemed the best way to reach this explosive young man was to allow him to get to know the teacher, on a one-to-one relationship. There were times when the student attempted to take advantage of this situation, but the teacher stood firm and told the boy whenever he was believed to be off limits. In late December, A--- told the teacher he would like to see him that evening. At their meeting A--- said he was thinking of running away from home and was wanting the teacher's advice and confidence. After listening to A---, the teacher suggested they both think about the situation and meet again in a couple of weeks. After several meetings, talking about life and responsibilities, A--- seemed to have changed his mind and decided to stay and complete his schooling.

"I see myself better, I am starting to understand different things I do and why I do them--and I understand other people better also.

I think this class has taught me more than any class I have ever had. . . .I've learned things that you can't put down on a report card, your friends know it, your teachers anybody closely related to you knows. And I think the things I've learned 1000 times more important than an A."

A--- progressed this year, but not without difficulties.

Example 10. Male, age 15. I.Q. 93. P.A. 2 to 10. S.A. 2 to 5. T.A. 2 to 5. Biology test, 97 to 92. This boy progressed in most all areas, particularly in sense of personal worth and school relations. J--- had been a source of irritation to both teachers and his parents. His Mother, remarried, came to talk with the teacher and reported that the boy's drumming at home was a source of irritation to his

stepfather. It seemed that the boy's only outlet and confidence was in his activity as drummer in a rock and roll band. The Mother reported that the student had begun to like his biology teacher. She seemed to have no particular reason for coming to the teacher except to discuss the problem at home with the boy. It seemed to be a case of paternal unacceptance and maternal over-protection. The Mother supported the boy later in the year when he was sent from school by the school administration for having long hair. Adult inconsistencies are difficult for troubled youth to understand. By J---'s request, the teacher discussed with him the difficulty, but necessity, of having to learn to cope with what seems to be adult dominance and inconsistency. J--- appeared to respond positively, particularly when the focus of the conversation was on his own responsibilities to himself. Patience and tolerance, as well as understanding of others, are difficult virtues for young, active people to learn.

## APPENDIX E

PRESENTATION AND ANALYSIS OF A QUESTIONNAIRE<sup>10</sup>  
USED IN DETERMINING DIFFERENCES BETWEEN THE  
EXPERIMENTAL AND CONTROL CLASSES

Presentation.-- This questionnaire was presented to the students and teachers of both classes, after completion of the study, in an attempt to distinguish their opinions as to possible differences and similarities of content and procedure of the two classes. Table XI shows a summary of the responses.

The questionnaire.--

Key: 1. always; 2. often; 3. about half of the time;  
4. seldom; 5. never.

- A. The teacher served as discussion leader and guide.
- B. There was interplay between all members of the class.
- C. The class dealt with facts, biological in nature.
- D. The class was teacher planned.
- E. The class dealt with dictated needs, (as opposed to pupil expressed needs, and a constant clarification of purpose).
- F. Members of the class were involved in individual and/or small group project studies.
- G. The learning process followed practice and reinforcement.
- H. Evaluation of student progress was by teacher, (as opposed to student-teacher).
- I. Individual pupil-teacher conferences were held.
- J. There was emphasis upon skills of reading and writing.
- K. Textbooks and reading materials pertaining to the subject were assigned and distributed to the students.
- L. Objective tests (e.g., true-false, multiple-choice, matching) were used as evaluation instruments.
- M. Subjective instruments (e.g. short essays) were used as evaluative tools.
- N. Films and other A-V materials were used.
- O. Teacher-parent conferences were held.
- P. Teacher-prepared biology work-sheets were used.

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<sup>10</sup>Referred to on p. 110.

- Q. Programmed materials were used.  
 R. Microscopes and other items of laboratory equipment were used by the students.  
 S. Teacher demonstrations were presented.  
 T. The teacher lectured.  
 U. Individual oral reports were presented by members of the class.

TABLE XI

SUMMARY OF RESPONSES TO QUESTIONNAIRE USED  
 IN DETERMINING DIFFERENCES BETWEEN  
 EXPERIMENTAL AND CONTROL CLASSES

Item of Questionnaire	Response		1. always	4. seldom
			2. often	5. never
		3. half of the time		
	<u>Control</u>		<u>Experimental</u>	
	Students	Teacher	Students	Teacher
A.	1.6	2.0	1.4	2.0
B.	3.0	3.0	2.5	2.0
C.	2.5	2.0	2.4	4.0
D.	2.4	2.0	2.8	3.0
E.	3.3	2.0	3.0	4.0
F.	4.0	4.0	2.9	2.0
G.	2.3	3.0	3.0	4.0
H.	2.0	4.0	3.1	3.0
I.	4.0	4.0	3.0	2.0
J.	2.6	2.0	4.3	5.0
K.	2.0	2.0	4.4	5.0
L.	2.6	2.0	2.3	5.0
M.	4.2	4.0	3.0	3.0
N.	1.7	2.0	2.0	2.0

TABLE XI--Continued

Item of Questionnaire	Response		Response	
	1. always	4. seldom	2. often	5. never
	3. half of the time			
	<u>Control</u>		<u>Experimental</u>	
	Students	Teacher	Students	Teacher
O.	5.0	4.0	5.0	4.0
P.	1.8	2.0	2.4	4.0
Q.	---	5.0	---	5.0
R.	3.3	4.0	3.3	3.0
S.	3.3	4.0	3.5	4.0
T.	2.5	3.0	2.1	4.0
U.	4.0	4.0	3.4	2.0

Analysis of response.-- No attempt was made to statistically treat this subjective data; however, based upon the responses of both students and teachers, the following class differences are probable:

1. In the experimental class there was more interplay between all members of the class (item B).
2. Members of the experimental class were more involved in individual and small group project studies (item F).
3. The learning process in the control class followed more closely practice and reinforcement schedules (item G).
4. Evaluation in the experimental class was more often by student-teacher than by teacher alone (item H).
5. Individual student-teacher conferences were more frequent

in the experimental class (item I).

6. There was much more emphasis in the control class upon skills of reading and writing (item J).

7. Textbooks and reading materials pertaining to the subject were assigned and distributed to students seldom to never in the experimental class, and often in the control class (item K).

8. Subjective instruments of evaluation were more frequent in the experimental class (item M).

9. Objective instruments of evaluation were more frequent in the control class (item L).

10. Teacher-prepared biology work-sheets were more frequently used in the control class (item P).

11. Individual oral reports were more frequent in the experimental class (item U).