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THE EFFECT OF REAL-LIFE PROBLEM-SOLVING

TRAINING UPON STUDENTS'

PROBLEM-SOLVING ABILITY

by

Larry D. Wilkinson

A Dissertation Submitted to
the Faculty of the Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

Greensboro
1976

Approved by

David E. Purpel

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APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of the Graduate School at the University of North Carolina at Greensboro.

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Date of Acceptance by Committee

WILKINSON, LARRY DALE. The Effect of Real-Life Problem-Solving Training upon Students' Problem Solving-Ability. (1976) Directed by: Dr. David E. Purpel. Pp. 321.

This study investigated the effect of real-life problem solving training upon high-school students' real-life problem solving ability, the level of their self concept, and their perception of the locus of control of their behavior. Also examined were sex and race differences, the relationship of real-life problem-solving ability with IQ, grade point average, and age, the effect of training upon school-related student behaviors, and students' evaluation of the training.

One hundred twenty-one high school students (65 females, 56 males, 94 whites, 27 blacks) enrolled in four classes participated in the study. Based on the Separate-Sample Pretest-Posttest Control Group Design (Campbell & Stanley, 1963), the four classes were randomly assigned to the treatment and control groups. Within each class students were randomly assigned to pretest and posttest sub-groups. Students were tested one time in either the pretest or posttest sub-group. The Otis Quick-Scoring Mental Ability Tests (1954), Tennessee Self Concept Scale (Fitts, 1965), A Locus of Control Scale for Children (Nowicki & Strickland, in press), The Problem Solving Competence Measure, and teacher and student questionnaires were used to collect data. Classes in the treatment group received two 50 minute training periods for ten consecutive school days on each of the five problem-solving stages: (a) general orientation, (b) problem definition, (c) generating alternative solutions, (d) decision making, and (e) solution testing.

Analysis of covariance on a three factor design (Treatment x Teacher x Test), each factor having two levels, was performed on the data associated with real-life problem-solving scores, locus of control, and self concept. The covariates were IQ, age, sex, race, and grade point average. A significant interaction occurred between the time of testing (pretest and posttest) and treatment (treatment and control) for the real-life problem-solving data. No significant interactions occurred with the locus of control or self concept data. Real-life problem-solving training increased the skills students used in the solution of real-life problems, but did not significantly change students' perception of the locus of control of their behavior, or the level of their self concept.

Analysis of covariance on a five factor design (Sex x Race x Treatment x Teacher x Test), each factor having two levels, was performed on the data associated with real-life problem-solving ability, sex and race. The covariates were IQ, grade point average, and age. No significant sex or race main effect differences or significant interactions occurred. Real-life problem-solving training had no differential effect on the problem-solving skills of female and male students or black and white students. There was no significant difference in the real-life problem-solving ability of female and male students, or black and white students.

Correlation coefficients were computed on students' pretest Grand Scores on The Problem Solving Competence Measure and IQ, grade point average, and age by the Pearson Product Moment technique. There was no relationship between the Grand Scores and IQ. There was no relationship between students' Grand Scores and age. A low to moderate positive relationship was observed between students' Grand Score and grade point average.

The majority of the students who received the training believed it was helping them respond to their personal problems. The majority indicated they were satisfied with the training as it had been presented, and made a few additional suggestions.

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The writer gratefully acknowledges the cooperation of the Administration of High Point Central High School, High Point, North Carolina, who permitted the study to be conducted, and the assistance of the participating students. Thanks are extended to the cooperating teachers, Mrs. Mary Lane and Mr. Paul Hutchins, and to Assistant Principal Mr. Kenneth Dickens who coordinated the study within the school curriculum.

For their love, encouragement and understanding the writer extends unreserved recognition to his wife, Ann, and children, Eric, Cindy, and Dale Ann who subjugated their claims on the writer's intentiveness during his studies at The University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

Background of the Problem

Once seen as simple advice giving from the experienced to the inexperienced, counseling as it is practiced in today's society is complex and many-faceted. This unique product of the American educational system has its roots deep in our democratic concern for the rights, dignity, and worth of the individual. Because of this, counseling is concerned with many things. The settings in which counselors work illustrate in some measure the degree of the diversity of its concerns. The predominant location is the public school (Shertzer & Stone, 1968). Historically, the secondary school has been the major location for the practice of counseling, but today counselors work in large number in elementary schools, junior colleges, colleges, universities, technical institute, hospitals, churches, mental health clinics, rehabilitation centers, welfare agencies, Youth Service Bureaus, and in private practice.

Beginning as a vocational guidance movement under the direction of Frank Parsons in Boston just after the turn of the century, counseling has seen its emphasis shift from a view of guidance as vocational assistance to a concern for the complete development of the individual (Van Hoose & Pietrofesa, 1970). In contrast to psychiatry which has concerned itself with such pathological conditions as personality disorders, psychoses, psychoneuroses, compulsions, obsession, and phobias--conditions of the mentally ill often requiring long-term depth-analysis in conjunction with medication--counseling has concerned itself with healthy persons who need assistance in becoming fully functioning persons, achieving personal identity, and solving problems (Shertzer & Stone, 1968).

How the above goals of counseling are to be achieved has given rise to a number of theories, models and approaches. Examination of the existing points of view operating within counseling today reveals great diversity. Patterson (1966) has grouped current theories into five categories on a continuum ranging from cognitive to affective as follows: Rational, Learning, Psychanalytic, Phenomenological and Existential.

Typically, individuals who seek the services of a counselor in whatever setting he may be working are not concerned about theory and viewpoint. Generally, they have a "real-life" problem which they cannot handle alone. They have sought the services of a counselor because they believe the counselor is more intelligent, and has more training and experience than they do in some particular area, and is capable of assisting them in solving their problem. The idea of directive intervention by the counselor to help the client replace the distress-causing behavior is stressed by Loveless and Brody (1974). They believe that a more relevant, parisimonious and effective approach to therapy can be created through active, problem-oriented, cognitive interactions between counselor and client. They contend that the effectiveness of all therapy forms may well be at least partly a function of cognition.

Writing from within the viewpoint of the cognitively oriented counseling approaches, Krumboltz (1966), in Revolution in Counseling, suggests that one technique open to the counselor to assist the counselee with a "real-life" problem is to teach the client how to solve the problem. If the client were willing to follow this procedure, Krumboltz (1966) suggests that the counselor might then help to define some specific steps for the client, i.e.,"(a) how to gather feasible alternatives for consideration, (b) how to gather relevant information about each alternative, (c) how to estimate his own chances of success with each alternative, (d) how to consider his own values and purposes in relation to various occupations under consideration, (e) how to deliberate and weigh the various values, possible outcomes and facts in relation to each alternative and (f) how to formulate a tentative plan of action subject to new developments and new opportunities" (p. 12). "The goal," Krumboltz (1966) states, "is learning to use this sequence of problem-solving steps in solution of personal, educational and vocational decisions" (p. 12).

The literature relevant to cognitive training in problem-solving procedures reveals that the problem-solving process can be divided into several stages or sets of cognitive operations similar to those suggested by Krumboltz. While authors representing various theoretical positions differ concerning specific details of their respective problem-solving models, the basic operations in all cases are the same (Davis, 1966, 1973; Goldfried & D'Zurilla, 1972). Although studies have shown that there are wide differences among individuals in the manner in which they actually go about problem-solving, there is a consistency among various theorists and investigators working in different areas regarding general kinds of operations involved in effective problem solving. When minor variations in wording and categorization are set aside, the following five general stages come nearer to representing a consensus viewpoint: (a) a general orientation or problem-solving "set" which the individual brings to a problem through a combination of all previous experiences, (b) problem definition and formulation, (c) generation of alternatives, (d) decision making, evaluation, and selection, and (e) testing of the solution (Goldfried & D'Zurilla, 1972). Goldfried and D'Zurilla (1972) concluded from their review of the real-life problem-solving literature that training in effective problem solving must include training in these five different steps or stages.

Loupe (1972) working with college sophomores tested the feasibility of teaching behavior patterns basically the same as the above stages to students in dissimilar situations to improve their problem-solving ability. The resulting differences between experimental and control groups suggest that problem-solving training does facilitate problem-solving ability. Some support was given in this study that training in general problem-solving stages results in students being able to better solve problems in dissimilar situations.

Goldfried and D'Zurilla (1972) have suggested that training in effective problem solving must include training in the five consensus stages of problem-solving. Loupe (1972) has shown in a limited study that training in general problem solving stages does improve students' ability to solve problems in dissimilar situations. What implications does this finding have for the role of counseling? It has been stated that one of the goals of counseling is to assist persons in solving their problems (Shertzer & Stone, 1968). The stages of problem-solving have been identified (Davis, 1966, 1973; Goldfried & D'Zurilla, 1972). The cognitively oriented counseling approaches advocate having the counselor teach the client a technique for solving his immediate problem, believing these skills will assist him in better solving his future problems (Krumboltz, 1966). And, it has been shown that problem-solving skill training does facilitate problem solving (Loupe, 1972). In light of the above statements one would imagine that many innovative problem-solving training courses would be in operation in a variety of settings. Counseling like all the helping professions emphasizes prevention (Shertzer & Stone, 1968). Each one knows that care and treatment are not enough, that causes must be uncovered and knowledge imparted to assist people in dealing with immediate and future problems. It is generally accepted that the counselor does have a responsibility to society in general that goes beyond the dyad or group counseling session (Lipsman, 1969).

A review of the "real-life" problem-solving literature reveals a dearth of training programs and empirical research. Covington, Crutchfield, and Davies (1966) have developed a program for training children in real-life problem solving skills; and Parnes (Parnes & Noller, 1973) with The Creative Studies Project at State University College at Buffalo, and Goldfried and D'Zurilla (1972) at the

State University of New York at Stony Brook have pioneered problem-solving training for college students. Currently there appears to be no definitive real-life problem-solving training program or studies with high school students.

The apparent neglect of problem-solving training for high school studentsappears to be in direct contrast to the needs of high school students and the wishes of their parents. Anyone closely associated with students in the public school system is aware that today's high school students are confronted with many problems. Adolescence, that transition period between childhood and adulthood, has traditionally been viewed as a period permeated with problems. Teenagers responding to questionnaires through the years have said that they were most concerned with the problems associated with: changes in physical development, such as breast size, body size and skin conditions; impersonal relationships such as friendships and popularity; school activities, such as homework, grades and study habits; family situations; relationships with the opposite sex including dating, petting and other sexual behavior (Shertzer & Stone, 1971). Add to these such forces at work in our rapidly changing American society as automation, advances in science, the advancement of civil rights, increased technology, increased specialization and job shortages, and the conclusion can be reached that growing up in a complex and competitive world, advancing in education and undertaking autonomous responsibility does impose great demands upnn youth which often create problems for them. Every generation believes the problems it faces are the worst that history has ever known. Even a casual observation of today's contemporary scene would tend to confirm this consistent negative contention.

The problems of the youth of today can also be reflected in the concerns of parents, teachers, counselors and school administrators. Shertzer and Stone (1971) cite six major problems associated with the problems of today's youth:

1. Dropouts continue to be a major concern even though the number is smaller than ever before. The magnitude of the problem is realized when statistics state that almost one million youth drop out of school each year.

2. Of all the problems in our youth culture, few evoke more misery or remorse than pregnancies among unmarried high school girls. Each year some 84,000 unmarried teenage girls bear a child according to a report cited from the Department of Health, Education and Welfare.

3. Youthful marriage is another problem. High school marriages continue on a rapid increase and pose not only a major social, legal and educational challenge to our country, but also forecast future grim economic problems.

4. Recent increase in juvenile crime points to another problem area. School personnel are in a strategic position to help the delinquent-prone find more positive directions for themselves.

5. Youth unemployment is another problematic area. School programs closely integrated with the tasks and training requisites of the work world appear to be crucial.

6. Designing appropriate educational programs is another problem that confronts educators. How can a program be designed that

fits the diversity of pupil interests and needs? Shertzer and Stone (1971) believe that the school's responsibility is to design a program and provide services that will enable students to learn to live in the world in such a way that they will leave a constructive mark upon it.

There are other problems. Drug and alcohol usage is an increasing problem for all levels and at all ages in our society. Americans have used and depend upon a broad array of chemical substances to allay anxiety and insecurity stemming from the pressures of contemporary life.

Much has been said and written about the sexual revolution. Mace (1970) states that the revolution is over. The revolution has created problems for youth who attempt to understand it and adjust to it.

Now that full racial integration has become a reality, students from racial minorities struggling for their place in society will experience personal dilemmas as the problems of human relations intensity. Many adjustments will need to be made in this area.

This description of contemporary adolescent culture is by no means complete. It is enough though to indicate that students in this age-span do have real-life problems and the need to acquire skills to deal with them creatively.

Sensing student needs, parents have stressed the need for training programs which teach problem solving skills. Parents in a nationwide Gallup survey, asked to rate the importance of some 48 possible goals of public school education, gave a particularly high rating to the "ability to figure things out for oneself" as contrasted with relatively low ratings for such things as the traditional educational goals (Olton & Crutchfield, 1969). A similar note was sounded by a blue-ribbon citizens committee in California which made the following recommendation to that state's Board of Education: Let the schools concentrate on the heart of the matter, which is training pupils to think for themselves. Education should center around the ability to solve problems (Olton & Crutchfield, 1969).

It seems clear that the kind of problem-solving which these educators and parents are talking about is not that of the cut-and-dried arithmetic problem or the exercise in formal logic. Their concern is with the kind of problem-solving which requires the individual to do independent thinking and to strive to achieve his own solutions to complex problems. The problems in question are "real-life problems" encountered daily by individual students.

Common sense tells us that individuals and society in general must find solutions to the problems that confront them if they are to survive. Skinner, (1974) in About Behaviorism, reminds us that man's problem-solving skills, strategies, and insights have their origins in two sources. They come from the raw contingencies to which we are exposed and from what others have learned and transmitted to us through culture.

Considering the alternative sources of problem-solving strategy, one must question the advisability of leaving the acquisition of problem-solving insights to the trial and error method used in the face of raw contingencies. This alternative appears to have serious limitations. Knowing something of the magnitude and complexities of the problems encountered by society in general and individuals in particular, one wonders if we have enough time to follow this approach. Will these problems wait for solutions gained through the trial and error approach? How much can one individual learn in a life time? Skinner (1974) believes that the answer is "not much" (p. 111).

The magnitude and the urgency of our "real-life problems" suggest that the better alternative is that of transmitting the problem-solving strategies and stages others have learned through instruction. Skinner (1974) suggests that "solving a problem is more than emitting the response which is the solution: it is a matter of taking steps to make that response more probable" (p. 111).

A number of factors suggests that it would be useful for the counselor to initiate a real-life problem-solving training program in order to make the solution of students' problems more probable. One factor is the magnitude of the real-life problems encountered by high school students during their adolescent years. A second factor is the wishes of parents. The parents of high school students have requested that such a program be implemented in the public school to help students learn how to solve their real-life problems, believing that they should not be left to learn how to deal with such problems by trial and error. Another factor is that such a training program would be consistent with the goals and responsibilities of counselors.

In addition to the above factors, counseling is concerned with research and its implications for the profession. Research has given support to the position that training in general problem-solving skills result in persons being able to better solve problems in diverse situations; however, there is much to be learned about real-life problem solving. Some of the characteristics of the problem-solver have been identified, but what are the characteristics of the real-life problem solver? The performance of individuals on intelligence tests has typically been found to be positively related to problem-solving efficiency (Bourne, Ekstrand & Dominowski, 1971). In recent years, measures have been developed to measure the way persons perceive the control of their destinies or fate. This measure known as "locus of control" referred to the degree to which individuals perceive the events in their lives as being a consequence of their own actions and thereby controllable (internal control), or as being unrelated to their own behaviors, and therefore beyond personal control (external) (Lefcourt, 1972). Baugh (1973) investigated problem solving by internally oriented and externally oriented subjects and found that on the basis of the number of successful solutions, internals were more successful than externals. Self-concept is another variable studied for its relationship to problem-solving ability. Carey (1958) noted an attitudinal difference between males and females which had an influence on their problem-solving ability. Before and after participating in a discussion, the disguised intent of which was the promotion of a more favorable attitude toward problem-solving, subjects were administered problem sets and a scale designed to measure their attitudes toward problem solving. The initial results indicated that men had more favorable attitudes toward problem solving than women. Following discussion, women performed better on the second problem set than on the first while the male performance was basically unchanged.

The relationship of sex difference and problem-solving ability has also been investigated. Maccoby and Jacklin (1974) report that "results reported in studies that investigated sex differences in relation to problem solving ability are equivocal." "No simple general statement can be made about sex differences in problem-solving efficiency; furthermore, when differences are observed, they seem difficult to explain in terms of differences in abilities related to reaching a solution"(Bourne, Ekstrand & Dominowski, 1971, p. 100).

Before a training program in real-life problem solving can be established in the public schools on a permanent basis many questions remain to be answered. Can a real-life problem-solving training program be accomplished in the public high school? How much time will it take from the traditional curriculum? What kind of teacher is needed to conduct such a program? What should comprise the problem-solving curriculum used with high school students? Will high school students respond favorably to such a training program? What are the variables associated with real-life problem-solving ability? This research was undertaken to attempt to respond to some of the questions raised above. While the study is not an exhaustive one, the goal is to make a contribution to the existing knowledge on education for real-life problem solving. A few limited programs have been initiated with elementary children and college students, but there appears to be no research data available with high school students as participants. It is this writer's opinion that real-life problem-solving skills should be taught in the public school as a part of the curriculum. If such a problem-solving training program were undertaken in a typical high school room by a responsible teacher with representative high school students, it should enhance their real-life problem-solving skills.

Statement of the Problem

This study provided high school students with short-term, real-life, problem-solving training within the context of a typical class room setting. The main thrust of the instruction was training in the five steps or stages of the consensus view of problem solving. First, there was training to develop an appropriate problem-orientation or "set." Training in problem definition and formulation was the second step or stage of instruction. Teaching students to generate alternative solutions to their problems was the third stage of instruction. Decision making--evaluating solutions and selecting the best one--was taught in the fourth stage. The fifth stage of instruction was training in testing the effectiveness of the solution chosen. The unique contribution of the study was short-term instruction to high school students in a school setting in the use of the problem-solving stages to solve their real-life problems.

The following specific questions were examined:

1. Will students who have received training in real-life problem solving during a two-week period show greater problem-solving skill than students who have not received this training?

2. Will students who have received training in real-life problem solving during a two-week period show greater problem-solving skill in response to their personal problems than students who have not received this training?

3. Will students who have received training in real-life problem solving during a two-week period be more internal in locus of control than students who have not received this training?

4. Will students who have received training in real-life problem solving during a two-week period be more positive in their self-concept than students who have not received this training?

5. Is there any significant difference in the real-life problem-solving ability of female and male students?

6. Is students' real-life problem-solving ability positively and significantly related to measures of intelligence?

7. Is student's real-life problem-solving ability positively and significantly related to students' grade point average?

8. Will real-life problem-solving training have an observable influence on students' behavior in such areas as: study initiative, improved self-concept, and problem solving related to curriculum and student life?

9. Will students find that real-life problem-solving training was helpful for their personal lives?

Hypotheses

The following null hypotheses were used to answer the first seven research questions:

1. There will be no differential increase in the grand problem-solving score between pre and post testing for the treatment and control groups. This null hypothesis was tested by the interaction of treatment and time of testing variables in a three factor analysis of covariance.

2. There will be no differential increase in the grand personal problem-solving score between pre and post testing for the treatment and control groups. This null hypothesis was tested by the interaction of treatment and time of testing in a three factor analysis of covariance.

3. There will be no differential change in the locus of control score between the pre and post testing for the treatment and control groups. This null hypothesis was tested by the interaction of treatment and time of testing in a three factor analysis of covariance.

4. There will be no differential change in the self concept score between the pre and post testing for the treatment and control groups. This null hypothesis was tested by the interaction of treatment and time of testing in a three factor analysis of covariance.

5. There will be no differential increase in the grand problem solving score of the male and female students between the pre and post testing for the treatment and control groups. This null hypothesis was tested by the interaction of treatment and time of testing for female and male students in a five factor analysis of covariance.

6. The correlation coefficient for the relationship between students' grand problem solving scores and IQ's will be .00. This null hypothesis was tested by computing the relationship between students' pretest grand problem solving score and IQ's with the Pearson Product Moment Correlation technique.

7. The correlation coefficient for the relationship between students' grand problem solving scores and grade point averages will be .00. This null hypothesis was tested by computing the relationship

between the students' pretest grand problem solving scores and grade point averages with the Pearson Product Moment technique.

Significance of the Problem

The significance of this research proposal can be viewed from several perspectives. The most important consideration must be that of the client or student with a real-life problem or potential real-life problem. The high school student is in a transitional stage and consequently encounters many real-life problems. The inability to respond effectively to the real-life problematic situations encountered in daily living is often disruptive to an individual's personal and social functioning. This inability, along with its personal and social consequences, often provides the necessary and sufficient conditions for an emotional or behavioral disorder requiring counseling or psychological treatment. If instruction in the use of problem-solving steps enables a person to make an adequate response to a problematic situation so that it is no longer problematic or disruptive, the person is freed to become a more fully functioning member of society. Making decisions and solving problems by individuals is the single means whereby a person asserts personal responsibility for his own behavior (Cassel, 1973). Without the ability to make effective responses in the face of problematic situations, an individual's behavior is marked by frustrations, discomforts and disequilibrium.

Training in real-life problem solving has more than short-term significance. This technique could enable counselors to prevent misery, suffering, waste and discouragement. If a person acquires a problem-solving pattern as a part of his cognitive skills, he has a way of approaching new situations which are often accompanied by diverse problems. Many of the problematic situations encountered daily would be less tension producing because the individual would know the procedures for making appropriate responses. Teaching problem-solving stages could prevent or reduce the need for professional assistance. Once the individual masters the procedures for problem solving, he has the potential of functioning as his own therapist.

A second reason for teaching students problem-solving skills is its compatibility with the emphases of the new counseling approaches which focus upon the present and encourage the individual to assume the responsibility for his own actions. Finding the reasons for his current problems in some unconscious and resolved conflict in the past does not necessarily aid the individual to solve his current real-life problem. Some therapists (Glasser, 1966) contend that the emphasis upon insight into the origin of unresolved real-life problems gives the client an excuse for not accepting the responsibility for solving his problem and prevents the individual from working in the present and planning for the future.

The technique of teaching individuals a problem-solving pattern is more compatible with the training and approach of some counselors than are the more extended techniques of depth psychoanalysis. This approach allows the counselor to become personally involved with the client as a real person rather than a transference figure out of the individual's past. By contrasting the technique of teaching clients a problem-solving pattern to use with real-life problems with the procedures of the more conventional approaches, the author is not suggesting the abandonment of such approaches. However, an alternative approach is suggested. The more classical methods of psychoanalysis require years of study and clinical training and may involve the clients in years of therapy. This does not appear to be the case of the skills requiring to teach a client how to use the problem-solving steps in responding to real-life problems. Further, the suggested training procedures appear to be applicable in a variety of settings such as a class led by a school counselor, a T-group, or the counselor-client dyad.

While teaching students problem-solving skills is consistent with the emphases of the newer approaches of counseling, it also has application in broad counseling areas. Most of the counseling techniques or approaches are not independently organized as a unitary phenomenon, but rate typically used in conjunction with one or more of the rather well organized and defined approaches, i.e., rational-emotive psychotherapy, client-centered, behavior modification, existential, etc. Teaching persons problem-solving stages does not serve as a panacea for problems faced in helping relationships, any more than any other approach to counseling. Rather it is a technique or procedure which a counselor can use within the context of his previous training.

Due to the dearth of problem-solving training program and studies to support the effectiveness of real-life problem-solving training this study has the potential for beginning to respond to some of the questions raised in conjunction with such a program: Can real-life problem-solving training be effectively conducted in the public high school? How much time is needed? Is training in the problem-solving stages an adequate curriculum? Will students find real-life problem solving training helpful for their personal lives? What are some of the characteristics of an effective real-life problem solver? Is teaching students real-life problem-solving procedures an appropriate function for the cognitively oriented approach to counseling? If such procedures do not increase the probability of a more effective response from students in the face of their real-life problems, one questions the emphasis on teaching such skills as a counselor function. While there is some success with problem-solving training with children and college students it is not known if it will be effective with high school students. Covington, Crutchfield, and Davies (1966) have had some success in training children real-life problem-solving skills, while Parnes (Parnes & Noller, 1973), Goldfried and D'Zurilla (1972), and Loupe (1972) have indicated success with college students. This study inquires into the effectiveness of real-life problem-solving training for high school students.

The aim of education is to insure the optimal level of development of the student and to insure that ultimately every student will reach a mature level of thought and action. Learning problem-solving techniques is not the sufficient ingredient, but rather it appears to be an indispensable step twoards the achievement of the other educational goals. This research proposal suggests a possible strategy and technique to assist the school and counselor in the total development of the individual. The possession of problem-solving skills will better equip a person to cope with the problems of the present and the unknown ones of the future. These are the kinds of skills which enable a person to deal intelligently and effectively with his own problems and opportunities, and which will provide him with an increasing sense of enjoyment in the use of his mind. It is this kind of thinking which today's student needs.

Assumptions and Limitations

This study was limited because it dealt with only one small segment of a large student population, specifically students in sociology classes in the tenth, eleventh and twelfth grades in one of two high schools in High Point, North Carolina. Like those in many educational studies, the subjects were a sample of convenience. It was financially and physically impossible to investigate what effect the teaching of problem-solving skills has on the problem-solving ability of all students, even in one high school. Since the subjects were only those currently enrolled in high school, the study did not deal with individuals of high school age who have dropped out of school, nor was it concerned with individuals who may be in other institutions such as those for the emotionally disturbed or correctional institutions. Such physical limitations as those described above prevented the researcher from using a random sample; thus generalizations cannot be made about populations which are dissimilar from the study sample.

The fact that the study utilized volunteer subjects presents a further limitation on generalizations resulting from the study. The results may be applied to and have significance only for similar populations volunteering for real-life problem-solving training.

The measurement of student's real-life problem solving ability was another limitation of the study. Only four scoring criteria were used to assess students' real-life problem-solving ability. What other scoring criteria would have been appropriate? At the moment we can only measure variables related to problem-solving in much the same way that we can estimate intelligence by measuring related variables, i.e., verbal skills, numerical ability, spatial relations, etc. All of the variables related to real-life problem solving are not identified or utilized in the study.

This study was concerned with the effect of real-life problem-solving training conducted over a two week period. Generalizations cannot be made for shorter or longer training periods. Since measurements were taken immediately after the conclusion of instruction, no generalization can be made on the long-term effectiveness of the training experience.

Definition of Terms

Problem. The term problem refers here to a specific situation or a combination of related situations which require a response from individuals in order to operate effectively in his environment. It is a psychological state of discomfort or disequilibrium sensed by the individual (Dewey, 1938). An individual is considered functioning or operating effectively in his environment when he has the ability to chose a course of action and take the appropriate steps to bring it to pass. A problem situation is one in which "(a) a person is trying to attain some goal, (b) his initial attempts fail to accomplish this end, and (c) at least two, and commonly a large number of alternative courses of action are possible" (Bourne, Ekstrand & Dominowski, 1971, p. 41). A situation is considered to be problematic if there is no satisfactory response immediately available to the individual confronted by the situation (Davis, 1966 & Skinner, 1953). Goldfried and D'Zurilla (1972) define a problematic situation as all those situations, "which by virtue of their novel aspects, complexities, ambiguities, or conflicting demands, present circumstances" that involve at least a temporary inability to respond effectively. Problematic situations include both external and internal cues resulting from personal reactions, including the individual's thoughts and emotional responses.

Problem Solving. Problem solving is a process "which makes available a variety of potentially effective response alternatives for dealing with a problematic situation and increases the probability of selecting the most effective response from among these various alternatives" (Goldfried & D'Zurilla, 1972, p. 73). Skinner (1974) states, "solving a problem is more than emitting the response which is the solution; it is a matter of taking steps to make the response more probable" (p. 111). Activities such as training in (a) the development of a problem-solving orientation, (b) problem definition, (c) generation of alternative solutions, (d) decision making, and (e) testing a proposed solution, may be viewed as taking the steps to make the response more probable.

Solution. A solution "is a response or pattern of responses which effectively alters the situation so that it is no longer problematic to the individual and at the same time maximizes other positive consequences and minimizes other negative ones" (Goldfried & D'Zurilla, 1972, p. 73). A solution occurs when the psychological state of discomfort and disequilibrium sensed by the individual fades. As presented in this study there is distinction between problem solving and carrying out a solution. "Problem solving" refers to a process or procedure by which the individual attempts to discover a solution to a problem. The problem-solving task is "one of learning to combine previously-acquired responses in a novel way so as to produce a new response or response pattern" (Goldfried & D'Zurilla, 1972, p. 74). "Carrying out a solution" on the other hand refers to an individual performing the response. In practice, individuals may solve a problem cognitively, but fail to execute the chosen response.

Locus of Control. Locus of control is a construct used in conjunction with social learning theory. "It refers to the degree to which individuals perceive the events of their lives as being a consequence of their own actions, and thereby controllable (internal control), or by some fate or force beyond his control (external control)" (Lefcourt, 1972, p. 3). The concept can be viewed as existing on a continuum from internal control on the one end and external control on the other. The internal individual perceives himself to be in complete control and mastery of his destiny and everything connected with it. On the other hand, the externally controlled individual perceives that he has no control over his destiny, but is rather controlled by fate and other external forces operating upon him externally.

Self Concept. Self concept is a term used to indicate how an individual feels about himself. Fitts (1965) has suggested that self concept to the total perception the individual has of himself in reference to: (a) Identity--what the individual is as he sees himself, (b) Self-satisfaction--how he feels about the individual he perceives, (c) Behavior --how the individual perceives his behavior, (d) Physical Self--how the individual views his body, physical health and general appearance, (e) Moral-Ethical-Self--how the individual perceives himself in reference to moral codes, (f) Personal Self--how the individual perceives his worth apart from his body, (g) Family Self--how the individual perceives his worth and value as a family member, and (h) Social Self--how the individual perceives his worth in relationship with other people.

CHAPTER II

RELEVANT STUDIES IN REAL-LIFE PROBLEM SOLVING

It is the purpose of this chapter to review the problem-solving research and theoretical literature which seem to have relevance for problem-solving in "real-life" situations and which suggest possible training or therapeutic procedures which may be employed to facilitate effective problem solving. Attention will be given to those insights gained from the general body of problem-solving literature which have direct application to "real-life" problem solving.

Views of Problem Solving

"Real-life" problem-solving is set within the general theoretical constructs described in the problem-solving literature. A number of theories exist on the nature of problem solving. One approach to problem solving is seen as perceptual reorganization (Bourne, Ekstrand, & Dominowski, 1971, p. 42). Gestalt psychology proposed the idea that people have problems because the requirements of some situations are incorrectly perceived. Before a solution can be achieved, there must be a change in the way an individual perceives the problem. As applied to problem-solving, perception may "refer to the organization of stimulus elements into some pattern," or in a general sense it may "refer to an awareness of some attribute of an object or situation, rather than to organization of the stimulus pattern of an object." Within this theory relationships among objects are emphasized and perception appears similar to "realizing or understanding."

A second view of problem solving is described as "Associative Arousal" (Broune, Ekstrand, & Dominowski, 1971, p. 42). Within this view problems exist because individuals' previous learning produces interference in new situations. The individual's previous experience has resulted in the "confirming of inappropriate behavior tendencies." The key to understanding the associative arousal view of problem solving is the response hierarchy. "At the simplest level this concept refers to the idea that a stimulus is associated with a number of responses and that the strength of the association varies." Responses are arranged in terms of their force or strength, thus forming a hierarchy. This viewpoint suggests that a problem exists "when the strongest of the responses is incorrect." A solution is found by the "arousal of successive responses in the hierarchy until the correct response is elicited."

A third view of problem solving has been described as a "Search Process" (Bourne, Ekstrand, & Dominowski, 1971, p. 42). "A problem exists when a person is faced with the task of choosing one alternative from a number of possible alternatives." Here the emphasis is placed on the "process of searching among the alternatives and evaluating them with respect to the solution requirements." This view places emphasis on the strategies used to limit the search in efficient ways. "The characterization of problem solving as a search process results in the attempt to discover the various strategies that problem solvers might use in selecting and evaluating alternative approaches to the solution."

In addition to these three views of problem solving, there is the position of behaviorism which is said to embrace a motor theory of thinking and problem solving, where the important activities are muscular, rather than a cognitive theory (Bourne, Ekstrand, & Dominowski, 1971). Davis (1973) reviewing problem-solving literature suggests that the behaviorist approach to problem-solving is limited in its usefulness for problem-solving training. Davis believes that in the effort to gain simplicity by dissecting human thinking and problem solving into the theoretical language of simple condition responses too much conscious and deliberate mental activity is ignored.

This review of problem solving is limited to the cognitive view of problem solving. It is concerned with behavior which takes place on a conscious level. The focus it takes is on the individual who is a healthy, aware, thinking, reasoning organism. Within the cognitive approach to problem solving, this review is concerned specifically with that portion of the literature which describes "real-life" problems and programs for their solution. From a cognitive view of problem solving, a problem by its nature disturbs the equilibrium of the person. Solving the problem results in removing the disturbance and restoring the balance. This is a matter of achieving "insight," a construct known as cognitive restructuring, perceptual reorganization, illumination or recentering (Davis, 1973). The "cognitive" theorist is attempting to explain human behavior in its everyday, conscious and strategic purposiveness. Davis (1973) notes that the theoretical language of the "cognitive" theorist reflects his phenomenological level of study: "the organism perceives, thinks about, and analyzes his environment; he forms tenable hypotheses, tries plausible leads, follows rules, reasons, encodes, deduces, and makes predictions and calculated guesses" (p. 29).

Characteristics of the Problem Solver

One relevant question that comes to mind in such a review centers around the characteristics of the problem solver that are related to problem-solving efficiency. Bourne, Ekstrand and Dominowski (1971) in their review of the empirical studies on problem solving report that individual differences in problem-solving efficiency are likely to be related "to differences in relevant knowledge, skills involved in formulating a problem, search, strategies, etc" (p. 98). The information available is imprecise, and many of the relationships described in the literature are of little value in understanding the solution process.

The performance of individuals on intelligence tests has typically been found to have a positive relationship to problem-solving efficiency. Citing the empirical work of Mendelsohn, Griswold, and Anderson (1966) and French (1958), Bourne, Ekstrand and Dominowski (1971) report that subjects who score higher on IQ tests also perform better on anagrams, and on lights-and-switches problems. They also cited a study by Maltzman, Eisman, and Brooks, (1956) which indicated that subjects with higher test scores solved problems more efficiently. Since measures of intelligence consider a number of behaviors like those used in problem solving, it is not surprising that there should be a positive relationship between the IQ scores and problem-solving ability.

Raaheim and Kaufmann (1974) presented 15-16 year old male and female subjects with five different problem situations as a writing task and found a clear relationship between success on the problem scores and general intelligence scores for the males but not the females. Fewer solutions were found among females and their IQ was not closely related to problem-solving behavior. These results are inconclusive since masculine-oriented tools were used in the study.

It is clear that no simple general statement can be made about sex differences in problem-solving efficiency; furthermore, when differences are observed, they seem difficult to explain in terms of differences in abilities related to reaching a solution (Bourne, Ekstrand, & Dominowski, 1971). Maccoby and Jacklin (1974) report that "the results of studies that investigate sex difference in relation to problem-solving abilities are equivocal." "Boys and men do perform better than girls and women on tests of field independence in many studies, but by no means all; the sex difference does not emerge consistently until the beginning of adolescence" (p. 105). "On some verbal tasks calling for restructuring (e.g., anagrams) females do very well and it is tempting to conclude that males are superior only on set-breaking tests that are visual spatial" (p. 105). The authors further report that on early studies, men appear to have an advantage on most of the Dunker and Luchins-jar kind of problems, whether their problems are stated verbally or not. There are enough instances reported however, in which the sexes do not differ. Maccoby and Jacklin (1974, p. 108) were unable to locate studies made since 1966 in which subjects of high school or older were used, however "the evidence from earlier work that the sexes do not differ on such measures as the reasoning subtest of the Primary Mental Abilities Test" reflects that girls and women are at least as able as boys and men to generate a variety of hypotheses and produce unusual ideas.

Where differences in problem-solving ability have been reported, the reasons are clearly defined. One interesting proposal is based on the idea that solving a problem is associated with a masculine role in our culture. If this is true, then females might expect that being females they probably won't do well on a problem and consequently they perform relatively poorly. Milton (1957, 1959) reports that for both female and male subjects, problem-solving efficiency was directly related to the degree of masculine role identification. His results also indicated that when male and females were compared with equal degrees of identification with the masculine role, the two sexes would perform equally as well.

Another variable Bourne, Ekstrand and Dominowski (1971) correlated with problem solving ability is age difference. The work of Birren, Jerome and Chown (1961) and Weir (1967) indicate that "problem solving efficiency appears to improve with age through adulthood subsequently to deteriorate" (p. 99). This seems consistent with Wechsler's (1958) report that age changes on measures of intelligence vary from one part of the test to another with considerable degree.

One characteristic of the problem solver which may influence problem-solving efficiency is the way a person perceives his control of his destiny or fate. In recent years, measures have been developed for the "locus of control," and persons may be characterized on whether they normally feel that the events affecting them are the results of luck or chance or whether they feel that they can control their own lives. The "locus of control" construct is an integral part of social learning theory (Rotter, 1954). "It refers to the degree to which individuals perceive the events in their lives as being a consequence of their own actions and thereby controllable (internal control), or as being unrelated to their own behaviors, and therefore beyond personal control (external control)" (Lefcourt, 1972, p. 3).

Maccoby and Jacklin (1974, p. 157) report that "the sexes do not differ consistently on locus of control scales through the grade school and high school years, but in college there is a trend for women to be externalizers." That is, they believe their accomplishments are the result of factors other than the result of their initiative. These authors contend that "the greater power of the male to control his destiny is part of the cultural stereotype of maleness, and is inherent in the images of the two sexes protrayed on television and in print." They cite a study by Jacklin and Mischel (1973) of stories in elementary school textbooks which found that when male characters in story books experienced good things, they came through their own actions and initiative. The good things that happened to female characters did not come from their actions, but from the actions of others, or simply from the particular situation or environment. One question remains unanswered: "Why it is, if males and females have equally good intellectual potential and the two sexes are similar in their achievement motivation throughout the school years, that female achievement in other spheres than the domestic one should drop off so sharply in the years after they have finished their formal schooling" (p. 162)?

During the college years sex differences do occur as women become more external in their locus on control. They "have less confidence than men in their ability to perform well on a variety of tasks assigned to them; they have less sense of being able to control the events that affect them, and they tend to define themselves in social terms" (Maccoby & Jacklin, 1974, p. 162). No research is available to explain why this phenomenon has not been seen among older or younger women. From the age of late teens to early twenties, young adults have traditionally married and established some type of lasting sexual relationships. Our culture has traditionally expected females to take less initiative in the courtship games and rituals than males. Maccoby and Jacklin (1974) believe that it is during this courtship period more than any other that individuals define themselves in terms of their "masculinity" and "feminity."

Phares (1968) in a study comparing internals and externals in their tendencies to use information for decision-making (one stage of problem solving) reports that the locus of control of individuals influences the way persons utilize information in problem solving. In the study 10 pieces of information on all subjects was learned to errorless recall for four males by all subjects. One week later the subjects were instructed to guess which of the eight girls and which of the 10 occupations were acceptable for the four men. Financial rewards were offered for correct matchings, and subjects had to list reasons for each of their matchings. Measurement of the information utilization was made by summing the total number of correct reasons given for the matches made. The internals gave more reasons and more correct reasons than externals. From this Phares concluded that the internally controlled are more likely to make use of information that externally controlled were equally aware of. Baugh (1973) investigated problem solving by internally oriented and externally oriented subjects and found that on the basis of the number of successful solutions, internals were more successful than externals.

Lefcourt (1972) reports that the research regarding cognitive activity and locus of control lends some support to the contention that persons with internal control expectancies tend to be more cognitively active than those with external control expectancies. Internals seem to be more certain about what is important to them and show more eagerness to gain information that would help increase their chances for success experiences. In those tasks involving skills where control was possible, internals took more time to deliberate about decisions and were more cautious than externals. On the other hand, externals were more involved in chance tasks, utilizing time and effort at decisions which were of little concern to the internals.

"Many writers have advanced the position that an internal locus of control, with its assumed correlates of competence and hope of success is a common goal of psychotherapy" (Lefcourt, 1972, p. 27). Such a goal is compatible with the expectations of persons who seek help from counselers with real-life problems as well as the general purpose of public instruction. The internals are in better control of their individual situation. If a person's equilibrium is disrupted because of real-life problems or troublesome circumstances, then an external locus of control is a decided obstacle, and therefore a target of change. A small number of studies have been published which focus upon locus of control changes occurring as a result of natural events, and others as a result of some deliberate effort such as psychotherapy. Penk (1969) reports that age change alone has been found to influence internal-external scores, older children being more internal than younger children. Kiehlbauch (1968) working with reformatory inmates suggests that uncertainty, with its implicit challenge to one's coping ability, can increase a person's sense of external control. Gorman (1968) measured internal-external control on youthful supporters of McCarthy the day after the 1968 Democratic Party convention and found they were more external than Rotter's norms for university students, suggesting a sharp decline in their optimism and belief in control. McArthur (1970) reported that students who became less probable draft candidates as a result of the draft lottery were significantly more external on the internal-external scale than those whose destinies were unchanged by the drawing. He concluded unexpected good fortune makes the dependence upon fate less unacceptable. However, Kaplan (1972) reports that data collected on 55 male undergraduates failed to replicate McArthur's study. Rather than showing a high external pattern, the opposite was found.

Some studies in a therapeutic setting have investigated the effects of therapeutic procedures upon locus of control. Smith (1970) compared internal-external scores of clinic subjects who requested assistance in resolving crisis with those intending to become engaged in long-term psychotherapy. Crisis clients are typically persons who are suffering from extreme uncertainties that have developed after some unforeseen changes in their lives. Within five weeks of receiving therapy designed to help clients achieve more effective coping techniques, crisis clients reported a significant decrease in externality, while regular therapy cases remained at the same level with an equivalent number of therapy sessions. This process of active coping with problems creating greater internality has been reported in another therapy study by Dua (1970). The effects of action-oriented therapy were contrasted with those of a reeducative therapy which was aimed at improving interpersonal skills on the level of the locus of control. The activity of the action-oriented therapy centered around planning specific behaviors for improving relationships with particular persons. At the same time the reeducating therapy took as its goal influencing the individual's attitude toward these persons. Dua found that the more action-oriented approach which planned specific behavior patterns produced the most change in the direction of internal control. Those persons with action training became more internal in the perception of their behavior than those subjects who received reeducative therapy. Gillis and Jessor (1970) found a relationship between the internality of individuals and the therapist's view of their improvement. When therapist judged that an individual was improving there was an accompanying increase in internality.

Nowicki and Barnes (1973) employed effective training during a summer camp experience in an attempt to effect changes in the locus of control scores of deprived inter-city adolescents. In a highly structured camp emphasis was placed on contingent reinforcement for good and poor performance. Five of eight groups showed significant increases in internality. Lefcourt (1972) is convinced that therapy of a problem-confronting nature offers confirmation of a theoretically probable relationship between increased effectiveness and increased perception of personal control. "As persons successfully cope with immediate difficulties, they do seem to experience an increase in perceived control" (p. 31). It is not known if this sense of control generalizes to enable persons to deal effectively with other difficulties without additional prods of an external nature.

Self-concept is another variable which influences a person's problem-solving ability. Investigating sex differences in problem-solving performance as a function of attitude differences, Carey (1958) noted an attitudinal difference between males and females which had an influence on their problem-solving ability. Before and after participating in a discussion, the disguised intent of which was the promotion of a more favorable attitude toward problem-solving, subjects were administered problem sets and a scale designed to measure their attitudes toward problem solving. The results indicated that men had more favorable attitudes toward problem-solving than women. Following the discussion, women performed better on the second problem set than on the first, while the men showed no improvement. There was no sex difference in the attitude score improvement following the discussion. This study seems to suggest that females could benefit from problem-solving training which is centered in part on problem-solving attitudes.

Maccoby and Jacklin (1974) report that the similarity of the two sexes in self-esteem is remarkably uniform across age levels through college age. They conclude from the studies summarized in their review of studies relevant to self-concept, that when males and females are asked to rate themselves on a series of characteristics, they have equally positive or negative self-images on the whole. One would conclude from this that the two sexes would approach a variety of tasks with equal confidence, but the study by Carey (1958) cited above refutes this idea. "College men are more likely than college women to expect to do well, and to judge their own performance favorably once they have finished their work" (Maccoby & Jacklin, 1974, p. 154).

Real-Life Problem Solving Theory

Feldhusen et al., (1971) in an extensive review of the problem-solving literature, saw problem-solving research falling into four classes or categories: (a) puzzle and insight type problems, (b) process problems, (c) component tasks, and (d) realistic, real-life problems. Typical puzzle-insight problems would include parlor games, two-string and hatrack problems, box problems, water-jar problems, anagrams, match sticks, verbal analogy problems and marble problems. Process problems, the second class noted, are those problems that have been used in research attempting to focus on the process involved in problem solving rather than the finished product. Light-switch problems, spy problems, simulation problems and concepts identification problems formed the composition of the second category. Component tasks, the third category of problem-solving tasks, assumes that problem solving, as a whole, cannot be considered as a unitary skill or ability, but rather is made up of several abilities interacting. Some of the tasks are described as: the ability to sense and define problems, to ask questions, guess causes, use familiar objects in unfamiliar ways, see implications, generate multiple hypotheses and evaluate ideas. The fourth type are those particular problems which have real-life meaning and relevance for individuals. The objectives of "real-life" relevant problems is "to draw upon the individual's own experiences" (Feldhusen et al., 1971, p. 10).

Now that "real-life" realistic problems have been identified from within problem categories, the review will focus upon real-life problem solving. Real-life problem solving is a complex and diverse process requiring many skills (Crutchfield, 1965). It would appear that the training of real-life problem-solving ability in the individual necessitates both the strengthening of a variety of specific thinking skills which are central to the process, and the encouragement of certain attitudes which favor the effective use of these skills. The problem solver must be able to sense and identify a problem and to verbalize it in workable terms, as well as grasp the essential elements of the problem, separating the relevant from the irrelevant.

Problem solving is a multifaceted procedure and various attempts have been made to subdivide the problem-solving process into different stages or components. Several theoretical descriptions of the problem-solving process have been formulated.

Dewey (1910) outlined five logical steps or stages in thinking and problem solving: (a) suggestions, in which the mind leaps forward to a possible solution; (b) an intellectualization of the difficulty or perplexity that has been felt (directly experienced) into a problem to be solved, a question for which the answer must be sought; (c) the use of one suggestion after another as a leading idea, or hypothesis, to initiate and guide observation and other operations in collection of factual material; (d) the mental elaboration of the idea or supposition as an idea or supposition (reasoning, in the sense that reasoning is a part, not the whole, or inference); and (e) testing the hypothesis by overt or imaginative action. Other well-known stages are those listed by Wallas (1926): (a) preparation, composed mainly of clarifying and defining the problem, along with gathering pertinent information; (b) incubation, a period of unconscious mental activity assumed to take place while the individual is (perhaps deliberately) doing something else; (c) inspiration, the "Aha!" or "Eureka!" experience, which occurs suddenly; and (d) verification, the checking of the solution. The steps postulated by Kingsley and Garry (1957) include: (a) a difficulty is felt; (b) the problem is clarified and defined; (c) a search for clues is made; (d) various suggestions appear and are tried out; (e) a suggested solution is accepted (or the thinker gives up); and (f) the solution is tested.

Theory in problem solving has come from research in several different fields, including experimental psychology, education and industry. Industry and other agencies have expended a significant amount of time and money toward solving problems encountered in their sphere of interest. Edwards (1968) surveyed the problem-solving courses sponsored by 43 organizations in the United States. Among the 30 furnishing specific information regarding their courses were 15 corporations, 1 government agency, 1 research organization, 4 consulting firms and 9 colleges and universities. The sample is representative of this area of problem-solving inquiry. With few exceptions the courses were planned for management level personnel including supervisors, engineers and researchers. Although all of the courses reported teach abilities associated with creativity, innovation and creative problem-solving, some stressed specialized aspects such as value engineering, work simplification, management development and decision-making. All the courses included lectures, demonstrations, group-discussions and exercises to get the students personally involved. Nearly all respondents reported an emphasis on practical work with students actually solving problems--in many cases, problems selected by the students themselves.

Evaluation of the courses for the most part took the form of end-of-course questionnaires. Edwards makes no mention of rigid research techniques, though some courses utilized tests of creativity ability. Evaluations were also expressed in terms of productivity for individuals and organizations they represented. Other measures of the course's success include increases in patent applications, problem solutions, money saved on processes or products, improvement in products or projects, profits, employee participation and bonus awards.

Researchers in experimental psychology have concentrated on studies on the specific independent variables that influence problem-solving performance. Studies in this area have been primarily concerned with such intellectual problematic tasks as solving water-jar problems, jigsaw puzzles, mechanical problems, mathematical problems, anagrams, and concept identification tasks. In education and industry the emphasis has been on such pragmatic tasks as the development and evaluation of procedures to facilitate effective problem-solving performance, and on the use of more creative and imaginative tasks, such as finding unusual uses for common objects and developing ideas for selling and improving products.

Reviewing the problem-solving literature from experimental psychology, education, and industry, Goldfried and D'Zurilla (1972) discovered that though there are wide differences among individuals in the manner in which they actually go about solving problems, there has been a significant degree of agreement among investigators working in different areas as to the general kinds of operations involved in effective problem solving, a view also reported by Davis (1966, 1973). By setting aside some minor variations in wording and categorization a consensus viewpoint of problem-solving stages is represented by the following five general steps: (a) general orientation, (b) problem definition and formulation, (c) generation of alternatives, (d) decision making and (e) verification. Before summarizing the salient features of each stage it should be clarified that the research on the stage-sequential approach to problem solving does not indicate that this is precisely the manner in which a problem is, or should be carried out in real life. Crutchfield (1969) and Davis (1973) stress that problem solving rarely proceeds according to neatly ordered stages. The individual may move back and forth from one stage to another during the course of problem solving. For example, he may be working on decision making and then go back to the generation of alternatives or problem definition for more information before making his decision. In the case of complex problems, the individual may be working on several different sub-problems at the same time, each at different stages of development. The summary of the stages that follows serves as a way of organizing problem-solving procedures or operations for the purpose of training and study.

General orientation is the first step in problem solving. It has long been recognized that an individual's general orientation or attitude in approaching a situation can greatly influence the way in which he will respond to that situation. The research (Goldfried & D'Zurilla, 1972) indicates that the type of orientation which is likely to encourage independent problem-solving behavior should include the "attitude to (a) accept the fact that problematic situations constitute a normal part of life, (b) accept the possibility that one has the ability to handle most of these situations, (c) recognize problematic situations when they occur, and (d) inhibit the tendency to respond either on the first impulse, or to do nothing" (pp. 75-76). A positive attitude appears to be important in successful problem solving. Colgrove (1970) conducted an experiment to determine whether a positive mental set that will upgrade problem-solving performance can be established by a simple instructional manipulation. The results demonstrated that the mere suggestion that a person has a reputation of being an original thinker creates a mental set that upgrades his problem-solving performance. It was shown that inhibitions which reduced the female performance seem to be lessened by instruction. It appears that to the extent that the individual anticipates being able to cope independently with the various problematic situations confronting him, even though no appropriate course of action may be immediately apparent, there is greater likelihood that he will be successful in finding an adequate solution.

Problem definition and formulation is the second and more central stage of the problem-solving process. Dewey (1910) stressed the importance of problem definition and formulation in his oft-quoted statement: "A question well stated is half answered" (p. 94). In contrast to the highly structured, well-defined form of the laboratory, problematic situations in the real world are "messy," vague and ambiguous. The goal of this second stage in real life is to help an individual recognize a problematic situation and inhibit his tendency to respond without thinking according to his first impulse. Goldfried and D'Zurilla (1972, p. 77) suggest this second stage should have a number of specific operations. Individuals must "(a) define the situation adequately in concrete operational terms." This means using words and labels that are clear, specific, and concrete, being careful not to leave out important details, and then, "(b) formulate the situation appropriately so as to put the facts in some orderly form, specify important issues, separate relevant from irrelevant information and identify the major objectives."

Once a problem has been clearly defined in concrete operational terms the third step in the problem-solving stages is generation of alternatives. Most researchers consider the procedure of generating alternative responses or possible solutions to be the core of the problem-solving process. The major task during this stage is to produce a list of possible solutions to the problem and to do so in such a way as to maximize the likelihood that the most effective response will be among those produced. Originally formulated in 1938 as a procedure for facilitating idea finding in group sessions, Osborn (1963, p. 156) listed the following four ground rules for generating alternatives commonly called "brainstorming": (a) "Criticism is ruled out." "Adverse judgment of ideas must be withheld until later." (b) "Freewheeling is welcomed." "The wilder the idea, the better it is." "Taming down is easier than thinking up." (c) "Quantity is wanted." "The greater the number of ideas, the greater the likelihood of generating useful ideas." (d) "Combination and improvement are sought." "In addition to contributing ideas of their own, participants should suggest how ideas of others can be turned into better ideas; how two or more ideas can be joined into still another idea."

Osborn (1963, p. 156) indicates that there are two basic principles of idea-production underlying the brainstorming rules "(a) deferment-of-judgment and (b) quantity breeds quality." The implication of the principle suggest that a person can generate more good quality responses if he withholds critical judgment until after an exhaustive list of possible solutions has been generated. Parnes (1972) notes that all but two of fourteen studies at a variety of institutions have shown that more ideas and more good quality ideas are produced by subjects when using deferred judgment than when following convention-thinking procedures. According to the quantity-breeds-quality principle, the more response alternatives a person can generate, the more likely he is to arrive at the potentially best ideas for a solution.

There is empirical evidence to suggest that brainstorming is more effective when employed by individuals. Bourchard, Drauden, and Barsaloux (1974) investigated the question: Is it more appropriate for persons to work individually and combine their output, or is it more appropriate for them to work in small groups and pool their results? In nine contrasts the pooled number of ideas generated by individuals was larger than the pooled number of ideas generated by groups. The pooled individual procedure was superior to the pooled group procedure.

Within the stage of generating alternatives there can be a lack of specificity in alternatives. Maier (1970) has suggested the need for instructions requesting the problem solver to screen out irrelevant variables and state his solution in terms of specific action rather than general approaches. An alternative proposal presented by Crutchfield (1969) is to encourage the problem solver first to generate and select the best strategy or set of strategies, and finally to return to the generation of alternatives phase in order to produce as many specific alternative behaviors as possible for carrying out the selected strategies.

Once all possible strategy-response alternatives have been identified, the individual can move to the fourth stage of problem solving. In the decision-making phase the individual evaluates his alternatives and selects the best one among them. The expected utility of any response alternative may be arrived at by a joint consideration of the value of each possible consequence and the likelihood of occurrence of those consequences (Edwards, 1961). Goldfried and D'Zurilla (1972) indicate that in most "real-life" problem solving, both the judgment of values and the anticipation of likelihood of their occurrence are entirely subjective. We conclude from this that the individual learns to solve his problems on the basis of his own subjective values system and his own general knowledge of means-end relationships gained from his past experience and what he knows of the experience of others.

Once a decision has been made the individual can move to the final problem solving stage of verification. Goldfried and D'Zurilla (1972) indicate that verification takes place after the chosen course of action is carried out and is designed to assess the actual outcome so as to make self-correction possible. Verification is seen primarily as the individual's observation of the record of his performance. This view is not completely consistent with their definition of problem solving as a behavioral process, whether "overt" or cognitive in nature. Dewey's (1910) fifth stage of problem solving is testing the hypothesis by overt or imaginative action. The literature would support the idea that verification may involve imaginary action or overt action, or a combination of both.

A legitimate question to be raised at this point is: What empirical evidence is there to support the theoretical consensus problem-solving model presented by Goldfried and D'Zurilla?" It appears from surveying the literature that the theoretical problem-solving model had its origin in observation of procedurés. Studies in the theory of problem solving have been designed and conducted from a sociological point of view. They have been basically descriptive in nature. Green (1966) notes that this problem-solving model has come largely from the descriptions of scientists working on difficult problems.

Real-Life Problem-Solving Research, Training and Assessment

Research in human problem solving has earned the reputation for being the most chaotic of all identifiable categories of human learning (Davis, 1966). The reason for this conclusion is the diversity of experimental procedures called problem-solving tasks (Davis, 1966). The majority of the problems used were devised by the authors and have not been used by anyone else. It is almost definitional of laboratory problem-solving experiments that virtually all semi-complex learning tasks which do not clearly fall into a familiar area of learning can safely be called problem-solving. Davis (1966), and Parnes and Treffinger (1973) concur with previous evaluations of problem-solving research noting that there does not appear to exist any single instrument or battery of tests for comprehensive assessment of problem-solving abilities. Research has indicated that there does not appear to be a single unitary problem solving aptitude (Guilford et al., 1962).

There is scant empirical evidence concerning the effects of training programs or procedures on more complex naturalistic or "real-life" problem-solving criteria. Some note-worthy research has been conducted in problem-solving skills among children, but would fail to qualify as including problems which represent real-life situations, or which are relevant concerns of the students. A great percentage would be categorized as "component type" because tasks taught or measured appear to focus on specific components or skills involved in the problem-solving process. Feldhusen et al., (1971) included in this category the battery of tests used by Guilford (1967) to establish the Structure of Intellect model of intelligence, the _Torrence Test of Creative Thinking_, (TTCT, 1966), _Unfinished Stories_ (Lundsteen and Michael, 1966), and the _Purdue Elementary Problem-Solving Inventory_ (Feldhusen et al., 1971). Feldhusen et al.,(1971,p.8) described the skills as: "the ability to sense and define problems, to ask questions, guess causes, use familiar objects in unfamiliar ways, see implications, generate multiple hypotheses and evaluate ideas." Also falling to this category would be Davis and Houtman's (1968) _Thinking Creatively: A Guide to Training Imagination_. This 150 page workbook prepared in humorous cartoon form for sixth grade, seventh grade and eighth grade students seeks to encourage creative problem-solving behaviors by instruction and illustrations dealing with creative attitudes and techniques. These exercises allow the student to find new ideas while practicing the strategies and by example. Another component type study is Feldhusen, Treffinger and Bahlke's (1970) _Creative Thinking: The American Pioneers_.

This program consists of 28 audio tapes with three or four printed exercises accompanying each tape to strengthen the thinking abilities of "originality, flexibility, fluency, and elaboration." The following areas of school curriculum are used as the format of the instructional material: Early Explorers, Frontiers in Transportation and Communication, Fighters for Freedom, and Frontiers in Health and Science. As expected, all such published research programs in the problem-solving-area indicate success of their instructional program, as measured by a variety of researcher-made tests and designated problem-solving tasks. One concludes that problem-solving skills can be taught in a variety of different ways using diverse procedures.

The most extensive program and research in instruction in real-life problem solving is the Productive Thinking Program developed by Covington, Crutchfield, and Davies (1966). The program consists of 16 booklets, and proposes to develop creative problem-solving abilities and related attitudes among fifth and sixth grade pupils. The booklet contains a series of simplified detective and mystery stories which combine the essentials of the problem-solving process and deal with a variety of situations which cut across curriculum content areas. A story line is maintained throughout the lessons by developing a narrative around two school children, Jim and Lila Cannon, who learn to become detectives under the direction of their Uncle John, a science teacher who doubles as the mysterious detective, Mr. Search.

The material is programmed and allows the student to participate in the solution of problems with the two children becoming models to be emulated. The stories are presented primarily by cartoon illustration in a booklet format, with the training program consisting of 16 lessons with an average of 30 pages per lesson. Each lesson is self-administering and self-paced. By leading Jim and Lila, and the student-participant through each of the problems, Mr. Search stresses making full use of information, becoming aware of important problem clues, generating many quality ideas, asking the right questions, and encourages the development of a plan for solving a problem. Not only does Mr. Search help direct the development of a problem-solving strategy, he encourages the development of a problem-solving strategy, he encourages the development of such attitudes as open-mindedness, self-confidence in the individual's ability to improve thinking skills and an interest in and an appreciation for such thinking processes.

The program was first used with 195 students from Berkeley and vicinity and at the time comprised 13 rather than 16 lessons (Covington & Crutchfield, 1965). The pupils came from four fifth grade and two sixth grade classes. Two of the fifth grade classes were designed as instructional groups; pupils in these classes studied the 13 lesson sequence. The materials were used one hour each day over a three week period with each child working individually on each lesson. Control classes received a shorter set of booklets which did not provide instruction in creative problem solving. Following the training period, an eight-hour post-test battery was administered to all pupils. Five months later a one-hour follow-up test battery was given.

Several measures were used to compare the pupils in both conditions including number of problem-clarifying questions asked, number and quality of ideas generated, and number of problem solutions achieved. The 98 instructed children markedly out-performed the 97 control children. Differences between proportions of pupils solving the problems in instructional and in control classes far exceeded statistical significance. The follow-up tests conducted after five months revealed continuing superiority of the instructed children over the control children.

The second study conducted by Covington and Crutchfield utilized all 16 lessons which comprise the Productive Thinking Program. Results of the study of 286 children corraborated the findings of the first study. Children instructed using the 16 programmed lessons showed marked superiority over the control children.

The control procedures employed by Covington and Crutchfield in their initial testing of the Productive Thinking Program are not those of the laboratory. The instructed classes were administered the training program as part of their regular classroom work. One hypothesizes that the authors wanted an implementation of their program in a natural setting to negate the reactive or interaction effect of testing; however, such a procedure raises the question of the lack of control of extraneous variables. The study is deficient in the statistical treatment of data. The authors chose to compute the percentages of problem solution of treatment and control groups. The reader is allowed to make his conclusion if the percentage gain of the treatment group over the control group is significant. While the researchers contend that the gain is significant, the program's credibility would be enhanced if the statistical treatment of the data had employed a parametric procedure such as analysis of covariance.

Treffinger and Ripple (1971) reviewed the research of use of the Productive Thinking Program in educational settings and report results contradictory to the reports of glowing success by the authors. They report three general variables which have influenced results concerning the program's effectiveness. One variable is the conditions under which the instructional materials are administered. This concerns the period of time taken to administer the materials and the amount and availability of supplementary practice. A second variable is the self-instructional utilization of the materials which refers either to the absence of teacher involvement in the presentation of the program or its presence and degree. The third variable is the criteria used to evaluate the effectiveness of the materials. The degree of similarity of the format between the training materials and the evaluation instrument appear to be a problem. The criticism can be leveled that the instructional material appears to be "teaching the test."

Treffinger and Ripple (1971) reviewed the work of Covington and Crutchfield (1965), Olton and Crutchfield (1969), Ripple and Dacey (1967), Treffinger and Ripple (1968, 1969), and Wardrop et al. (1969) and concluded that the programmed procedures of the Productive Thinking Program were most successful when distributed over a period of time. A concentrated presentation tended to lower success. Teacher participation in a structured setting also raised the student performance, along with similarity of the criterion performance measures. The authors were most critical of the programmed booklet's problem-solving tasks, with which treatment effects were regularly observed. They contend that there is no clear evidence that these problem-solving tasks are no more than an extension of the training materials. Treffinger and Ripple (1971) argue that the complex creative problem-solving process Covington, Crutchfield and Davies have described in their program does not involve such abilities as fluency, flexibility, originality and elaboration.

Thus far, the review of "real-life" problem-solving literature has been concerned with training associated with elementary children. There appears to be no research in print which deals with "real-life" problem-solving training for high school students. As one might suspect the next age level where problem-solving training has been conducted is with college students. This age level like the work conducted with elementary children is also sparse.

Loupe (1972) reports success in short-term problem-solving training with college students. A non-random sample of 60 college sophomore females was selected out of a pool of approximately 400 to represent extreme types of a personality dimension called seeking style. The 60 females were then divided into a training and control group. The basic problem-solving model for the experiment was the classical consensus view inspired by the writings of Dewey (1910). The model included the following: problem sensing, problem defining, hypothesizing, searching for information and resolving. A three-hour, small group training program was devised to illustrate and provide opportunities for practice and reinforcement of behaviors which support the five aspects of inquiry described above. Sherlock Holmes mysteries were used as expert examples and were also segmented to provide information and situations about which subjects were to generate hypotheses, plan search strategies, redefine problem situations, revise search plans, evaluate new information and decide whether a resolution was reached or a new hypothesis needed to be tested. Other problem situations were constructed in the form of branching problems which were used as group training exercises and as individual problem-solving post tests. A trainer led the training group to insure participation by all subjects, provide examples and reinforcement, while maintaining a quick pace. The control subjects experienced a three hour small group training course in concept learning.

Within five days of training the subjects participated in Shulman's Teacher's Inbasket, a simulation of a realistic teaching situation without students present but including all records, communications, and the Inbasket of jobs to be accomplished. The students were instructed to role-play, to do as they would do in a real situation. The students typically remained in the situation about two hours. The students were observed through one-way mirrors while in the Inbasket situation and the following aspects of their behavior were recorded: "Bits, the number of times the subject consulted source material; sources, the mean number of different kinds of information sources consulted regarding a particular problem; shifts, the number of times the subject changed from one source to another; problem sensitivity, the total number of problems identified by the subject; competence, a qualitative evaluation of the understanding demonstrated by the subject regarding the problem; total time and problem-solving quality, a competence measure on the immediate training posttest" (Loupe, 1972, p. 8).

Loupe reports a significant difference in the quality of problem solution of the experimental group over the control group. The experimental group also exceeded the control group on two of the dependent measures observed on the transfer task: sources, a measure of breadth of inquiry and competence, the quality or depth of solution. This study appears to support the feasibility of teaching behavioral patterns which would facilitate problem-solving or inquiry in diverse situations. The training in problem-solving strategies resulted in greater overall problem-solving competence for the experimental group.

There are several limitations within Loupe's study. His sample of convenience is limited to college sophomore females who were apparently teacher interns. A random sample of college students randomly assigned to treatment and control groups would have been more representative. While Loupe's use of the *t* test is an accepted practice, analysis of covariance would have been preferred. One limitation of the Teacher's Inbasket as an assessment instrument of problem-solving ability is the typical two hour time of administration to individual students and the special one-way mirrors for observation. However, this measurement does approach problem solving as a complex process and incorporates a number of the measures suggested by Treffinger and Ripple (1971).

In contrast to the short-term training of Loupe is The Creative Problem-Solving Course and Institute at The University of Buffalo pioneered by Sidney J. Parnes (Parnes and Harding, 1962). The Creative Problem-Solving course has been offered at The University of Buffalo since 1949 and the Institute since 1955. In this course students are taught the importance of imagination in all walks of life, the universality of imaginative talent and the use of creativity in all stages of problem-solving from orientation to evaluation. Early in the course the students are taught the deferred judgment principle. Check list procedures are encouraged. Students are taught to sense problems in their studies, work and personal lives and to properly define these problems for creative attack. Incorporated in the course is a workbook for use in and outside of the class session devoted to the practical application of creative problem-solving processes. In time the course was expanded into a four semester curriculum. Summarizing the results of the course on some 200 research measurements of students and their comparable controls not taking the course, Parnes and Noller (1973) cited the following results: "(a) These course students show significant differences over comparable controls in the ability to cope with real-life situational tests, including not only the production of ideas, but also their evaluation and development. (b) They show significant differences over comparable controls in applying their creative abilities in special tests given in English ourses. (c) They perform significantly better than the comparable controls on the semantic and behavioral half of J. P. Guilford's Structure-of-intellect (S-O-I) model, including three of five of his mental operations--cognitive, divergent production; and convergent production; they show no significant accomplishment over the controls in the symbolic and figural half of Guilford's model, nor in his memory or evaluation operations. (d) Most course students report large gains in their own productive, creative behavior; they rate the program as quite helpful in their other college courses and their everyday lives. In the second year, there is a significant increase in the percentage of students who report large gains in ability to cope with problems and to participate actively in discussions. (e) Tests results bear out their significant year-to-year improvement over comparable controls. (f) Course students show a growing tendency (not yet attaining statistical significance) to become more productive than comparable controls in their non-academic achievements in areas calling for creative performance" (pp. 14-15). The Institute is an intensive three-day session which incorporates the semester's work in a three-day study. No results are reported on the Institute; however, this annual event continues to be held for educators business, industrial, military and civic leaders.

Others working with real-life problem solving among college age students are Goldfried and D'Zurilla (1972). They have developed a method for assessing the effectiveness with which college freshmen handle real-life problems and a preventative training program to facilitate greater problem-solving competence. Their work prepared for the National Institute for Mental Health as a research grant is more of a theoretical presentation and has not been pursued empirically upon the completion of the contract of the grant.

The suggested training program is instruction in the theory and practice of the consensus view of problem solving. They contend that training in effective problem solving must include the five different steps or stages: "(a) training to develop an appropriate problem-solving orientation or "set," (b) training in problem definition and formulation, (c) training in the generation of alternative responses or solutions, (d) training in decision making, and (e) training in verification which is the evaluation of the effectiveness of problem solving" (p. 75). Their problem-solving program consists of moving the client through the progressive problem-solving steps or stages. The setting for the program is within the therapy and counseling dyad. The training is not a counseling theory, but a technique used by the counselor-therapist's skill and professional training. For each problematic situation used for training, the client must reach some minimal criterion for adequate performance in one stage of problem solving before he is allowed to go on to the next stage. The authors fail to define specifically what this minimal criterion is, though one suspects this means a criterion suggested by the counselor and agreed to by the counselee. New problematic situations are introduced and training procedures repeated until a satisfactory level of problem-solving effectiveness has been achieved in all five stages.

The goal of Goldfried and D'Zurilla's training program is to teach the problem-solving stages so effectively that stimulus response chain is established. A stimulus response chain consists of a sequence of discriminative stimuli and responses. Each response produces some change in the environment which then acts as a discriminative stimulus for the successive response (Whaley & Malot, 1971). Each stage of the problem-solving sequence serves as a cue for the next and a reinforcer for the last, while the entire chain is reinforced by the final outcome--the satisfactory resolution of the problem. While a variety of techniques may be used, the authors suggest instruction, which is the communication of information about the various steps and techniques involved in effective problem-solving and modeling, where the client is given a demonstration of how the stages proceed. Within the modeling procedure the client is praised for success and trouble-shooting is carried out to identify mistakes so they can be corrected.

The problem-solving assessment instrument developed by Goldfried and D'Zurilla is the Behavioral-Analytic Test of Competence (BATC) which consists of 58 real-life problems typically encountered by any student on a contemporary American university campus. These problematic situations were identified and grouped into the following ten categories on the basis of similarity in relevant stimulus elements inherent in the situations:" (a) dealing with campus red tape, (b) study habits, (c) balance between studying and relaxation, (d) handling difficult course materials, (e) relationships with instructors regarding academic matters, (f) selecting a major and career, (g) relationship with hallmates, (h) relationship with roommate, (i) relationships with the opposite sex, and (j) relationship with parents" (pp. 50-51). The purpose of the instrument is to examine students' response to these cases according to criteria for competence or effectiveness of personal behavior based on a consensus view from other students, teachers, and school counselors.

Several limitations are present in the instrument as it now exists. Requiring students to respond to 58 problematic situations with a description of what you would do in the problematic situation and how you would do it is overwhelming. One understands that the authors wanted to cover the majority of problematic situations encountered by freshman to assess their psychological adjustment, but one problematic situation from each of the ten sub-types of problems should be adequate.

The test is further limited, because it deals only with problematic situations encountered by men students in the freshman class.

A positive characteristic of this assessment instrument is the novel way in which the authors developed their instrument. Their procedures appear to have significant merit for any researcher seeking to assess real-life problem-solving ability. While other existing instruments have utilized such approaches as Sherlock Holmes mysteries, Goldfried and D'Zurilla selected their 58 problematic situations from a pool of real-life problems collected from each of the following sources: "(a) self-observations by the students during their first-semester, (b) observations of freshmen men by Resident Assistants, (c) interviews with faculty and staff members, and (d) a survey of the clinical folders of all male freshmen who applied for treatment at the student unit of the University Psychological Center" (p. 20). Consensus scoring criteria were developed for the problematic situations through extensive screening of possible responses by the student's peer group and significant others such as teachers, counselors, and staff members. The final criteria consists of a list of strategies, strategy combinations, and specific behaviors of the problematic situations, along with their assigned values. The authors have not pursued the refinement of their assessment instrument nor have they used it in any published empirical study. The 58 problematic situations presented in the test requiring detailed descriptions of what the student would do and how he would do it, the complicated scoring criteria and the low validity data reported by the authors seem to explain why the instrument is not in use.

A more recent work in the assessment of problem-solving ability is that of Parnes and Treffinger (1973) who have developed new scoring criteria for problem situations already constructed by Goldfried and D'Zurrilla (1972) in their Behavioral-Analytic Test of Competence (BATC). The Goldfried and D'Zurilla problematic situations were included because they were relevant to the life experiences of college students, were open ended and could be answered in controlled time periods without special facilities or resources. Drawing upon the insights gained from their review of the literature of problem-solving assessment, (Appendix A), four new scoring criteria were developed for problems solved in college situations. These scoring dimensions were identified as: (a) fluency, (b) flexibility, (c) originality, and (d) structural analysis. Fluency assessed the number of ideas produced in response to the problem; flexibility, the variety or kinds of ideas produced; originality, the ability to produce unusual or infrequent ideas about the problem; and structural analysis, assessed the total organization and sequency of ideas produced.

Several tests of validity and reliability were conducted. Interrater reliability was significant at the .01 level of confidence and the following reliability coefficients were reported: fluency .93; flexibility, .82; originality, .94; and structural analysis, .74. The four new scoring criteria were all positively and significantly intercorrelated at or above the .05 level of significance. An index of validity of the four measures cited above came from 23 instruments considered related to "cognitive and effective components of creative talents" administered to all subjects. Ten of the tests were "derived from the Structure-of-Intellect Model, representing the divergent production operation or the transformation products" (Appendix B, Parnes & Treffinger, 1973, p. 17). Guilford (1967) and Guilford and Hoepfner, (1971) report that these instruments assess cognitive abilities which are positively related to creative talent. Evidence for the validity and the reliability for the tests is summarized and reviewed by Guilford (1967) and Guilford and Hoepfner (1971). The non-academic accomplishments were assessed by The American College Survey (Richards, Holland, & Lutz, 1966). This self-report instrument asks the subject to report his accomplishments in each of the following twelve areas: "Leadership, Social Participation, Art, Social Service, Science, Business, Humanistic-Cultural activities, Religious Service, Music, Writing, Social Science, and Speech-Drama" (Parnes & Treffinger, 1973, p. 17). Wallach and Wing (1969) were cited to support the claim that "student accomplishments in the variety of areas included by the twelve categories would be adequate external criterion of creative expression among college students" (Parnes & Treffinger, 1973, p. 17). The Adjective Check List (Gough & Heilburn, 1965) was used as the third external measure to correlate attributes of students to problem-solving ability.

The fluency scores were significantly and positively correlated with five divergent production abilities associated with intelligence and with one non-academic accomplishment measure. The flexibility scores were significantly and positively correlated with only one measure of divergent production. The originality scores were significantly and positively correlated with five measures associated with intelligence. The structural analysis scores were significantly and positively correlated with four measures of non-academic accomplishment (Appendix B). Parnes and Treffinger (1973, p. 32) reported that "although many correlation coefficients were positive and significantly greater than zero, the magnitude of the relationships tended to be low to moderate." The correlations exceeded .30 in only a few cases. Guilford (1971) has indicated that correlations of complex criteria with only one or with only a few divergent production categories may yield only moderate correlations. Another possible explanation of the low correlation coefficients is the restricted range of both the divergent production measures and the non-academic accomplishment scales. The larger the range in correlation, the greater the possibility of having larger correlation coefficients, noting a higher relationship (Downie & Heath, 1974). The evidence for the validity of the four new variables is somewhat conservative, but the results of Parnes and Treffinger's work provide preliminary indications supporting the validity of the new variables.

Comparison of high and low criterion groups on total non-academic achievement was the final criterion for investigating the construct validity of the four variables. "Subjects who scored one standard deviation or more above the mean on total non-academic accomplishments constituted the high group and students who scored one standard deviation or more below the mean constituted the low group" (Parnes & Treffinger, 1973, p. 18). The groups were then compared on each of the new variables separately using one-way ANOVA. "Subjects in the high non-academic accomplishments group had significantly greater means than subjects in the low group on three of the four new variables: Fluency (4.60 vs 3.00), Originality (6.70 vs 4.00) and Structural Analysis (2.25 vs 1.72)" (Parnes & Treffinger, 1973, p. 24).

Finally after the completion of the tests of reliability and validity for each of the new variables, they were utilized as dependent variables for comparing experimental and control groups in a creative studies project using one-way ANOVA. However, because of time and scoring budget limitations the scoring criteria were used on only one problem situation. It is unfortunate that Parnes and Treffinger did not give their scoring criteria an adequate exposure. Goldfried and D'Zurilla (1972) identified 10 separate categories of real-life problematic situations encountered by students. It appears that a more reasonable approach would be a battery of 10 problematic situations, one each from the 10 categories identified by Goldfried and D'Zurilla to which the four new scoring criteria could be applied. While one would not expect the restricted use of the scoring criteria to measure significant problem-solving ability between experimental and control groups on only one problematic situation, the direction of the actual scores appear to be consistent with Parnes and Treffinger's general findings. These four new scoring criteria embrace the concept that real-life problem solving involves several inter-related procedures. The four new scoring criteria for complex problematic situations appear to yield reliable and valid indices of creative problem-solving abilities and merit their use in further empirical studies of problem-solving ability.

A pilot study in short-term problem-solving training in the use of the consensus problem-solving model was conducted by this author. The independent variable was instruction in the use and application of the problem-solving stages to real-life problems. The training was presented on four consecutive evenings with two 55 minute periods each evening to adults, college and high school students enrolled in a problem-solving course at Christ United Methodist Church, High Point, North Carolina. The class served as a treatment group (N=18) and a control group (N=7) was randomly selected from the church membership not enrolled in the course. The dependent variables were: (a) problem-solving ability measured by "The Problem-Solving Competence Measure," an experimenter-made instrument which incorporates five real-life problems similar to those of Goldfried and D'Zurilla (1972) and the scoring criteria (Appendix C) developed by Parnes and Treffinger (1973); (b) problem-solving attitudes measured by "A Childhood Attitude Inventory for Problem Solving" (Covington, 1966); and (c) levels of moral judgment measured by the Kohlberg Protocol (1971).

Procedures followed consisted of a pretest and posttest of the treatment and control groups with the instruments cited above. A two tailed *t* test was computed on gain scores between the pretest and posttest of the treatment and control groups. No significant difference was found on problem-solving attitudes or level of moral judgment between either treatment or control groups. However, a significant difference in problem-solving ability was measured between the treatment and the control groups. Inter-rater reliability between the two scorers of "The Problem-Solving Competence Measure" was computed by the Pearson Product Moment Correlation technique resulting in a positive coefficient of .90 at the .05 level of significance.

Tentative conclusions drawn from the study were: (a) problem-solving skills can be taught in a brief time period, enhancing the probability of persons emitting an appropriate response to real-life problems, and (b) the problem solving criteria developed by Parnes and Treffinger (1973) can be used to measure problem-solving ability when applied to a number of "real-life" problem situations with acceptable reliability (Downie & Heath, 1974). These results suggest the need for further empirical studies in short-term, "real-life" problem solving training in other educational settings, and the further use of Parnes and Treffinger's scoring criteria.

This study was limited in a number of ways. Participants in the treatment group were not a random sample, but were those persons who had enrolled in the course on a voluntary basis. Neither the treatment nor the control group had an adequate number of participants to generalize on the results. The design was inadequate and provided limited control for extraneous variables. The study was useful in providing an opportunity to experiment with a number of procedures and make a preliminary investigation of the feasibility of instruction in this area.

Summary

Real-life problem solving was described as a cognitive activity of an individual who perceives, contemplates about, and analyzes his environment. He forms hypotheses, tries solutions and makes calculated guesses to respond to his problems. A number of characteristics of the problem solver were identified. Several studies suggested that a relationship exists between IQ and problem-solving skills. No apparent relationship exists between an individual's sex and problem-solving skills. Age was cited as one variable which has a positive relationship with problem-solving ability. There is some evidence to suggest that internally oriented persons are more successful problem solvers than externally oriented persons (Baugh, 1973). Some evidence is reported supporting the relationship between self-concept and problem-solving skills (Carey, 1958).

Feldhusen et al. (1971) indicated that problem-solving research fell into four classes: (a) puzzle and insight type problems, (b) process problems, (c) component tasks, and (d) realistic real-life problems. Goldfried and D'Zurilla (1972) and Davis (1966, 1973) reported that by setting aside some minor variation in wording, the five general problem solving steps presented in the problem-solving literature are: (a) general orientation, (b) problem definition and formulation, (c) generation of alternatives, (d) decision making, and (e) verification.

Real-life problem-solving research has primarily been conducted with children and college students. The most extensive program and research in instruction in real-life problem solving with children is The Productive Thinking Program developed by Covington, Crutchfield, and Davies (1966). The material in the study is programmed and allows the student to participate in the solution of problems with two children becoming models to be emulated. Parnes (Parnes & Harding, 1962) has pioneered a four semester problem-solving training program for college students at the University of Buffalo. This program has many activities which approximate instruction following the consensus problem-solving model. Parnes (Parnes & Noller, 1973) reported a significant increase in the problem-solving skills of the treatment group between pre and post testing and little change in the problem-solving skills of the control group between pre and post testing. There appear to be no research or studies in print which deal with real-life problem-solving training for high school students.

Goldfried and D'Zurilla (1972) suggested that training in effective problem-solving must include the five different steps or stages, "(a) training to develop an appropriate problem-solving orientation or "set," (b) training in problem definition and formulation, (c) training in the generation of alternative responses or solutions, (d) training in decision making, and (e) training in verification" (p. 75). Loupe (1972) reported that following three hours of training in the consensus model of problem solving, treatment students exhibited a significant increase in their problem-solving skills when compared to control groups.

A pilot study conducted by the writer was also described. The study was conducted to investigate the practicality of pursuing extensive research in real-life problem-solving training. The study was used as an opportunity to explore materials and procedures which seemed to have application to a future study.

CHAPTER III

METHODS AND PROCEDURES

This chapter describes the methods and procedures of a study in classroom training in real-life problem solving. The study was designed to examine the effects of real-life problem-solving training in the stages of the classical consensus problem-solving model (Dewey, 1910, Krumboltz, 1966; Davis, 1966, 1973; Goldfried & D'Zurilla, 1972) on high school students' real-life problem solving ability. Would the knowledge of such procedures make the solution of real-life problems more probable? The study was also concerned with the effect of real-life problem-solving training on student self concept and locus of control. Other questions investigated included sex differences in real-life, problem-solving ability, and the relationship of real-life problem solving ability with IQ and grade point average. The study inquired into the effect of real-life problem-solving training upon student's behavior in such areas as study initiative, and problems related to curriculum and student life. How students would respond to this type of training experience was also a concern of the study. Another area of concern was how helpful would high school students find this training for their personal lives.

The independent variable was a real-life problem-solving curriculum adapted and developed from the relevant literature. The dependent variables were: (a) real-life problem-solving ability as measured by four criteria associated with real-life problem-solving ability: fluency, flexibility, originality, and structural analysis (Parnes & Treffinger, 1973), (b) internal-external locus of control as measured by the Locus of Control Scare for Children (Nowicki & Strickland, in press), and (c) self concept as measured by the Tennessee Self Concept Scale (Fitts, 1965). Other variables considered in the study were sex, IQ, and grade point average as they relate to real-life problem-solving ability.

The subjects, source of data, measurement of dependent and independent variables, instruments employed to gather data, experimental design, specific experimental and statistical procedures are described in detail in this chapter.

Subjects

One hundred twenty-one high school students enrolled in three sociology classes and one psychology class at High Point Central High School, High Point, North Carolina participated in the study. High Point Central High School is one of two high schools serving the high school student population of a city of 60,000 residents. The student body is composed of students in the tenth, eleventh, and twelfth grades and numbers 1200.

Sociology and psychology were elective courses offered at different times during the school day. The student's choice of a particular section of sociology or psychology was a function of scheduling elective courses around required courses which take priority. Students had the option of taking sociology or psychology in either the fall or spring semesters.

The sample had an average age of 17.14 years, an average IQ of 106; and a Grade Point Average of 2.45 on a 4.0 scale. Table 1 summarizes these characteristics. The sample consisted of 4 tenth graders, 35 eleventh graders, and 82 twelfth graders. The sexual composition of the sample was approximately evenly divided with 65 females and 56 male subjects. The ratio of black and white students was similar to that of the student population with 94 whites and 27 blacks participating. By racial and sex category the sample population was composed of 49 white females, 45 white males, 16 black females and 11 black males.

A plotting of the geographical location of the homes of the student sample revealed that the students were representative of the socio-economic composition of the larger student population which ranges from the very poor to the very wealthy. The plotting was completed with the assistance of the assistant principal who outlined the school district boundaries on a map of the city of High Point. The school district boundaries revealed that students attending High Point Central High School either came from the very poor, upper middle income or wealthy areas of High Point. The High Point School Central school district included almost no middle income neighborhoods. By taking the names and address of the students participating in the study and taking note of the neighborhoods where they lived it was determined that the students came from all areas of the school district.

Table 1

Characteristics of the Total Sample

Characteristic	N	$\bar{X}$	S
Age	121	205.71 Mo.	13.07 Mo.
		(17.14 years)	(1.09 years)
IQ	121	106.17	29.16
Grade Point Average	121	2.45	.70

Design

The design was a modification of "The Separate-Sample Pretest-Posttest Control Group Design" (Campbell & Stanley, 1963). Figure 1 describes the design. Campbell and Stanley (1963) note that when the number of social units are increased in a study and they are randomly assigned in quantity, an experiment which embraces the characteristics of the "Pretest-Posttest Control Group Design" can be attained. The strength of this design was that as the number of groups are added with randomization, all sources of internal invalidity are controlled for. The design in which four intact groups were randomly assigned was a great improvement over the two group design. Of course the effectiveness of randomization was limited by the small number of groups. Table 2 describes the distribution of subjects in the treatment and control groups with respect to sex, race, grade in school, age, grade point average, and IQ. Once the control and treatment classes were assigned, students within each of the classes were randomly assigned to the pretest and posttest sub-groups. Table 3 describes the assignment of classes to the treatment and control groups and the assignment of subjects within the classes of the treatment and control groups to the pretest and posttest sub-groups.

General Procedures

Prior to initiating the real-life problem-solving training program a letter was sent to all parents of students in the designated sociology and psychology classes describing the study to be conducted (Appendix E). The experimenter met with the students in all the classes and solicited their cooperation and participation. Students not wishing to participate were given the option of an independent study project.

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        R   O   (X)
        R        X   O
   R'   - - - - - - - - - -
        R   O   (X)
        R        X   O

        R   O
        R            O
   R'   - - - - - - - - - -
        R   O
        R            O
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R' -- denotes the random assignment of classes to treatment or control groups.

R -- denotes the random assignment of students within each class to the pretest or posttest group

O -- observation or measurement

X -- treatment

Figure 1. A modification of "The Separate-Sample Pretest-Posttest Control Group Design" (Campbell and Stanley, 1963) for use with Four Classes.

Table 2

Distribution of Subjects over Treatment and Control Groups by Sex, Race, Grade in School, Age, Grade Point Average, and IQ

	N	$\bar{X}$
<u>Treatment Group</u>		
Females	33	
Males	25	
Blacks	14	
Whites	44	
Tenth Grade Students	2	
Eleventh Grade Students	20	
Twelfth Grade Students	36	
Age of Students	58	17.03 years
Grade Point Average	58	2.468
IQ	58	103.327
<u>Control Group</u>		
Females	32	
Males	31	
Blacks	13	
Whites	50	
Tenth Grade Students	2	
Eleventh Grade Students	15	
Twelfth Grade Students	46	
Age of Students	63	17.24 years
Grade Point Average	63	2.449
IQ	63	108.793

Table 3

Subject Assignment

	Pretest Sub-group	Posttest Sub-group	Total
Training Classes:			
Sociology Class I (Teacher I)	13	13	26
Psychology Class I (Teacher II)	16	16	32
Control Classes:			
Sociology Class II (Teacher II)	12	15	27
Sociology Class III (Teacher I)	18	18	36
Total	59	62	121

To measure the effect of real-life problem-solving training upon students' behavior in such areas as improved real-life problem-solving ability, improved self concept and increased initiative in study, all teachers in the high school were mailed specific instructions for rating this behavior (Appendix F). This particular behavior was to be recorded over a one month period during which the problem-solving training was being conducted. The teachers had no knowledge of which students were in the treatment or control groups, or of the research hypotheses.

The pretest students were administered the Problem Solving Competence Measure, the Locus of Control Scale for Children (Nowicki & Strickland, in press), and the Tennessee Self Concept Scale (Fitts, 1965). Following this, students in the treatment group began the curriculum unit. Simultaneously, the control group classes studied the introduction to sociology which deals with the history, development and organization of people living together. The co-ordinated unit of study for the control classes had no content associated with real-life problem solving.

During the instruction sessions in the treatment classes a daily log was maintained which outlined the sequence of procedures followed, and the sequence of the curriculum material presented in each class. The recorded log of the instruction to the first treatment class and procedures followed became the teaching agenda for the second treatment class to maintain uniformity within the two classes. Any deviation in the procedures followed in the second treatment class from those followed in the first class was noted. A chronology of basic procedures followed is presented in Table 4.

The instruction sessions consisted of daily fifty minute sessions for a period of two weeks, exclusive of drill and testing time. Two fifty-minute class periods were spent in instruction and application of each of the five general stages of problem-solving suggested by the consensus problem-solving model (Dewey, 1910; Krumboltz, 1966; Davis, 1966, 1973; Goldfried & D'Zurilla, 1972): (a) general orientation to develop a mind set to stop and think, (b) problem definition and formulation, (c) generation of alternative solutions, (d) decision making, and (e) testing the solution.

Curriculum

The curriculum used in the problem-solving training was prepared by the experimenter and was organized to stress the five stages cited above. Also used were a number of real-life problems typically encountered by high school students which served as a testing area for the application of the stages. The curriculum was presented in three ways: orally, in mimeographed hand-out sheets, and on the chalk-board. A mimeographed hand out was prepared for the following problem-solving stages: generation of alternative solutions (Appendix J), decision-making (Appendix K), and testing the solution (Appendix M). These handouts outlined the salient features of the stage being studied and the directions for implementing that particular stage. A summary handout (Appendix P) encompassing and outlining the important features of all the stages was distributed to the students receiving training prior to the two days of drill at the end of the instruction period.

Table 4

A Chronology of Procedures

August 29	-	Sent letter home to parents by students informing them of the educational study to be conducted in the sociology and psychology classes. (Appendix E)
September 8	-	Met with all classes and solicited the involvement of students in the study.
September 9	-	Mailed directions for evaluating behaviors related to problem-solving to all teachers at High Point Central High School (Appendix F).
September 10	-	Administered the pretest for the Problem Solving Competence Measure.
September 11	-	Administered the pretest of The Locus of Control Scale for Children (Nowicki and Strickland, in press), and the Tennessee Self Concept Scale (Fitts, 1965) to the treatment and control classes. No contact was made with the control classes again until posttest administration.
September 12	-	Began instruction with treatment classes. Instruction focused on the general orientation stage.
September 15	-	Instruction in general orientation stage concluded, first quiz administered.
September 16	-	Instruction in the problem definition stage began.
September 17	-	Instruction in the problem definition stage concluded, second quiz administered.

September 18 - Instruction in the generation of alternative solutions stage began.

September 19 - Instruction in the generation of alternative solutions stage concluded and third quiz administered.

September 22 Instruction in the decision making stage began.

September 23 - Instruction in the decision making stage concluded, fourth quiz was administered.

September 24 - Instruction in solution testing procedures began.

September 25 - Instruction in solution testing procedures concluded, fifth quiz administered.

September 26 - Class engaged in written drill applying the problem-solving techniques to five new problems.

September 29 - Class engaged in written drill applying the problem-solving techniques to five new problems.

September 30 - Administered Posttest for the Problem Solving Competence Measure.

October 1 - Administered the posttest for the Locus of Control Scale for Children (Nowicki and Strickland, in press), and the Tennessee Self Concept Scale).

October 2 - All students receiving problem-solving training completed a questionnaire (Appendix A-1) evaluating the training experience.

October 3 - Administered the Otis Quick-Scoring Mental Ability Test to all subjects.

October 10 - Mailed all High School Teachers a form for evaluating students' problem solving behavior (Appendix T).

A second part of the curriculum consisted of 19 problems that high school students might encounter (Appendices, G, I, Q, and R). Some of the problems were presented with "programmed" instructions for implementing a particular stage (Appendices I, N, and O) and others were presented to be used in drill in the application of problem-solving skills (Appendices Q and R).

Teaching Techniques

The teaching techniques used in this study were those being used by many teachers in a variety of settings. In the beginning an attempt was made to establish rapport with the students, convincing them of the instructor's appreciation for high school students. Student participation was stressed as students were encouraged to ask questions about areas they did not understand. The instructor often asked the students questions individually and as a group to draw them into the instructor-student dialogue. At times students were requested to broaden or explain why they responded in a particular way or believed a particular approach to a problem to be valid. Occasionally the instructor challenged, sometimes coaxed, and often encouraged, but never tried to pressure or embarrass any student. Participation and relevant, intelligent responses by students were reinforced by smiles, nods, and general comments of approval. Since the training was conducted in a typical classroom setting, the instructor was flexible in the employment of techniques, depending upon the student's responses, reactions and needs. The verbal instruction and discussion technique was one basic approach which was utilized. Using this technique the instructor described and demonstrated a poor problem-solving technique often followed by students. In contrast to this, an effective problem-solving technique which followed the problem-solving stages was presented and demonstrated. The instructor described and explained the strategy and its objectives and then provided verbal instructions, directions and guidance as the students practiced the use of the strategy on either real or hypothetical problematic situations. Typical real-life problems encountered by high school students were presented orally and in written form by the instructor. During practice, each step of the strategy was discussed, appropriate applications reinforced, and inadequacies corrected. This technique was used with individuals and with the group as a whole. The major potential advantage of the group situation was that a greater amount of information and knowledge was available regarding possible alternatives, thus providing a more adequate training model for problem-solving. In addition, group discussion encouraged a more thorough and critical appraisal of possible alternatives which contribute to the effectiveness of training in the decision-making phase of the strategy.

Another technique used on a limited basis was behavioral rehearsal or role-playing. This procedure was used in individual and group situations. It was carried out entirely in imagination (cognitive rehearsal) or by acting out the various problem-solving situations in psychodramatic fashion. The use of this technique came after the group had received instruction in the problem-definition stage of problem solving techniques.

Drill in the use of problem-solving techniques was employed in conjunction with the other methods of presentation. Problematic situations were presented to the students in written form with "programmed" steps for the student to follow in outlining the particular stage being studied.

Experimenter-made quizzes were created to evaluate the student's mastery of the major goals of the course (learning problem-solving techniques and skills), and to serve as a teaching aid. This basic course testing procedure consisted of five quizzes which covered material presented with each of the five areas or stages of problem-solving: (a) general orientation with regard to problematic situations designed to encourage independent problem-solving behavior, (b) problem definition and formulation, (c) generation of alternative solutions, (d) decision making and (e) testing the decision. Questions for each stage being studied were written on the board prior to the beginning of instruction and generally called for definitions relevant to the stage of problem solving studied. Students received one of two scores on each of the quizzes: (a) acceptable, (b) unacceptable. When the experimenter judged that 80 percent of the class had mastered the material, he advanced to instruction in the next stage. A brief review of the material previously covered was conducted at the beginning of instruction on each new stage to reinforce students' knowledge of the relationship of the five stages.

At the conclusion of the instruction classes of the five stages of problem-solving techniques, the students were presented a number of "real-life" problematic situations upon which to apply their new skills (Appendices Q and R). These problematic situations, programmed to direct the students through the five stages of problem solving, were presented during two 50 minute class periods on two successive days.

At this point, the posttest subgroups in treatment and control classes were administered The Problem Solving Competence Measure, The Locus of Control Scale for Children (Nowicki & Strickland, in press), and the Tennessee Self Concept Scale (Fitts, 1965). All students receiving problem-solving training completed a questionnaire evaluating their experiences in the classes (Appendix S). All participants in the study were administered the Otis Quick-Scoring Mental Ability Test (1954) to determine IQ's. Upon the completion of all instruction, application, drill and testing, all teachers in the high school were given forms for recording the names of students who had exhibited particular problem-solving related behaviors during the past four weeks (Appendix T).

Detailed Description of Classroom Procedures

The program described here involved training in each of the five stages of problem solving: (a) general orientation, (b) problem definition and formulation, (c) generation of alternatives, (d) decision making, and (e) testing the solution. A problematic situation involving sibling rivalry over room-cleaning behavior (Appendix G) was selected for training purposes. The student was guided through this problem using the problem-solving stages until the students, the experimenter and the co-operating teacher were convinced it was solved. During the instruction periods other situations were introduced and training followed until a consensus agreement on a solution was attained.

Training to Develop an Appropriate Problem-Solving Orientation or "Set"

The first instruction centered on the general orientation stage and the rationale for giving real-life problem-solving instruction. The expected results of the course were presented in the form of the following course objectives:

The student who successfully completes the sequences of this training period can expect to accomplish the following results:

1. a heightened awareness of the variety of real-life problems that surround people, and the reasons people have problems.

2. an open mindedness to the ideas and problems of others

3. a significant increase in self confidence and ability to deal with real-life problems

4. a greatly improved ability to produce quality ideas and original thoughts which lead to the effective solution of real-life problems.

This introduction included a description and explanation of the stages of problem solving and an attempt to develop a set of expectations believed to be associated with effective problem solving. The instructor stated enthusiastically that the student would learn how to use these stages in the solution of his own real-life problems. "The course is fun, but it is not for fun." "It is for keeps!" "The skills learned here can have an important impact on all of your activities at the present as well as in future life."

Instruction in the first stage of problem solving had several thrusts. First an attempt was made to make the student aware of the kind of problematic environment in which he lives. Here the student was challenged to view problems as a natural occurrence in one's daily life. The student was made more sensitive to daily problematic situations by: (a) having the student list the general areas of daily living in which these kinds of situations might occur such as: relationships with family and friends, studying, dating, vocational choice, etc., (b) having the students compose a list of the real life problematic situations they are now encountering, and (c) the instructor listing problematic areas cited by such secondary sources as guidance and counseling text books (McKinney, 1958; Hudson, 1958) and the Mooney Problem Check List (1950). They were given an opportunity to share their personal list; however, they were personal and each student was asked to keep the list for consideration later in the course. This concluded the instruction on the first day.

Instruction on the second day began with a review of problematic areas often encountered by students. The second emphasis of instruction of stage one was a discussion of the factors contributing to the occurrence of problematic situations such as maturation, changing roles, and new environments. Future Shock (1970) by Toffler was one source of reasons for problems mentioned in this second thrust.

A third emphasis of instruction of the first stage was concerned with developing a proper mind set toward problematic situations. The goal of this emphasis was to help students restrain their inclination to respond impulsively or to do nothing. "Stop" and "think" were presented as a proper response to a problematic situation. At this point the instructor exhibited an ineffective problem-solving model, and then illustrated how the effective problem-solver utilizes the problem-solving stages outlined for the course.

One aid in developing a proper attitude toward problematic situations was to continually reassure the student that while life is composed of problematic situations, he can learn the skills necessary to solve life's problems. Helpful at this point was a review of several studies in problem-solving training beginning with Kohler's (1925) work with Chimpanzees and the exploits of Sultan, the most famous of the chimps. The rationale here was, that if primates on the lower evolutionary scale can master problem-solving so should high school students. The problem-solving course at the State University College at Buffalo (Parnes & Noller, 1973) was briefly described along with a description of Loupe's (1972) short-term problem-solving training.

At this point the student was given a written copy of the problematic situation chosen to serve as a prototype (conflict over room cleaning behavior previously described) (Appendix G).

The function of this general orientation was to provide the student with an initial set of anticipations before training in the other stages began.

Here, approximately at the mid-point of the second day of instruction, the first experimenter-made quiz was administered. It consisted of asking the students to: (a) list five problematic areas in the lives of high school students, (b) list and describe three reasons why problematic situations arise in student's lives, and (c) list the best response to make to a problematic situation and explain the reason for this choice.

The instructor scored the first quiz and determined that 88% of Class I and 84% of Class II of the treatment group performed acceptably. Table 5 summarizes the results of each of the five experimenter-made quizzes by classes. The instructor had established an acceptable performance of 80% of the students in both classes as the criteria to be met before advancing to instruction in the next stage. Since both classes exceeded this level, it was possible to move to instruction on the second stage.

Training in Problem Definition and Formulation. Beginning on the third day, the problem-solving training focused upon problem definition and formulation. Training in this phase of problem solving was designed to help the student more adequately define and formulate the problem. Dewey (1910) reported that "a problem well-stated is half solved." The goal in defining the problem was to aid the student move from an abstract conceptualization towards objectivity, specificity, clarity, and detail.

The instructor pointed out to students that in a typical problem-solving study, the problematic situation would be presented to the students in a highly structured, well-defined form with the aid of very specific, detailed instructions. The purpose in following such a procedure was to avoid unwanted sources of variance in the student's problem solving performance. In contrast to the problems encountered in a laboratory, most real-life problems are "messy," vague or ambiguous. Generally necessary facts and information are inadequate in terms of suggesting an appropriate direction for solving the problem. In real-life

Table 5

Percentage of Students Performing Acceptably on Experimenter-Made Quizzes

	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5
Treatment Group					
Class I	88%	81%	81%	85%	81%
Class II	84%	91%	91%	87%	81%

settings where problems are usually unstructured, it appears critical for students to develop the skills in organizing information related to a problem in a meaningful way. The importance of defining the problem in operational terms instead of broad general statements or with subjective feelings was stressed to the students.

Frequently students make the mistake of working on a problematic area rather than on a single problem, thus taking on more than they can handle. A problematic area is usually stated in universal, global terms. It typically deals with a whole cluster of problems such as: courtship, family, personal-psychological relations, etc. A problem comes from within the problematic area and can be stated in precise terms. This was illustrated by drawing a circle on the board to represent a problem area. A small wedge drawn in the circle represented a specific area. A comparison was made to eating an apple pie: "A pie is not eaten all at once, because you would choke to death. Instead, a pie is eaten by cutting out a wedge and eating it a bite at a time. Another way of stating this was: "Don't bite off more than you can chew!" Clear problem identification from within a problematic area was stressed as an essential first step toward initiating a solution.

The following example of the importance of problem definition was used with the class:

> A speaker arrived at a meeting about fifteen minutes ahead of time, and immediately noticed that no lectern or lecturer's stand had been provided for this presentation. He quickly defined his dilemma as, "Where might I get a lectern in a hurry?" Then in asking himself why he needed a lectern, he realized that it was because he felt

> uncomfortable without a place to rest the notes for his talk. He recognized that the basic problem that challenged him was not, "How to find a lectern?" What was his real problem? The speaker redefined his dilemma as "How to find a comfortable way to hold my notes," or "How to speak without a lectern?" With his more realistic recognition of his problem, he observed a rectangular wastebasket. By visualizing this basket as being placed on its side on a table he immediately discovered something to serve as a lectern. Restating the problem was virtually all that was needed to solve the problem (Parnes, 1966, pp. 8-9).

Thus far in the presentation students were encouraged to identify the problem within the problematic area. Now the students were asked to take a specific problem and broaden their thinking about the problem and the goals that are implicit in them. To do this students were instructed to ask the question "Why?" to every problem they had defined. Another way of broadening the question which was suggested to the students was to identify basic objectives. The students were asked to raise the question, "What is it that I am trying to accomplish?" In the previous example of a missing lectern the question was: "How can I get a lectern?" "Why do I need a lectern?" "I need something to rest my notes on!" The real problem is, "What are possible ways of holding my notes?" A lectern was only one possible choice. The students were asked to help solve the problem by looking around the room to make suggestions. Their ideas included: a chair, a music stand, a stack of books, the desk, an over-head projector stand, a student, a music stand, and a brief case.

A further example was used to encourage the students to broaden their thinking about specific problems and the goals implicit in them. One question was "In what ways may we make a better mousetrap?" (Parnes, 1966, p. 11). Students were instructed to ask the question, "Why?"

A number of answers were given by the class: "To catch mice," "To get our homes rid of mice." The instructor taught the students to broaden the problem by re-stating it in the following manner: "In what ways can we get rid of mice?" The instructor wrote "In what ways" on the chalk board and indicated that this phrase could be placed in front of any problem once it had been re-stated. They were encouraged to note that the phrase, "In what ways" suggested action or things they would do to solve their problem.

Other problem exercises were drawn immediately from school life and included such problems as: "In what ways might we decorate the school for home-coming?" "In what ways might we improve the school pep rally?" In each of the examples it was pointed out to students that they should continue to ask the question "Why?" to every question raised and push the question until the broadest possible restatement was reached.

Another means of reaching helpful definitions suggested to the student was to change the verb in a given statement. An appliance manufacturing company for example changed "toast bread" to "brown and dehydrate bread" and the subsequent design was an adaptation of the traditional toaster which opened a new manufacturing line for the company (Biondi, 1972).

Students were reminded that closely associated with problem definition was problem formulation. This necessitated identifying all the important facts in the problem situation, even to gathering additional information if necessary. Students were told that typically problems specify a Who?, What?, Where?, When?, Why?, and To what extent? The suggested goal here was to regain the inquisitiveness of childhood when we continually asked these questions of our environment: What?, How?, Where?, When?, Why?

While the problem definition and formulation were separated for discussion, the students were reminded that the two processes form a sequence of events in the second stage. The instructor provided the students with the following recap of how the two process relate to each other in the second stage:

> First the problem is isolated from within the problematic area. The student moves from abstract conceptualization toward objectivity, clarity, and specific detail by gathering relevant information by asking such questions as: What? How? Where? Why? What are my basic objectives? Once an initial statement of the specific problem is formed, the problem is broadened by asking, "Why?" This process continues until the broadest aspect of the problem is conceptualized. This process may also be enhanced by changing verbs in the statement. Once the problematic situation is adequately defined in specific terms, the facts may be formulated in the logical order of a question. In many problematic situations the best solution becomes obvious once the problem is adequately defined, the major issues formulated, and the problem well stated. Further problem solving before action and solution testing may not be necessary. However, this is not always the case, and many persons need training in the techniques for generating alternatives, the third stage of problem solving.

The second instruction period on problem definition and formulation began with a review of the previous day's work. At this point the students were introduced to a worksheet (Appendix H) to be used with the room-cleaning conflict problem (Appendix G). When this exercise was completed the students were given another mimeographed exercise associated with the room-cleaning conflict problem (Appendix I, Problem 1). Problem definition on this "programmed" sheet was completed individually, and then with the class as a whole. A new problem on high school dating behavior (Appendix I, Problem 2) was presented for small group drill using the "programmed" stages outlined on the mimeographed sheet. At the conclusion of the exercise the entire class discussed the problem.

The second experimenter quiz was administered. This brief quiz consisted of asking students to: (a) paraphrase John Dewey's famous quote on problem solving, (b) list the key questions one should ask when confronted by a problematic situation, and (c) list two ways to broaden a problem.

After scoring the quiz it was determined that 81% of Class I and 91% of Class II of the treatment group performed acceptably. These data are summarized in Table 5. Since the test performance of the two classes exceeded the 80% acceptable performance criteria established by the instructor, it was possible to begin instruction on the third stage.

Training in the Generation of Alternative Solutions. The next step was to teach the students the skills necessary to generate alternative solutions to the problematic situations. A mimeographed sheet which briefly described the theory and procedures of this third stage was distributed to all students (Appendix J). Generating alternatives was compared to biting an apple on all sides. Similar to the experience of looking at a beautiful gem, one discovers there are many sides and facets to be observed before one can fathom its beauty. The major goal of this stage was to challenge students to produce as complete a list of alternative solutions as possible, with the most effective being among them. The core of the instruction in this third stage was to teach students how to "brainstorm." As the term suggests, brainstorming called for the student to attack a problem with ideas. Underlying brainstorming were two basic principles for producing ideas: "(a) deferment of judgment, and (b) quantity breeds quality"(Osborn, 1963). Originally developed to increase the productivity of his creative business colleagues, Osborn (1963, p. 156) formalized the technique with the four following ground rules:

1. "Criticism is ruled out." "Adverse judgment of ideas must be withheld until later." The instructor cautioned the students of their usual tendency to be immediately critical and judgmental of ideas produced by themselves or others. Students were reminded that the goal here was to withhold all their judgments until all the solutions were in. The key idea here was for students to suspend their criticism while they were being creative.

2. "Freewheeling is welcomed." "The wilder the idea, the better; it is easier to tame down, than to think up." The students were encouraged to be uninhibited, since the wilder idea may be the best when all are considered. Students were reminded that this was not a waste of time, since "off-beat," "way-out" ideas may trigger a valid solution.

3. "Quantity is wanted." "The greater the number of ideas, the greater the likelihood of useful ideas." Students were encouraged to produce a long list. The greater the number of ideas, the more likelihood of prizewinners. It is far easier to whittle down list of possible

solutions than to attempt to lengthen it. Students were encouraged to follow the logic of the statistics of this principle. It seems obvious, that as the number of ideas increase, the number of potentially productive ideas will also, if the proportion of good ideas remain constant. The increased number of ideas generated increases the potential of their combining with other ideas mushrooming the total idea output.

4. "Combination and improvement are sought." In addition to contributing ideas of their own, students were encouraged to make suggestions as how other students' ideas could be turned into better ideas. Stressed at this point was the principle of how two or more ideas can be joined to make still another idea. "Hitchhiking" on another student's ideas was one of the valuable features of the group brainstorming sessions. This principle was also encouraged for their "private" real-life problem solving.

Once the ground rules for brainstorming had been taught, the class was divided into six groups of three to five students. The students were instructed to continue working on the Problem 1, concerned with room cleaning behavior (Appendix I), and Problem 2, on dating behavior (Appendix I) utilizing the "programmed" worksheets on the problems. They were instructed to read the problem again, and imagine that it was their personal problem. With the help of the teacher, the experimenter reminded the students to "stop and think," then proceed through the procedures for defining the problem, and begin generating alternative solutions once the problem was defined to the satisfaction of the group. Each group designated a chairman, a secretary to record alternate ideas and a judge to reprimand any group member who criticized or judged any alternative generated in the exercise. A "fantastic" prize was promised to members of the group which produced the most solutions to Problem 2. The purpose of this innovation was to stimulate interest and student involvement. It was announced that the award would be made the following day.

Near the end of the first instruction class on stage three, Problem 3 (Appendix I) which deals with peer pressure to engage in drug use was presented to each individual. This exercise was to be completed outside class and returned on the following day with the promise of a "fantastic" individual prize for the person generating the most possible solutions to the problem.

The second class session, concerned with the generating of alternative solutions stage, began with a review of the principles presented on the previous day. The "fantastic" prizes promised to the group generating the most solutions to Problem 2 (Appendix I) and to the individual generating the most solutions to Problem 3 (Appendix I) were distributed. The prizes consisted of boxes of crackerjacks wrapped in white tissue paper. When the students had unveiled their awards, the experimenter wrote the following sentence on the board: "Students who generate many solutions to their problems become "crackerjack" problem solvers."

Following this, the class was divided into groups of six students. The groups were instructed to brainstorm for six minutes on Problem 4

(Appendix I) which concerns a conflict with parents over dating behavior. After the initial six minute brainstorming session, the class exercise was stopped and the groups were given new instructions. They were then asked to spend six more minutes combining the solutions they had generated to make new solutions.

Problem 5 (Appendix I) which described a conflict with a sister over drug use behavior was distributed to all students in the class for individual definition and brainstorming for solutions. Problem 6 (Appendix I) which deals with a conflict with parents over double standards for male and female children was distributed to students for drill outside the class.

Following a period of review over the principles involved in generating alternative solutions the third experimenter-made quiz was administered. The students were asked to: (a) list and explain in their own words the four ground rules for brainstorming, and (b) list and describe the two basic rules to be followed when an individual is brainstorming for solutions. Over 80% of the students in the two classes of the treatment group performed acceptably on the quiz and the instructor prepared to begin instruction on the fourth stage of problem solving. 81% of class I and 91% of class II performed acceptably.

Training in Decision Making. When all alternative solutions had been generated and identified on Problem 1 (Appendix I) the students were ready to receive training in the decision making stage of problem solving. On the first day of class each student was given a mimeographed copy of the important features to be covered in the instruction of this stage (Appendix K). This was provided to serve as a guide to the class presentation and as a later reference for individual study.

At this point in the training experience, students were told that decision making involved taking the alternative solutions they had generated for problems and picking the best one among them. Since the generation of alternative solutions stressed the with-holding of judgment, the list of solutions generated by the students contained ideas of varying quality. They were directed to rough screen their list of ideas eliminating any obviously poor alternatives which do not justify further serious consideration. With the inferior alternative eliminated, the efficiency of the decision making process increases.

As inferior alternatives were eliminated in the quest for the best solution, the students were asked to raise the questions: (a) What are the consequences of each alternatives if I carry out this possible course of action?, (b) What are the likelihood of these consequences occurring? and (c) What values do I place on these consequences? (Goldfried & D'Zurilla, 1972). Students were reminded that while this real-life problem-solving training was presented in a group setting, the individual learns to solve problems on the basis of his personal, subjective value system and his own general knowledge and what he has learned from the experiences of others passed on through education.

Goldfried and D'Zurilla (1972, p. 83) suggested that the consequences of alternatives should be considered under the following four categories: "personal, social, short-term, and long-term." These categories were put in the form of questions that students could ask of the solutions they had generated: (a) What will happen to me personally if I follow this particular course of action? (b) What are the social consequences of this particular course of action? What effect will this decision have on the important people in my life, and what reaction will this decision cause others to make toward me? (c) What are the short-term consequences of this decision? What will happen "right now, today or tomorrow"? (d) What are the long-term consequences? What are the possible results of this particular course of action in the future?

The students were encouraged to make a written check-list on the viable alternatives so that the various consequences could be evaluated. By evaluating the alternatives against each other it was possible to select a set of strategies. At this point the student had narrowed alternatives to the ones likely to have the best pay off in the sense of having the best chance of achieving the objectives defined by the student.

A part of the training in the decision making phase of problem-solving was encouraging the student to act. Thus far, the training had focused upon cognitive operations believed to increase the probability of effective behavior. Problem solving involved more than thinking--action must be taken. It was possible for persons to engage in cognitive operations essential to problem solving, but fail to take any action, and consequently remain in a problematic situation.

Having completed the formal instruction on the decision-making stage, the class as a group was asked to rough screen the alternative solutions generated for Problem 1 (room-cleaning behavior, [Appendix I]), with the instructor. Each student was given a new copy of the problem identical to the previous worksheet (Problem 1, Appendix I) with one exception. Attached to the problem was a worksheet (Appendix L) to direct the student through the decision making stage. Four possible solutions were listed on the board and each student was asked to choose from these remaining alternatives the best decision, and list the possible consequences from a personal, social, short-term and long-term view. This exercise concluded the first day of instruction of the decision-making stage.

The second day of instruction on the decision-making stage began with a review of the objectives of decision making. The class was divided into subgroups of two students, and each student was given a new copy of Problem 2 (dating behavior [Appendix I]) with an attached worksheet (Appendix L) for direction through this stage. Following a work period of 10 minutes, the paired students were asked to share their decisions with the entire class and were subsequently recorded on the board. The instructor and class members reacted and evaluated the recorded decisions. The instructor encouraged the students to define the problem in a sentence which begins with the word "how?" and reminded them that alternative solutions generated should reflect action words. It was pointed out that superior solutions chosen in the decision making stage were those which reflected a detailed plan of action, indicating how the student would go about solving the problem. Then each student was given a "programmed" worksheet (Appendix L) to use with Problem 3 (peer pressure to use drugs [Appendix I]) to be completed outside class and returned the following day.

Following the drill in the decision making process, the fourth experimenter-made quiz was administered. The students were requested to (a) describe what takes place in decision making, (b) explain why values should be considered in decision making, and (c) list four different categories for exploring the consequences of alternative solutions. Over 80% of the students in the two classes in the treatment group performed acceptably on the quiz and the instructor prepared to begin instruction on the final stage of problem-solving training on the ninth day of the instruction period. 85% of class I, and 87% of class II performed acceptably.

<u>Training in Testing the Solution</u>. Instruction in this stage was primarily concerned with teaching students to observe the specific and general consequences of their actions and to predict the possible consequences of their final solution to a problem through the use of imagination. Two processes were recommended to the students to use in testing the solutions to their problems. The first process recommended was for students to evaluate the consequences of their solutions after they had been acted upon. If the solutions produced satisfactory short-term, long-term, personal and social consequences which satisfied the student, the problem-solving process could be terminated. However, if the student discovered that the results of the solution had not met

his expectations, he would know the problem was not satisfactorily solved. The procedure recommended to any student who had this experience was to return to the drawing board, and engage in the problem-solving process a second time. While engaging in the problem-solving process the second time, the students were directed to become a "trouble-shooter" to try to discover where he had gone wrong the first time and correct the error.

During instruction on this final stage the instructor reinforced any confidence the students may have gained by reassuring them that they had the skills to deal with their problems. The instructor encouraged the student to try something. To try and fail at least was a learning experience, but in failing to try, a student suffers the loss of what might have been. If the student found that the selected course had failed to satisfactorily resolve the problem, or had resulted in some unforeseen negative consequence, the instructor helped the student see that this was a human quality. He then encouraged the student to go back to the drawing board and try again to arrive at a solution which would be more likely to be effective. Students were reminded that persons learn by "trial and error."

Instructing students to observe the consequences of the solutions to their problems had its limitations. Many of the consequences of our decisions can only be evaluated after the passage of time. This is particularly true of real-life situations. It was pointed out to students that the consequences of some of the solutions generated for their problems have such major consequences that "trial and error" procedures are faulty. The limitations reinforced the need students had to learn a second technique for testing solutions.

It was set forth to the students that training in the fifth stage of problem solving also involves learning to test the solution they have chosen for their real-life problem by imaginative action. Sometimes it is not possible to observe the overt consequences of one's actions; consequently imagination can be a helpful technique in evaluating the decision made. At this stage of problem solving the student had defined the problem, generated alternatives, and chosen the best alternative. The only logical means of testing the solution may be through imaginative action, since the consequences of actual trial and error testing are often catastrophic if a poor decision has been made. The use of imaginative action was similar to the procedure of stating values and consequences in the training presented in the fourth stage, only here the process was confined to the final alternative solution chosen, and was more intense than the screening process taught in stage four.

Following the instruction session, students were given a worksheet (Appendix N) on which Problem 1 (room cleaning behavior) had been defined and a series of decisions had been listed to provide the student an opportunity to test solutions by observing the consequences of decisions and by imaginative action. Following a brief period of individually testing and evaluating the solutions on the worksheet, students were given a chance to share their decisions. Class members were encouraged to evaluate and react to responses being made in class. Additional drill in imaginative action was provided through the distribution of a second worksheet containing Problem 4 (parent-youth dating conflict [Appendix O]). Again students were instructed to test the solutions suggested for the problem through imaginative action. At the conclusion of the first day of instruction and drill on solution testing, each student was requested to write out a personal problem which could be used for class discussion.

The second day of class instruction on testing the solution began with a review of the training objectives of the fifth stage. Students were distributed a mimeographed "programmed" worksheet introducing a new problem involving boredom with studies (Appendix I, Problem 7) for class-room drill using imaginative action. The instructor used a "stop-and-go" technique with each of the seven listed responses allowing for student participation and reaction. The "stop-and-go" technique allowed the class to test a solution, "stop" and discuss why they accepted or rejected the solution as a viable option and "go" on to the next solution, repeating the process until all the solutions on the "programmed" worksheet had been discussed. This identical process was followed with the "programmed" worksheet introducing a problem of parent-student conflict over study habits (Appendix I, Problem 8) where students were asked to evaluate eight responses using imaginative action. Drill and instruction in the testing stage of problem-solving was concluded with a worksheet containing a problem on conflict between student wishes and family needs (Appendix I, Problem 9) which instructed students to test four solutions by imaginative action.

The fifth experimenter-made quiz was administered. The students were instructed to: (a) list two ways problem solutions could be tested, (b) state what a student should do if the chosen alternative fails, and (c) explain how an individual can determine if a problem has been solved. Eighty percent or more of the students performed acceptably on the quiz. Test results indicate that 81% of class I, and 81% of class II performed acceptably.

Problem Solving Drill. The first day of drill began by presenting each student a one-page, mimeographed condensation of the course (Appendix P). The instructor reviewed the curriculum which had been presented to the students by briefly describing the objectives of each stage and explaining how they were inter-related in a chaining action which provides a procedure for the resolution of their personal problems. After a question and answer session, all students were given drill sheets (Appendix Q) containing five real-life problems (Problems 10, 11, 12, 13, 14) typically encountered by high school students. The majority of these problems came from students involved in the training. Students were directed to put themselves in the place of the person experiencing the problem and use their new skills to satisfactorily resolve the problems. Approximately 40 minutes, the remainder of the class period, was given to this exercise.

The experimenter began the second drill session with an evaluation session where student strengths and weaknesses on previous problems were highlighted. The experimenter made very positive statements about the new skills the students had acquired. It was stressed that they now possessed a technique they could use today, tomorrow and the rest of their lives to solve any real-life problem they encountered. They were no longer "pawns" to be moved about by the unpredictable problems encountered in their daily lives; rather, they were persons who had the skills and intelligence to deal with any problem and determine their own destinies. What they had learned in the two weeks of instruction was "for keeps." All students were distributed drill sheets (Appendix R) containing five new problems (Problems 15, 16, 17, 18, 19). As on the previous day, students were directed to put themselves in the place of the person experiencing the problem and use their new skills to satisfactorily resolve the problem. Approximately 40 minutes was allowed for this exercise.

The classroom training in real-life problem solving was concluded with the second day of drill in the application of the technique. All treatment and control students were administered the posttest for The Problem Solving Competence Measure, the Locus of Control Scale for Children (Nowicki & Strickland, in press) and the Tennessee Self Concept Scale (Fitts, 1965). Students in the treatment classes completed a questionnaire evaluating the training. Otis Quick-Scoring Mental Ability Test were administered to students in the treatment and control classes to assess IQ's. The sequence of the tests and questionnaires and days administered is described in Table 4.

Instruments

Otis Quick-Scoring Mental Ability Tests (Gamma Test: Form Fm, 1954). This self-administered paper and pencil test was used to measure the mental ability of the students. The test manual indicated that mental ability included "thinking power and the degree of maturity of the mind." The Gamma Test: Form Fm has been equated to the older forms and includes questions on such areas as vocabulary and arithmetic reasoning. Since a minimum vocabulary level is necessary to comprehend the content of questions included, the test manual suggests that the measure is not culture fair. A measure of a student's mental ability described as comparable to an intelligence quotient on the Binet Scale was found to comparing student's scores on the Gamma Test with the norm for their particular age. Though not a quotient in the traditional sense, the manual suggests that this "IQ" had the same significance as an IQ.

The publishers reported reliability coefficients (odd vs. even items) corrected by the Spearman-Brown Formula to .85 for Form Am and .92 for Form Em for grades twelve. The standard error of measurement indicating the degree to which a student's obtained score may vary from his true score was reported in the manual to be 3.0 points, "that is, a pupil's score will be in error not more than 3.0 points in 66 2/3% of cases"(Otis, 1954, p. 6).

One weakness of the measure is its lack of criterion related validity. The publishers suggest that the "validity of a test is meant the degree to which it measures the ability it is designed to measure" (Otis, 1954, p. 6). They report their instrument to be a measure of brightness; "the actual rate of progress of pupils through school is the most appropriate criterion of the validity of the Gamma Test" (Otis, 1954, p. 6). Student brightness (Otis IQ) is determined by the number of points the child varies from the norm of the performance of his age group in school (Cattell, 1931). Traxler (1934) reports that from a standpoint of correlation with the Stanford-Binet IQ the Otis IQ is highly valid. The correlation coefficient found was .725. When the coefficient was corrected for what he calls "attenuation" by the Spearman correlation formula the resulting coefficient was .927. He observed that the Otis IQ averages about eight points lower than the Stanford-Binet.

The following limited data on validity was reported by the publishers:

> The validity of each item of the Higher Examination was investigated by finding the biserial coefficient of correlation between the item and the total score in the test. Although the scores of only 100 adults of each sex were used in the experiment, the coefficients for the items were without exception positive for both sexes, having a median value of .61. This experiment indicates that all the items of the Higher Examination have real validity in a mental ability test.
>
> When Forms Em and Fm were prepared, difficulty and validity indices[1] were computed on each item in these new forms. Since all pupils in the item-analysis experiment took Form Am as well as one of the new forms, difficulty and validity indices were also computed for the items in the older form Am. The final items in Em and Fm were selected to match those in Am in terms of difficulty, validity and item type. The mean difficulty for Grades 10 and 12 combined on each of the three forms was found to be approximately 62%. The mean validity index of the test items in each of the forms was approximately .50 (p. 6).

Reviewers have pointed out the lack of validity data provided by the publishers on the new forms of the Otis measures; however no

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[1]Difficulty values for each item were computed by averaging the per cents passing each item in the upper and lower 27% of the item-analysis population. Validity indices are approximations of the item-total score correlations obtained from the upper-lower 27% groups by means of the Flanagan table (p. 6).

one has responded with appropriate studies on criterion related validity. In a limited study, Estes (1965) found the correlation coefficient between the Otis (New Forms) and Stanford-Binet to be .63, between the Otis and Wechsler Intelligence Scale for Children (WICS) to be .67.

Lefever (1959) was critical of the technique for computing validity on the new measures. He reported measures described above by the publishers were more indicative of reliability. When Lefever reviewed this measure the majority of his criticisms were levels at the amount of information furnished the user rather than against the quality or usefulness of the measure. His review was concluded by stating, "Such a measure, if interpreted with care, can be useful to both teacher and counselor by revealing within fairly broad limits of accuracy the probable level of academic achievement for a majority of students" (Lefever, 1959, p. 362).

Suggested by the publishers as appropriate for research, and widely used in school settings, this measure was selected because it met the researcher's need for a short and easily scored indicator of scholastic aptitude which yields IQ's.

Tennessee Self Concept Scale (Fitts, 1965) was administered to assess the student's own picture of himself. The author reported that this self-administering paper and pencil measure was applicable to a wide range of "psychological adjustments from healthy, well-adjusted people to psychotic patients." Mean administration time is 13 minutes and scoring can be completed by hand in six or seven minutes for the Counseling form.

Scores were obtained by summing student's responses to 100 self-descriptive statements to which students had responded on a 5-point response scale ranging from "completely true" to "completely false." The most important score on the Counseling Form to be used in this study was the Total Positive Score. This measure reflected a student's "overall level of self esteem" obtained by summing the following sub-sales of the measure: Identity, Self-Satisfaction, Behavior, Physical Self, Moral-Ethical-Self, Personal Self, Family Self, and Social Self. Inter-correlations on these scores with the Total Positive Score average .88 in the data provided by the author.

Norms were developed from a sample of 626 people which included representatives from all parts of the country. Both sexes were approximately even in numbers as were blacks and whites. The educational range of the sample which came from all social, economic and intellectual levels was from the 6th grade through the PhD degree. A reported reliability of .92 was based on test-retest with 60 college students over a two week period for the Total Positive Score.

The test manual (Fitts, 1965) indicated that judges of content validity accepted the categories used in the Tennessee Self Concept Scale as "logically meaningful and publicly communicable." Validity was further supported by data indicating the instrument was capable of descriminating between groups. Statistical analyses had been performed comparing a large group of psychiatric patients (N = 369) with a non-patient normal group (N = 629). The comparison demonstrated significant differences between the patients and non patients for almost every score. The test manual (Fitts, 1965) cited several studies that indicated that the Tennessee Self Concept Scale reflected changes in self concept due to significant experiences in predicted ways. One study cited was an unpublished study of group therapy with six female patients. Therapy was preceeded by an administration of the Tennessee Self Concept Scale and other measures. Predicted Scale Changes were made from pretest data. Sixty of the 88 perdictions made were correct (p less than .001).

A Locus of Control Scale for Children (Nowicki and Strickland, in press) was administered to determine how an individual perceived the origin of the control of his behavior. The concept referred to the degree to which a student perceived the events in his life as being determined by his actions (internal control), or by some fate or force beyond his control (external control). Scores on this paper and pencil self-administering measure were taken by summing the number of yes responses given by a student to the 40 questions which composed the Scale. Low scores were indicative of internally controlled persons, and high scores indicated externally controlled persons.

Nowicki and Strickland (in press) have reported that the 40 items in their Scale "were not related to social desirability or intelligence test scores, but were related to achievement." Reported estimates of internal consistency by the split-half method, corrected by the Spearman-Brown Formula are: "r = .63 (grades 3, 4, 5); r = .68 (grades 6, 7, 8); r = .74 (grades 9, 10, 11); r = .81 (grade 12) (Nowicki and Strickland, in press). The authors believed that these reliabilities were satisfactory "in light of the fact that these items were not arranged according to difficulty." This contention is based on the fact that the "test is additive and items are not comparable, the split-half reliabilities tend to underestimate the true internal consistency of the scale." Reported test-retest reliabilities sampled at three grade levels six weeks apart were .63 for the third grade, .66 for the seventh grade, and .71 for the tenth grade. Mean scores reported by sex and grade included the following data: Tenth Grade, Males = 13.05 (s.d. 5.34), Females = 12.98; (s.d. 5.31); Eleventh Grade, Males = 12.49 (s.d. 4.81), Females = 12.01 (s.d. 5.5); Twelfth Grade, Males = 11.38 (s.d. 4.74), Females = 12.37 (s.d. 5.05).

The Problem Solving Competence Measure was an experimenter-made paper and pencil measure of real-life problem-solving ability for high school students, administered in a 50 minute class period. Five of the six problematic situations in the protocol (Appendix D) were chosen or developed from the following sources: (a) interviews with students, (b) interviews with faculty and staff members, (c) interviews with the director and counselors of the High Point Youth Service Bureau, High Point, North Carolina, a counseling service for pre-delinquent youth, (d) interviews with guidance counselors at Central High School, High Point, North Carolina, (e) secondary sources such as The Mooney Problem Check List (1950) and guidance and counseling text books (McKinney, 1958; Hudson, 1958, Shertzer & Stone, 1968, 1971), (f) problems listed in the Stony Brook Freshman Survey (Goldfried & D'Zurilla, 1972), and (g) dilemmas listed in Hypothetical Dilemmas for Use in Moral Discussion (Blatt, Colby, & Speicher, 1974). Goldfried and D'Zurilla (1972) recommended surveying students to insure the relevance and validity of the problems. Parnes and

Treffinger (1973) also cited the importance of problematic situations being relevant to the students being tested. The situations chosen were open ended and could be answered in controlled time periods without special facilities or resources. The sixth problem in the protocol was one which the student recorded his own life and experience.

Students were asked to solve the problematic situations by writing their procedures and responses to the problem. The four scoring variables for Problems 1-5 were those developed by Parnes and Treffinger (1973): (a) fluency, (b) flexibility, (c) originality, and (d) structural analysis. Fleuncy, assessed the number of ideas produced in response to the problem; flexibility, the variety or kinds of ideas produced; originality, the ability to produce unusual or infrequent ideas about the problem; and structural analysis assessed the total organization and sequency of ideas produced. Validity and reliability on these scoring criteria are found in Appendix C. They were adopted to this instrument in the following way: The scorer read each protocol and recorded the fluency, flexibility, and structural analysis scores for each problem on the experimenter-made answer sheet (Appendix U). As answers to each question were read, a frequency distribution of answers for each problem and for each class was prepared by recording the occurrence of each answer. Each class in the treatment and control groups had a frequency distribution of answers for that class to be used in assessing originality scores. The following numerical ratings were assigned to answers by weighting the frequency distribution (Wilson, Guilford, & Christensen, 1962):

Frequency of Occurrence	Rating
1	3
2-3	2
4-5	1
6 and above	0

After an answer frequency distribution was prepared for each class, originality scores were assigned to the answers for each problem by use of the frequency distribution and above weighted score values. Assigning originality scores necessitated reading each problem on each protocol a second time to record it on the answer sheet (Appendix U), however, it afforded the scorer a second opportunity to check his previous evaluation of the fluency, flexibility and structural analysis and make adjustments when errors had been made. The answer sheet (Appendix U) permitted the scorer to compute composite scores of fluency, flexibility, originality and structural analysis for each of the five problems as well as composite scores for fluency, flexibility, originality and structural analysis across the five problems. A grand score for each student was computed by summing the scores of each of the five problems, or by summing the composite scores for fluency, flexibility, originality and structural analysis across problems.

Question six requested the student to write a personal problem he was currently attempting to solve. Then, the student was requested to describe how he would meet the problem as he had done with the previous five problems. This question was designated The Personal Problem Solving Competence Measure and was scored on the following criteria: (a) fluency, (b) flexibility, and (c) structural analysis, adhering to the instructions in Appendix C. Numberical scores were recorded on the appropriate form (Appendix V). The grand score of The Personal Problem Solving Competence Measure (Problem 6) was computed by summing the scores of the three criteria described above.

A Questionnaire Regarding Real-Life Problem-Solving Training was a paper and pencil instrument consisting of 13 statements which solicited the students' response to the real-life problem-solving training experience (Appendix S). Nine of the statements were answered by responding on a Likert-type scale. One statement asked students to indicate the particular stage of problem-solving training which had helped them the most. The remaining three statements gave students an opportunity to point out areas in their lives where the training had been useful, and to indicate ways the training procedures could be improved.

Collection of Data

Data used in the statistical analysis for the study was obtained from three sources. The first and primary source was students participating in the study. Data from this source included pretest and posttest measures on the dependent variables, a questionnaire evaluating students' response to problem-solving training and IQ scores obtained from the administration of the Otis Quick-Scoring Mental Ability Test (1954).

A second source of data was student's records, from which the High School Administration supplied information on the following covariates: grade point average, age, sex, and race. At no point was the student's identity and related information on the above areas revealed.

A third source of data was teacher-recorded problem-solving behaviors observed during a month of the Fall semester when the training was being conducted.

Control of Variables

The two general methods for controlling variables were direct and statistical (Winer, 1971). The design, a modification of "The Separate-Sample Pretest-Posttest Control Group Design" (Campbell & Stanley, 1963) approached the characteristics of the "Pretest-Posttest Control Group Design" which controls for all sources of internal and external invalidity. Campbell and Stanley (1963) cited the interaction of selection and maturation as a threat to the internal validity of the design. The brief time span of two weeks between pretest and posttest should negate this threat. However, this does remain indeterminant.

Further direct control over extraneous variables was exercised by a rigid attempt to make the conditions of testing and training uniform for all classes. Since the study took place within the curriculum of a public school, subject loss was not a primary concern. Two students randomly assigned to the pretest sub-group of sociology class I, a part of the treatment group dropped the course the day the pretesting began, and two students enrolled in the same class one week into the training experience. They were not included in the data. Absenteeism during this first month of school was negligible and was not a concern. One student was absent for one week in sociology class I; however, the data were included in the study because it was recorded in the pretest measurements.

Analysis of covariance was the statistical procedure employed to control variables. This procedure was used simultaneously with direct control to adjust the data in the pretest and posttest scores by removing the effect of age, race, sex, grade point average, and IQ in the analysis of variance.

Analysis of Data

Data for the analysis were obtained from the pretest and posttest measurements of students on the dependent measures associated with problem-solving ability, locus of control and self concept. Table 6 lists the dependent variables upon which analyses were performed. Covariates used to adjust scores to add statistical control are listed in Table 7. The independent variables used in the analysis of data are listed in Table 8.

Statistical analysis was completed using the Statistical Package for the Social Sciences (Nie et al., 1975), and the Statistical Analysis System (North Carolina State University, 1972). Analysis of Covariance on a three factor design (Treatment x Teacher x Test), each factor having two levels, was performed to test the hypothesis regarding real-life problem-solving ability, locus of control, and self concept. Winer (1973) called the design Model I, where all factors are fixed. Differences exceeding the .05 level were considered significant. Analysis of covariance on a five factor design (Sex x Race x Treatment x Teacher x Test), each factor having two levels, was performed to test the hypothesis regarding real-life problem-solving differences related to sex. This design was also Model I (Winer, 1973).

Table 6

Dependent Variables Used in the Analysis of Data

1. The Grand Score of The Problem Solving Competence Measure (GPS)
2. The Fluency Score of The Problem Solving Competence Measure
3. The Flexibility Score of The Problem Solving Competence Measure
4. The Originality Score of The Problem Solving Competence Measure
5. The Structural Analysis Score of The Problem Solving Competence Measure
6. Problem No. 1 of The Problem Solving Competence Measure
7. Problem No. 2 of The Problem Solving Competence Measure
8. Problem No. 3 of The Problem Solving Competence Measure
9. Problem No. 4 of The Problem Solving Competence Measure
10. Problem No. 5 of The Problem Solving Competence Measure
11. The Grand Score of The Personal Problem Solving Competence Measure (PGPS) (Combined score of The Personal Problem (Problem No. 6) of The Problem Solving Competence Measure)
12. The Fluency Score of The Personal Problem Solving Competence Measure
13. The Flexibility Score of The Personal Problem Solving Competence Measure
14. The Structural Analysis Score of The Personal Problem Solving Competence Measure
15. Locus of Control measured by the Nowicki and Strickland Scale (in press)
16. Self Concept measured by the Tennessee Self Concept Scale (Fitts, 1965).
17. IQ Measured by the Otis Quick Scoring Mental Ability Test (1954) Gamma Test (Form Fm)
18. Grade Point Average of Students

Table 7

Control Variables (Covariates)

1. Age of Student
2. Sex of Student
3. Race of Student
4. Grade Point Average of Student
5. IQ of Student

Table 8

Independent Variables

1. Treatment
a. Treatment Group
b. Control Group
2. Test
a. Pretest
b. Posttest
3. Teacher
a. Teacher 1
b. Teacher 2
4. Sex
a. Female
b. Male
5. Race
a. Black
b. White

The Pearson Product Moment Correlation was utilized to establish the relationship of variables in the study to test the hypotheses on the relationship between real-life problem solving ability and IQ and grade point average.

Percentages were computed on the students' responses to the ten statements on the Likert-type scale on the questionnaire regarding real-life problem-solving training in order to answer the question about students' response and receptiveness to real-life problem-solving training in a classroom setting. Other data on the questionnaire were reported without statistical analysis.

Reliability of Scoring

After instructing two alternate scorers (scorer 2 and scorer 3) for approximately 30 minutes each in the use of the Parnes and Treffinger (1973) scoring criteria (Appendix C) protocols were distributed for scoring. A random sample of 40 of the 121 students responses to the five problems of The Problem Solving Competence Measure, and the one personal problem of The Personal Problem Solving Competence Measure (Problem No. 6) were coded to conceal the student's group (treatment or control; pretest or posttest), shuffled, and given to the alternate scorers with unmarked answer sheets (Appendices U and V). The random sample represented the responses of five students randomly drawn from each of the sub-groups (pretest and posttest) which comprised the treatment and control groups described in Table 3. Numerically, this meant that the alternate scorers scored answers to 240 of the 726 problems answered by the 121 students in the study. The procedure of inter-rater reliabilities on a random sample was chosen because of the large number of students in the study and the time required to score each protocol. The average scoring time was 25 minutes for each student's response. On the originality scale the alternate scorer (scorer 3) used the frequency distribution of answers prepared for each class of the treatment and control groups by the experimenter. This seemed acceptable in view of the inter-rater reliability coefficient of .96 on the fluency score, the measure tallied to compose the frequency distribution for each class. The weighted scores for the originality scores were: a 3 rating for answers that appeared only one time in a class, a 2 rating for answers that appeared 2-3 times in a class, a 1 rating for answers that appeared 4-5 times in a class and a 0 rating for answers that appeared 6 or more times. Table 9 summarizes the results of the inter-rater reliabilities of scorers 1, 2, and 3 compared with the inter-rater reliabilities reported in the Parnes and Treffinger (1973) study.

The inter-rater reliabilities of scorers summarized in Table 9 indicate a high positive relationship between the scoring of scorer 1 and 2, 1, and 3, and 2 and 3 (Downie & Heath, 1974). The inter-rater reliabilities reported for this study were similar to those reported in the Parnes and Treffinger (1973) study.

Table 9

Inter-rater Reliabilities for Scorers 1, 2, and 3 Compared with the Parnes and Treffinger Inter-rater Reliabilities (1973)

Scoring Criteria	Parnes and Treffinger correlations	Scorer 1 and Scorer 2 correlations	Scorer 1 and Scorer 3 correlations	Scorer 2 and Scorer 3 correlations
<u>Problem Solving Competence Measure</u>				
1. Grand Score				
2. Fluency	.93*	.99*	.96*	.97*
3. Flexibility	.82*	.95*	.94*	.91*
4. Originality	.94*		.94*	
5. Structural Analysis	.74*	.90*	.87*	.82*
<u>Personal Problem Solving Competence Measure</u>				
1. Grand Score		.94*	.96*	.96*
2. Fluency		.94*	.96*	.95*
3. Flexibility		.85*	.88*	.78*
4. Structural Analysis		.81*	.82*	.82*

*Significant at the .05 level or less

CHAPTER IV

PRESENTATION AND INTERPRETATION OF DATA

This study was undertaken to determine the effects of real-life problem-solving training in the stages of the classical consensus problem-solving model (Dewey, 1910; Davis, 1966, 1973; Krumboltz, 1966; Goldfried & D'Zurilla, 1972) on high school students' real-life problem-solving ability. Questions were raised on the effect of real-life problem-solving training on students' self concept. Locus of control was also investigated. Other questions investigated included sex differences in real-life problem-solving ability and the correlation of real-life problem-solving ability with IQ and grade point average. Inquiry was made into the effect of real-life problem-solving ability upon students' behavior in such areas as study initiative, and problems related to curriculum and student life. An effort was made to evaluate high school students' response and receptiveness to real-life problem-solving training in a classroom setting. The study sought to determine if high school students would find this training helpful for their personal lives. Also investigated were the relationship of Race and Age to problem-solving ability.

One hundred twenty-one high school students enrolled in three sociology classes and one psychology class participated in the study. The design of the study was a modification of "The Separate-Sample Pretest-Posttest Control Group Design" (Campbell & Stanley, 1963). Four classes were randomly assigned to the treatment or control groups. Within each of the four classes students were randomly assigned to pretest and posttest sub-groups. In this design students were tested only one time, either in the pretest or posttest. Two of the classes composed the treatment groups which received fifty minute training periods each on ten consecutive school days. Two days of instruction were spent giving training on each of the five problem-solving stages: (a) training to develop an appropriate problem-solving orientation or "set," (b) training in problem definition and formulation, (c) training in the generation of alternative responses or solutions, (d) training in decision making, and (e) training in testing the effectiveness of problem-solving. Two fifty minute drills on the application of the problem-solving stages to real-life problems followed immediately after the training sessions. The two classes which comprised the control group were engaged in a co-ordinated program which focused upon the history, development and organization of people living together. This meant that both classes of the control group were studying the same thing during the period when problem-solving training was being conducted with the two classes in the treatment group.

Data used in the statistical analysis for the study were obtained from three sources: measurement on dependent and independent variables, information supplied by the administration from student records, and teacher-reported problem solving behaviors.

The results of the statistical analyses are reported for each of the following: The Problem Solving Competence Measure, The Personal Problem Solving Competence Measure, Locus of Control, Self Concept, The Relationship of Sex Difference to Real-Life Problem Solving Ability, The

Relation of IQ to Real-Life Problem-Solving Ability, The Relationship of Grade Point Average to Real-Life Problem-Solving Ability, Problem-Solving Related Behaviors, and Students' Responses to Real-Life Problem-Solving Training. In addition to these results of statistical analyses made to test null hypotheses and to answer questions, results of the statistical analyses of The Relation of Race Difference to Real-Life Problem-Solving ability and The Relationship of Age to Real-Life Problem-Solving Ability are also reported. No null hypotheses were stated, nor were any research questions asked in relation to these two variables. Race and age were used as covariates in the Analysis of Covariance procedures.

The Problem Solving Competence Measure

The Problem Solving Competence Measure assessed real-life problem-solving skills. It yielded a grand problem-solving score which was obtained by summing scores on the following four problem-solving criteria: fluency, flexibility, originality, and structural analysis. An alternate method of computing the grand problem-solving score consisted of summing the fluency, flexibility, originality and structural analysis scores for the five problems used in the measure.

Grand Problem Solving Score

The null hypothesis associated with this measure was: There will be no differential increase in the grand problem-solving scores between pre and post testing for the treatment and control groups.

Analysis of covariance on a three factor design (Treatment x Teacher x Test), each factor having two levels, was performed. Table 10 summarizes the results of the analysis. Two significant main effects

Table 10

Analysis of Covariance for the Grand Problem Solving Score of The Problem Solving Competence Measure

Source	df	MS	F
Covariates			
Age	1	68.39	0.28
Sex	1	810.84	3.36
Race	1	1210.06	5.02*
G.P. Average	1	2092.19	8.69*
IQ	1	118.97	0.49
Treatment (A)	1	4732.95	19.66*
Teacher (B)	1	261.92	1.08
Test (C)	1	6355.10	26.41*
AB	1	98.76	0.41
AC	1	13305.64	55.29*
BC	1	114.46	0.47
ABC	1	1.65	0.00
Error	108	240.63	

*Significant at the .05 level or less.

emerged from this analysis: a main effect between the scores of the treatment and control groups and between the scores of the pretest and posttest groups. The data revealed that averaged over time periods students in the treatment group achieved significantly greater problem-solving scores than those in the control group. When scores were averaged over the treatment and control groups for the pretest and posttest groups, the data revealed that the posttest group achieved significantly greater problem-solving scores than those in the pretest group. There was a significant interaction between the time of testing (pretest and posttest) and treatment (treatment and control). Since there was a significant Treatment x Testing interaction, the null hypothesis was rejected. Table 11 presents the adjusted means for the treatment and control groups categorized by time of testing (pretest and posttest). Figure 2 presents the joint effect of the treatment and time variables in the interaction. The data given in Figure 2 revealed that for the control group there was very little difference between the pretest and posttest scores. In the treatment group, after real-life, problem-solving training, the posttest scores were greater.

A three factor Analysis of Covariance (Treatment x Teacher x Test), was performed on each of the four criteria which compose the grand problem-solving score: fluency, flexibility, originality, and structural analysis to determine if the results of analysis for the Grand Problem Solving Score were consistent across the component parts.

<u>Fluency Score of The Problem Solving Competence Measure</u>

The Fluency Score represented the total number of ideas that the student produced in response to the five problems on the Problem Solving

Table 11

Adjusted Means of the Grand Score of the Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	37.96	74.36	56.16
Control Group	46.88	40.78	43.68
	42.49	56.49	

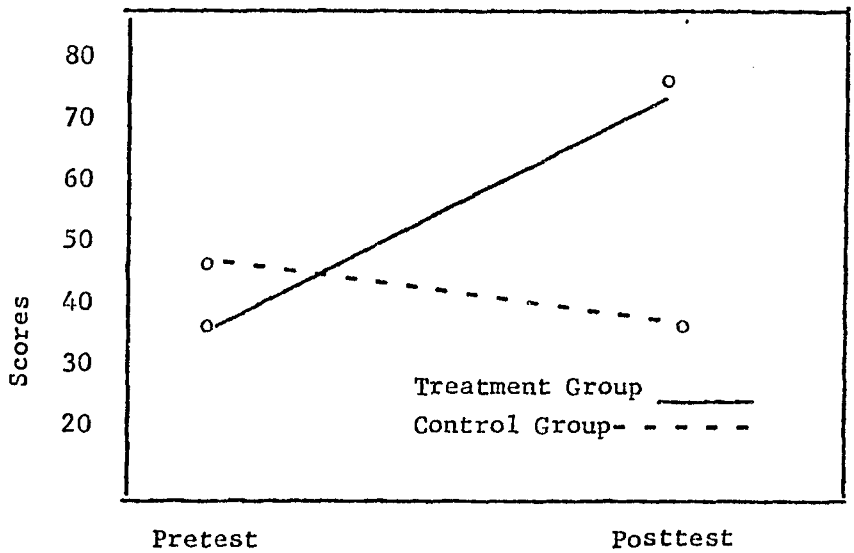

Figure 2. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Grand Problem Solving Score of The Problem Solving Competence Measure.

Competence Measure. "Ideas" include all things which the student says he will do. One point was given for each idea, so long as some specific action or behavior was described.

The analysis of covariance for the Fluency Score of The Problem Solving Competence Measure produced the same significant main effects and interaction described above in the analysis of covariance for the Grand Score. There were significant main effect differences between the scores of the treatment and control groups and between the scores of the pretest and posttest groups. A significant interaction occurred between time of testing (pretest and posttest) and treatment (treatment and control). The results of the analysis is summarized in Table 12. Adjusted means for the treatment and control groups categorized by time of testing (pretest and posttest) are presented in Table 13. Figure 3 presents the interaction of the treatment variables (treatment and control) and time of testing (pretest and posttest) for adjusted means of the fluency score. The interaction between treatment and time of testing presented in Figure 3 indicated that little change occurred over time for the control groups, however, there was a marked increase in fluency performance for the treatment group. This interaction between treatment and time of testing for the fluency scores was similar to the interaction between treatment and time of testing for the grand problem solving score which led to the rejection of the null hypothesis.

Flexibility Score of The Problem Solving Competence Measure

The Flexibility Score represented the student's ability to see different kinds of possible solutions. It measured the alternative ways

Table 12

Analysis of Covariance for the Fluency Scores of The Problem Solving Competence Measure

Source	df	MS	F
Covariates			
Age	1	10.06	0.41
Sex	1	137.08	5.62*
Race	1	117.87	4.84*
G. P. Average	1	205.98	8.45*
IQ	1	29.56	1.21
Treatment (A)	1	478.14	19.63*
Teacher (B)	1	23.73	0.95
Test (C)	1	758.85	31.16*
AB	1	1.22	0.05
AC	1	1270.13	52.15*
BC	1	9.00	0.36
ABC	1	12.54	0.51
Error	108	24.35	

*Significant at the .05 level or less.

Table 13

Adjusted Means of the Fluency Score of The Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	12.71	24.55	18.63
Control Group	15.36	14.00	14.65
	14.06	18.93	

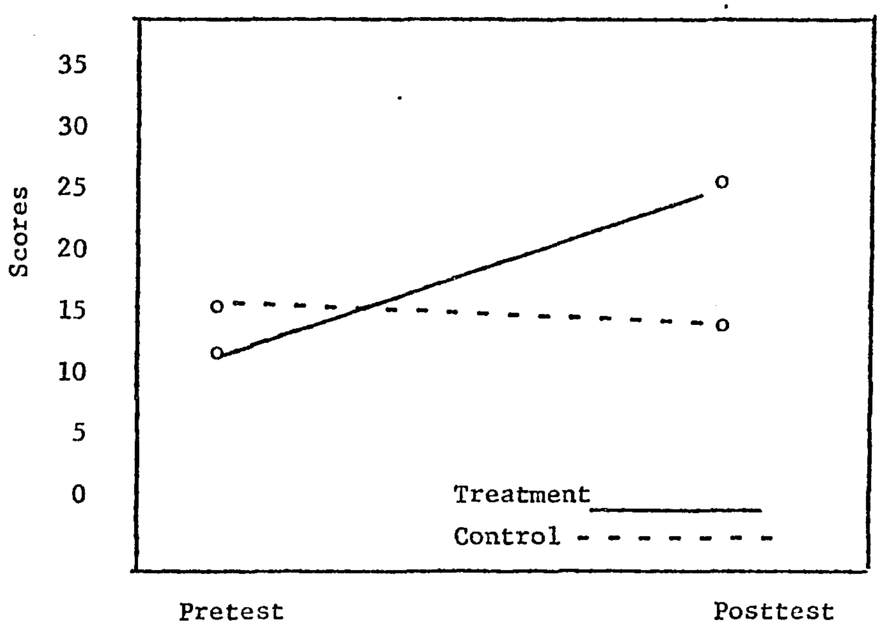

Figure 3. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Fluency Score of The Problem Solving Competence Measure

of solving the problem. The Flexibility Score was the number of different categories of solutions used by the student to solve the five problems in The Problem Solving Competence Measure.

The analysis of covariance for the Flexibility Score revealed three significant main effects and a significant interaction. There were significant main effect differences between the scores of the treatment and control groups, between the scores obtained under the two levels of the cooperating classroom teacher, and between the scores of the pretest and posttest groups. A significant interaction occurred between time of testing (pretest and posttest) and treatment (treatment and control). The results of the analysis is summarized in Table 14. Adjusted means for the treatment and control groups categorized by time of testing (pretest and posttest) are presented in Table 15. Figure 4 presents the interaction of the treatment variable and the time of testing for adjusted means of the Flexibility Score.

The interaction between treatment and time of testing presented in Figure 4 indicated that little change occurred over time for the control group. In the treatment group, after real-life problem-solving training, the posttest scores were greater. The interaction between the time of testing for the Flexibility Scores was similar to the interaction between treatment and time of testing for the Grand Score which led to the rejection of the first null hypothesis.

<u>Originality Score for The Problem Solving Competence Measure</u>

The Originality Score was a measure of the uniqueness of a solution given by a student to a problem in comparison to solutions given by other

Table 14

Analysis of Covariance for the Flexibility Scores of The Problem Solving Competence Measure

Source	df	MS	F
Covariates			
Age	1	1.64	0.13
Sex	1	4.89	0.41
Race	1	35.21	2.97
G. P. Average	1	57.26	4.83*
IQ	1	9.74	0.82
Treatment (A)	1	61.94	5.22*
Teacher (B)	1	87.80	7.40*
Test (C)	1	288.24	24.31*
AB	1	18.72	1.57
AC	1	531.52	44.84*
BC	1	0.07	0.006
ABC	1	7.57	0.63
Error	108	11.85	

*Significant at the .05 level or less.

Table 15

Adjusted Means of the Flexibility Score of the Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	8.97	16.41	12.69
Control Group	11.84	10.76	11.27
	10.43	13.40	

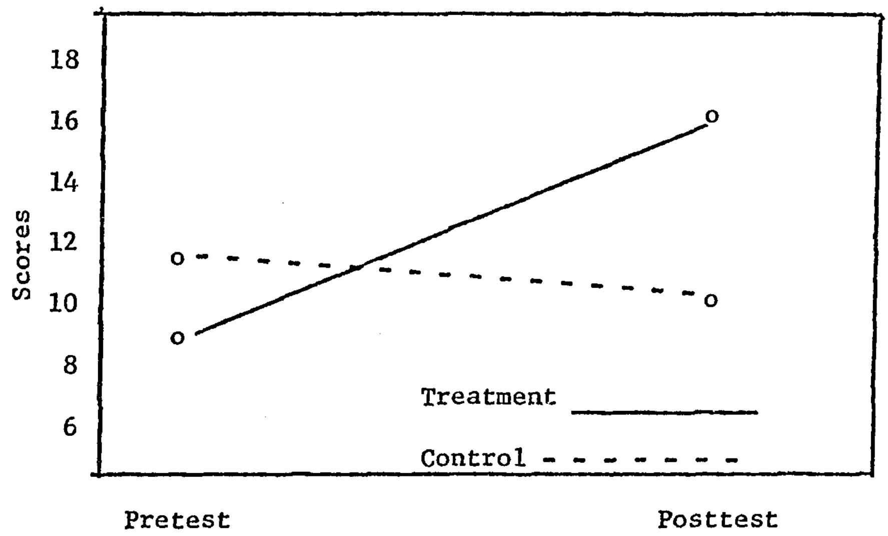

Figure 4. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Flexibility Scores of The Problem Solving Competence Measure

students in the group to the same problem. Scores were weighted to represent the number of times a solution occurred. If the solution occurred one time in the total responses of the group to the problem it received a score of 3. Solutions which occurred two to three times received a score of 2. Those solutions which occurred four to five times received a score of 1. Any solutions which occurred six or more times in a group received a 0 score. The total weighted score computed by summing the scores of each of the five problems of The Problem Solving Competence Measure was the student's Originality Score.

The analysis of covariance for the Originality Score resulted in two significant main effects and one significant interaction. Significant main effect differences were observed between the scores of the treatment and control groups and between the scores of the pretest and posttest groups. The analysis revealed a significant interaction between time of testing (pretest and posttest) and treatment (treatment and control). Table 16 summarizes the results of the analysis. Table 17 presents adjusted means for the treatment and control group categorized by time of testing (pretest and posttest). The interaction of the treatment variable and time of testing for adjusted means of the Originality Score of The Problem Solving Competence Measure is presented in Figure 5. The interaction between treatment and time of testing presented in Figure 5 indicated that little change occurred over time for the control group; however there was a marked increase in originality performance for the treatment group. This interaction between treatment and time of testing for the Originality Score was similar to the interaction

Table 16

Analysis of Covariance for the Originality Scores of
The Problem Solving Competence Measure

Source	df	MS	F
Covariates			
Age	1	9.69	0.18
Sex	1	53.80	1.03
Race	1	154.81	2.98
G. P. Average	1	265.70	5.12*
IQ	1	4.97	0.09
Treatment (A)	1	643.00	12.40*
Teacher (B)	1	9.06	0.17
Test (C)	1	465.60	8.98*
AB	1	24.41	0.47
AC	1	1511.32	29.15*
BC	1	34.26	0.66
ABC	1	1.58	0.03
Error	108	51.83	

*Significant at the .05 level or less.

Table 17

Adjusted Means of the Originality Score of the Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	9.29	20.56	14.92
Control Group	11.88	8.96	10.35
	10.60	14.38	

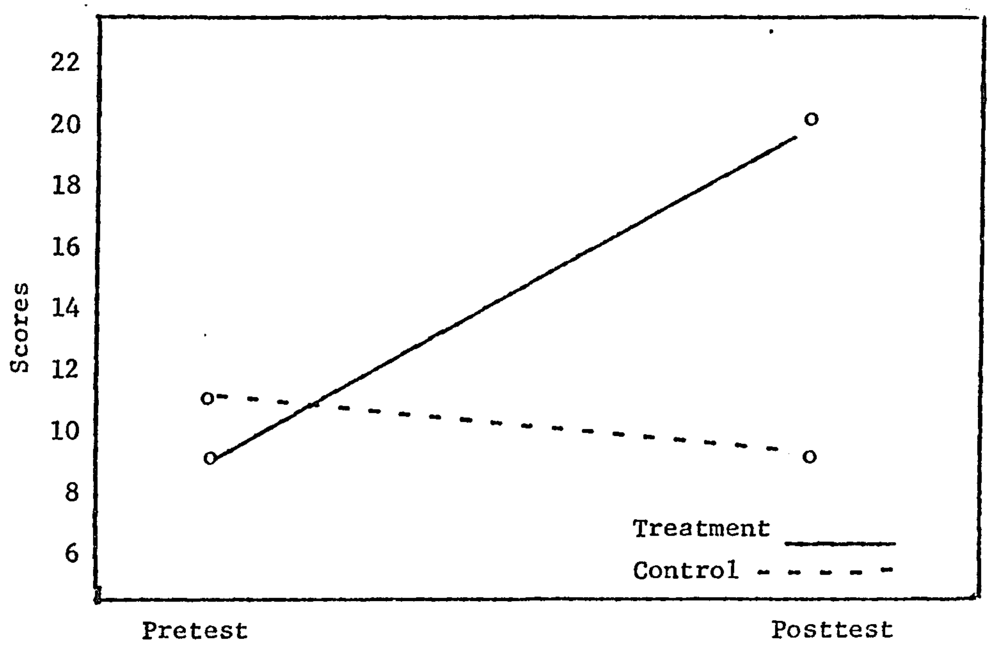

Figure 5. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Originality Score of The Problem Solving Competence Measure.

between treatment and time of testing for the Grand Problem Solving Score which led to the rejection of the null hypothesis.

Structural Analysis Score for The Problem Solving Competence Measure

The Structural Analysis Score was assigned after reading the student's complete response to a problem. A total of 3 points were assigned to the problem if the response included a clear, complex plan which outlined a sequence of several successive actions to be taken. To receive 3 points, the statement had to indicate some understanding of the consequences of each possible response. When a student indicated that he had a clear idea of what he would do through one or more possible actions, but lacked clear organization in how he would solve the problem, he received 2 points. The student was assigned 1 point for the problem if he merely gave one or more ideas which specified actions he might take. Zero points were given if the student had no ideas, or if the response to the problem was completely irrelevant. The Structural Analysis Score was the sum of the points assigned to the five problems for this measure in The Problem Solving Competence Measure.

The analysis of covariance for the Structural Analysis Score revealed three significant main effects and one significant interaction. There were significant main effect differences between the scores of the treatment and control groups, between the scores obtained under the two levels of the cooperating classroom teacher, and between the scores of the pretest and posttest groups. A significant interaction occurred between time of testing (pretest and posttest) and treatment (treatment and control). Table 18 summarizes the results of the analysis. Adjusted

Table 18

Analysis of Covariance for the Structural Analysis Scores of The Problem Solving Competence Measure

Source	df	MS	F
Covariates			
Age	1	0.09	0.02
Sex	1	41.05	12.83*
Race	1	25.47	7.96*
G.P. Average	1	34.01	10.63*
IQ	1	0.35	0.11
Treatment (A)	1	163.44	51.08*
Teacher (B)	1	17.03	5.32*
Test (C)	1	213.15	66.62*
AB	1	0.33	0.10
AC	1	356.70	108.35*
BC	1	2.22	0.69
ABC	1	0.73	0.23
Error	108	3.19	

*Significant at the .05 level or less.

means for the treatment and control groups categorized by time of testing (pretest and posttest) are presented in Table 19. Figure 6 presents the joint effect of the treatment and time variables in interaction. The data given in Figure 6 revealed that for the control treatment there was very little difference between the pretest and posttest scores. In the treatment group, after real-life problem-solving training, the posttest scores were greater. This interaction between treatment and time of testing for the Structural Analysis Scores was similar to the interaction between treatment and time of testing for the Grand Problem Solving Score which led to the rejection of the null hypothesis.

Five Problems within The Problem Solving Competence Measure

The Problem Solving Competence Measure in addition to having scores on fluency, flexibility, originality, and structural analysis yielded scores on five different problems in the Measure. Analysis of covariance on a 3 factor design (Treatment x Teacher x Test) each factor having two levels, was computed on the scores of each of the five problems. The data revealed significant main effect differences similar to those reported above for the Grand Problem Solving Score, Fluency, Flexibility, Originality, and Structural Analysis. There was a signifi- interaction between the time of testing (pretest and posttest) and treatment (treatment and control) for all of the five problems. Tables summarizing the results of the analysis of covariance and adjusted means for the treatment and control groups categorized by time of testing (pretest and posttest) for the five problems are presented in Appendix W. Figures A - E presenting the joint effect of the

Table 19

Adjusted Means of the Structural Analysis Score of the Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	6.63	12.83	9.73
Control Group	7.76	7.07	7.40
	7.20	9.77	

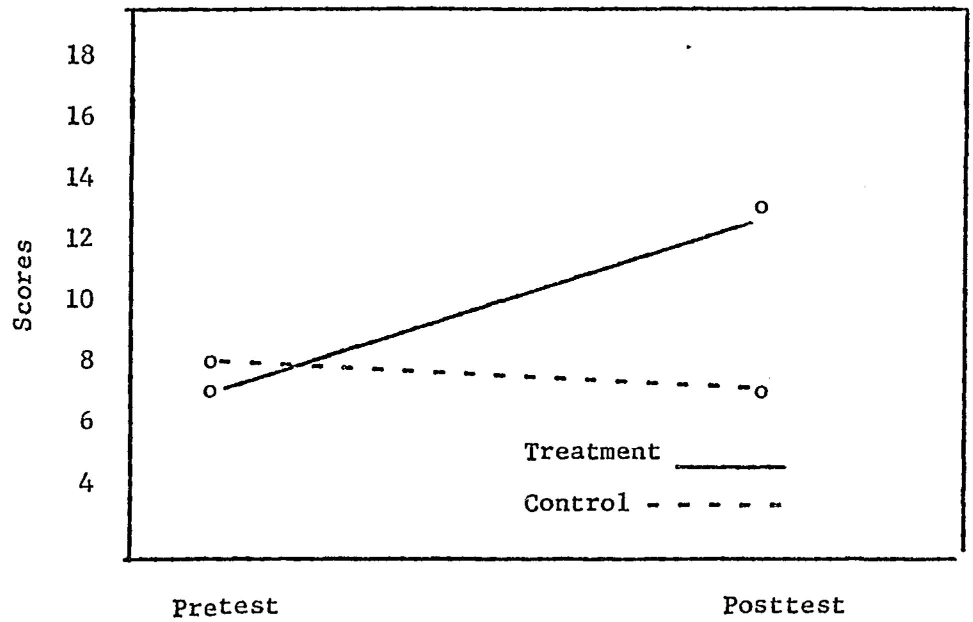

Figure 6. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Structural Analysis Score of The Problem Solving Competence Measure.

treatment and time variables for each of the five problems are also presented in Appendix W.

The Personal Problem Solving Competence Measure

The Personal Problem Solving Competence Measure evaluated how a student responded to a personal real-life problem. The student stated a real-life problem with which he was currently dealing. Measurements were taken on three criteria: fluency, flexibility, and structural analysis. These measures were the same as those described above for The Problem Solving Competence Measure. A Grand Score for the measure was obtained by summing the scores of these three criteria.

Grand Personal Problem Solving Score

The null hypothesis associated with this measure was: There will be no differential increase in the grand personal problem-solving scores between pre and post testing of the treatment and control groups. This null hypothesis was tested by the interaction of treatment and time of testing in a three factor analysis of covariance.

Analysis of covariance on a three factor design (Treatment x Teacher x Test) each having two levels was performed. One significant main effect and one significant interaction were observed: a significant main effect difference between the scores of the pretest and posttest groups and a significant interaction between time of testing (pretest and posttest) and treatment (treatment and control). Since there was a significant treatment x testing interaction, the null hypothesis was rejected. The result of the analysis is summarized in Table 20. Adjusted means for the treatment and control groups categorized by

Table 20

Analysis of Covariance for the Grand Problem Solving Score of The Personal Problem Solving Competence Measure

Source	df	MS	F
Covariate			
Age	1	16.14	5.42*
Sex	1	7.65	2.57
Race	1	19.12	6.42*
G. P. Average	1	10.82	3.63
IQ	1	0.01	0.004
Treatment (A)	1	4.71	1.58
Teacher (B)	1	0.63	0.21
Test (C)	1	68.87	23.14*
AB	1	5.39	1.81
AC	1	54.97	18.47*
BC	1	7.06	2.37
ABC	1	7.16	2.40
Error	108	14.97	

*Significant at the .05 level or less.

time of testing (pretest and posttest) are presented in Table 21. Figure 7 presents the interaction of the treatment variable and time of testing for adjusted means of the Grand Score of The Personal Problem Solving Competence Measure. The interaction between treatment and time of testing presented in Figure 7 indicated that little change occurred over time for the control group. In the treatment group after real-life problem-solving training, the posttest scores were greater.

A three factor analysis of covariance (Treatment x Teacher x Test) was performed on each of the three criteria which compose the Grand Personal Problem Solving Score: fluency, flexibility and structural analysis, to determine if the results were consistent across the component parts.

<u>Fluency Score of The Personal Problem Solving Competence Measure</u>

The Fluency Score represented the total number of ideas that the student produced in response to his personal problem. "Ideas" included all things which student says he will do. One point was given for each idea, so long as some specific action or behavior was described.

The analysis of covariance for the Fluency Score yielded one significant main effect and one significant interaction. There was a significant main effect difference between the scores of the pretest and posttest groups. A significant interaction occurred between time of testing (pretest and posttest) and treatment (treatment and control). Table 22 summarizes the results of the analysis. Adjusted means for the treatment and control groups categorized by time of testing (pretest and posttest) are presented in Table 23. Figure 8 presents the interaction of the treatment variables and time of testing for adjusted means of the

Table 21

Adjusted Means of the Grand Score of the Personal Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	3.21	10.19	6.70
Control Group	5.27	5.65	5.47
	4.26	7.78	

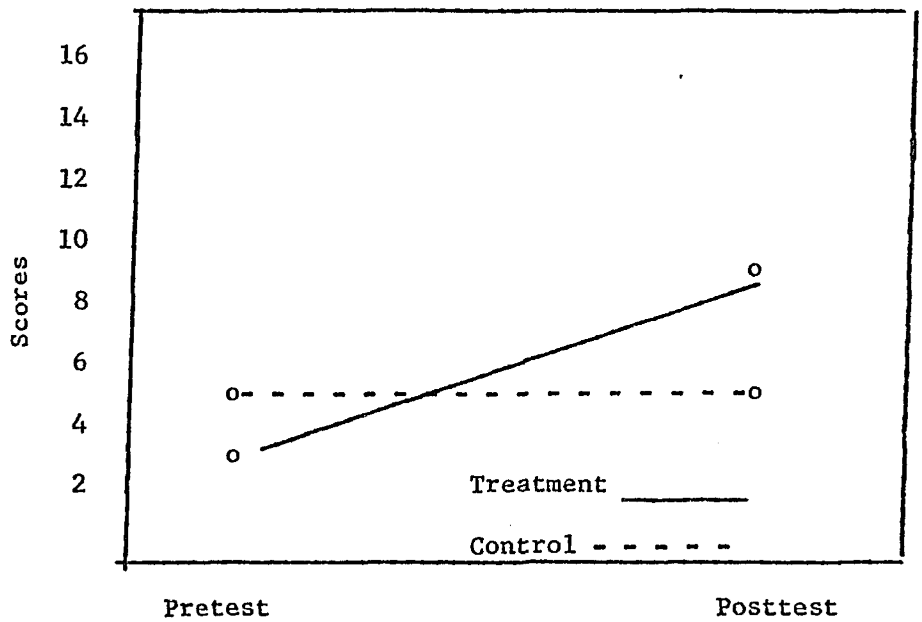

Figure 7. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Grand Problem Solving Score of the Personal Problem Solving Competence Measure.

Table 22

Analysis of Covariance for the Fluency Scores of The Personal Problem Solving Competence Measure

Source	df	MS	F
Covariate			
Age	1	6.73	3.21
Sex	1	9.49	3.57
Race	1	18.44	8.79*
G. P. Average	1	5.72	2.74
IQ	1	0.00	0.00
Treatment (A)	1	6.86	3.27
Teacher (B)	1	0.50	0.23
Test (C)	1	48.09	22.93*
AB	1	8.13	3.88
AC	1	57.70	27.52*
BC	1	1.34	0.63
ABC	1	6.50	3.10
Error	108	2.97	

*Significant at the .05 level or less.

Table 23

Adjusted Means of the Fluency Score of the Personal Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	1.27	4.25	2.76
Control Group	2.24	2.46	
	1.76	3.30	

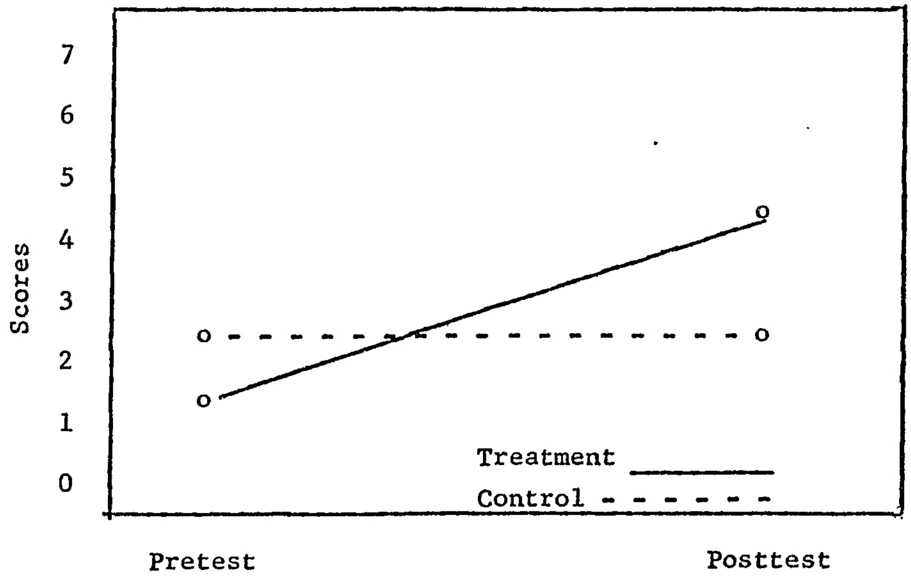

Figure 8. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Fluency Score of The Personal Problem Solving Competence Measure.

Fluency Score of The Personal Problem Solving Competence Measure. The interaction between treatment and time of testing presented in Figure 8 indicated that little change occurred over time for the control group; however there was a marked increase in fluency performance for the treatment group. This interaction between the treatment and time was similar to the interaction between treatment and time of testing for the Grand Personal Problem Solving Score which led to the rejection of the null hypothesis.

Flexibility Score of The Personal Problem Solving Competence Measure

The Flexibility Score represented the student's ability to see different kinds of possible solutions. It measured the alternative ways of solving the problem. The Flexibility Score was the number of different categories of solutions used by the student to solve the personal real-life problem.

The analysis of covariance for the Flexibility Score revealed one significant main effect and one significant interaction. There was a significant main effect difference between the scores of the pretest and posttest group. A significant interaction occurred between time of testing (pretest and control), and the results of the analysis are summarized in Table 24. Adjusted means for treatment and control groups categorized by time of testing (pretest and posttest) are presented in Table 25. Figure 9 presents the joint effect of the treatment and time variables interaction. The data given in Figure 9 revealed that for the control treatment there was little difference between the pretest and posttest scores. In the treatment group, after real-life

Table 24

Analysis of Covariance for the Flexibility Scores of The Personal Problem Solving Competence Measure

Source	df	MS	F
Covariate			
Age	1	6.73	3.21
Sex	1	7.49	3.57
Race	1	18.44	8.79*
G. P. Average	1	5.76	2.74
IQ	1	0.00	0.00
Treatment (A)	1	6.86	3.27
Teacher (B)	1	0.50	0.23
Test (C)	1	48.09	22.93*
AB	1	8.13	3.88
AC	1	57.70	27.52*
BC	1	1.34	0.63
ABC	1	6.50	3.10
Error	108	2.09	

*Significant at the .05 level or less.

Table 25

Adjusted Means of the Flexibility Score of the Personal Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	1.05	3.82	2.43
Control Group	1.97	1.92	1.94
	1.52	2.80	

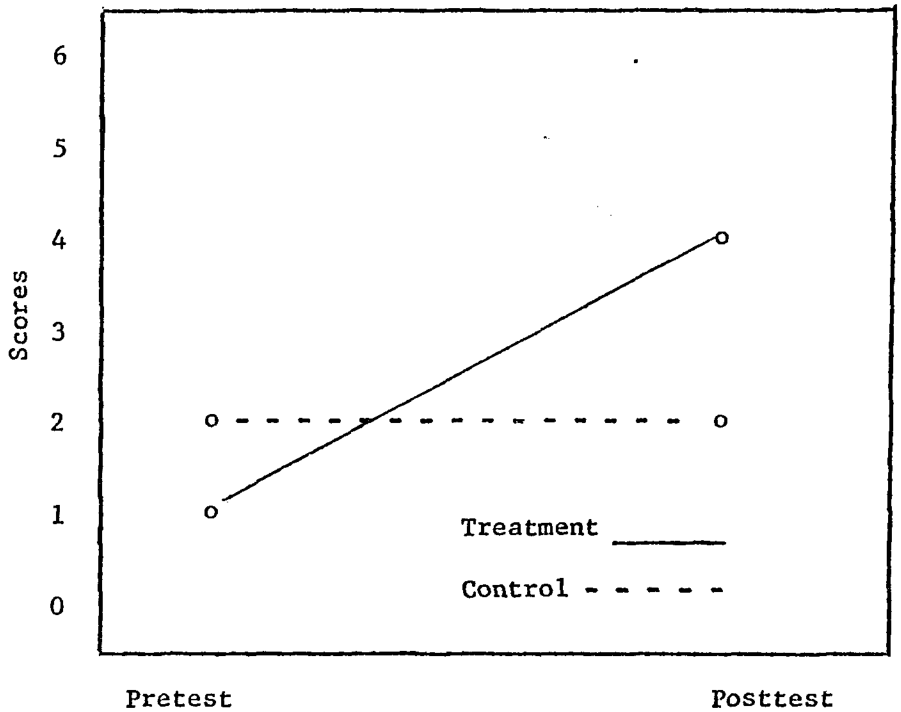

Figure 9. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Flexibility Score of The Personal Problem Solving Competence Measure.

problem-solving training, the posttest scores were greater. The interaction between treatment and time of testing for the Flexibility Score was similar to the interaction between treatment and time of testing for the Grand Personal Problem Solving Competence Measure which led to the rejection of the null hypothesis.

Structural Analysis Score for The Personal Problem Solving Competence Measure

The Structural Analysis Score was assigned after reading the student's complete response to a problem. A total of 3 points were assigned to the problem if the response included a clear, complex plan which outlined a sequence of several successive actions to be taken. To receive 3 points, the statement had to indicate some understanding of the consequences of each possible response. When a student indicated that he had a clear idea of what he would do through one or more possible actions, but lacked clear organization in how he would solve the problem, he received 2 points. The student was assigned 1 point for the problem if he merely gave one or more ideas which specified actions he might take. Zero points were given if the student had no ideas, or if the response to the problem was completely irrelevant. The Structural Analysis Score was the sum of the points assigned to the five problems for this measure in The Problem Solving Competence Measure.

The analysis of covariance for the Structural Analysis Score revealed one significant main effect and two significant interactions. There was a significant main effect difference between the scores of the pretest and posttest groups. A significant interaction occurred between time of testing (pretest and posttest) and teacher (teacher 1 and teacher 2). A significant interaction occurred between time of testing (pretest and posttest) and treatment (treatment and control). Table 26 summarizes the results of the analysis. Adjusted means for teacher (teacher 1 and teacher 2) categorized by time of testing (pretest and posttest) are presented in Table 27. Adjusted means for the treatment and control groups categorized by time of testing (pretest and posttest) are presented in Table 28. Figure 10 presents the joint effect of the teacher and time variables in interaction. The data given in Figure 10 revealed that for teacher 1 there was very little difference between the pretest and posttest scores. In the teacher 2 group, after real-life problem solving training, the posttest scores were greater. Figure 11 presents the interaction of the treatment variable and time of testing for adjusted means of the structural analysis score. The interaction between treatment and time of testing presented in Figure 11 indicated that little change occurred over time for the control group; however there was a marked increase in structural analysis performance for the treatment group. The interaction between treatment and time of testing presented in Figure 11 indicates that little change occurred over time for the control group; however there was a marked increase in structural analysis performance for the treatment group.

Locus of Control

Locus of Control was a concept used to describe how an individual perceived the origin of the control of his behavior. The construct referred to the degree to which students perceived the events in his life as being determined by his own actions (internal control), or by some

Table 26

Analysis of Covariance for the Structural Analysis Scores of The Personal Problem Solving Competence Measure

Source	df	MS	F
Covariate			
Age	1	1.25	1.78
Sex	1	0.32	0.46
Race	1	3.64	5.17*
G. P. Average	1	0.59	0.84
IQ	1	0.03	0.04
Treatment (A)	1	1.82	2.60
Teacher (B)	1	1.37	1.95
Test (C)	1	13.04	18.56*
AB	1	2.66	3.78
AC	1	6.63	9.43*
BC	1	3.70	5.27*
ABC	1	0.27	0.39
Error	108	0.70	

*Significant at the .05 level or less.

Table 27

Adjusted Means of the Structural Analysis Score of The Personal Problem Solving Competence Measure for Levels of Teacher and Tests

	Pretest	Posttest	
Teacher I Group	1.28	1.53	1.41
Teacher II Group	0.71	1.69	1.20
	0.95	1.62	

Table 28

Adjusted Means of the Structural Analysis Score of the Personal Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	.84	2.01	1.42
Control Group	1.06	1.27	1.17
	0.95	1.62	

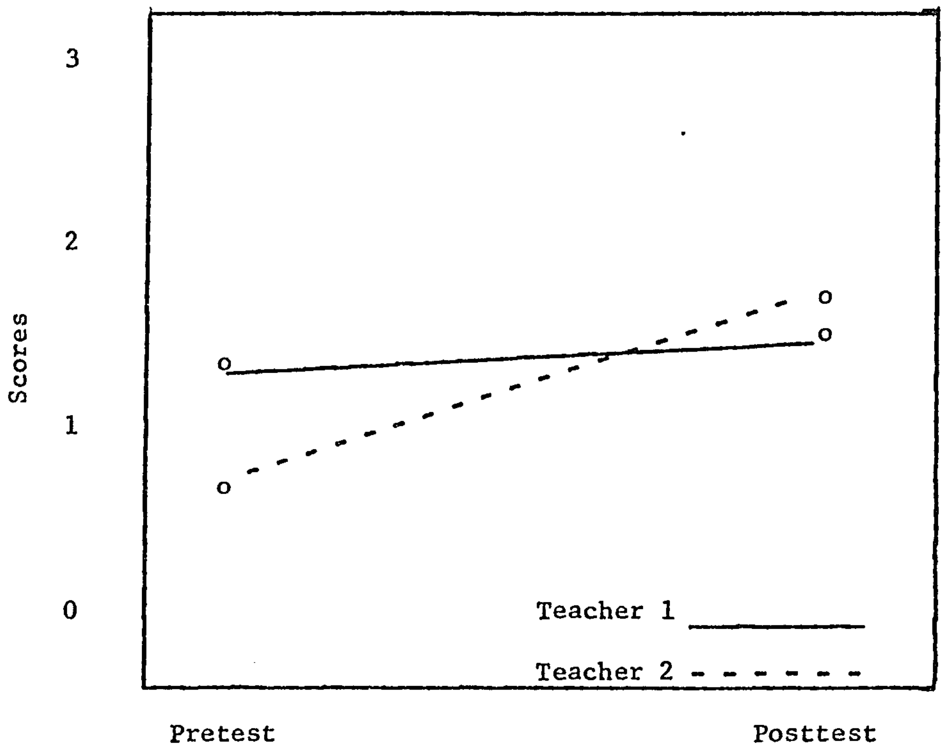

Figure 10. Interaction of the Treatment Variable and Teacher for Adjusted Means on the Structural Analysis Score of The Personal Problem Solving Competence Measure.

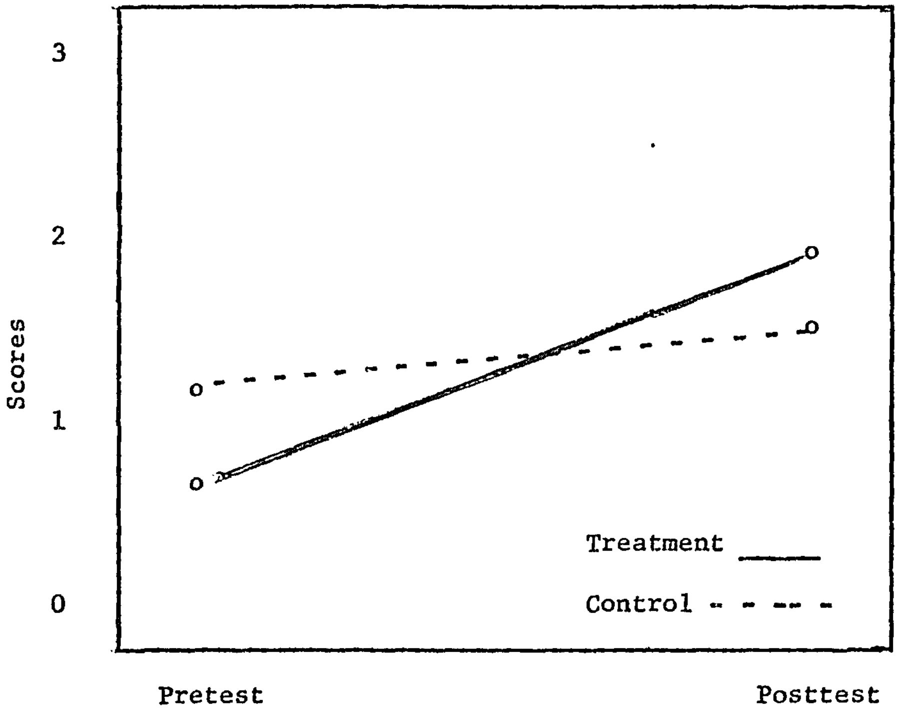

Figure 11. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Structural Analysis Score of The Personal Problem Solving Competence Measure.

fate or force beyond his control (external control). The Locus of Control Score was the number of yes answers given by students in response to the 40 questions on The Locus of Control Scale for Children (Nowicki & Strickland, in press).

The null hypothesis associated with this measure was: There will be no differential change in the locus of control score between the pre and post testing for the treatment and control groups.

Analysis of Covariance on a 3 factor design (Treatment x Teacher x Test), each having two levels, was computed. The dependent measure was the number of yes answers given by the students in response to the 40 questions on The Locus of Control Scale for Children (Nowicki & Strickland, in press). The analysis of covariance revealed that there were no significant main effects or significant interaction. Since there was no significant interaction between the time of testing (pretest and posttest) and treatment (treatment and control), the null hypothesis was accepted. The results of the analysis are summarized in Table 29. The lack of interaction between treatment and time of testing revealed that little change occurred over time for the control group, nor was there a change in locus of control scores for the treatment group following real-life problem solving training.

Self Concept

Self concept indicated how an individual felt about himself. The Tennessee Self Concept Scale (Fitts, 1965) used in the study yields a Total Positive Score which reflects the overall level of self esteem. The Total Positive score is the sum of the following sub-scales:

Table 29

Analysis of Covariance for the Locus of Control Scores

Source	df	MS	F
Covariate			
Age	1	1.40	0.06
Sex	1	25.10	1.07
Race	1	294.78	10.73*
G.P. Average	1	54.26	2.33
IQ	1	0.05	0.002
Treatment (A)	1	9.71	0.41
Teacher (B)	1	30.86	1.32
Test (C)	1	23.86	1.03
AB	1	3.05	0.13
AC	1	5.11	0.21
BC	1	6.32	0.27
ABC	1	28.24	1.21
Error	108	23.26	

*Significant at the .05 level or less.

1. Identity--what the individual is as he sees himself.

2. Self-satisfaction--how the individual feels about the self he perceives.

3. Behavior--the individual's perception of his own behavior.

4. Physical Self--the individual's view of his body, state of health, and physical appearance.

5. Moral-Ethical-Self--describes the self from a moral-ethical frame of reference--moral worth, relationship to God, etc.

6. Personal Self--the individual's sense of personal worth apart from his body and relationship with other people.

7. Family Self--the individual's feeling of worth and value as a member of a family.

8. Social Self--describes the individual's sense of worth in his social relationships with other people.

The null hypothesis associated with this measure was: There will be no differential change in the self concept scores between the pre and post testing for the treatment and control groups.

Analysis of covariance on a 3 factor design (Treatment x Teacher x Test), each factor having two levels,was computed. The dependent measure used was the Total Postive Score of the Tennessee Self Concept Scale (Fitts, 1965). The analysis revealed that there were no significant main effect differences or any significant interactions. Since there was no significant treatment x testing interaction, the null hypothesis was accepted. Table 30 summarizes the result of the analysis. The lack of interaction between treatment and time of testing indicated

Table 30

Analysis of Covariance for the Self Concept Scores

Source	df	MS	F
Covariate			
Age	1	339.22	0.41
Sex	1	19.41	0.02
Race	1	5609.90	6.94*
G. P. Average	1	54.90	0.06
IQ	1	798.69	0.98
Treatment (A)	1	534.39	0.66
Teacher (B)	1	175.42	0.21
Test (C)	1	2915.87	3.60
AB	1	5.78	0.00
AC	1	1054.14	1.30
BC	1	2000.66	2.47
ABC	1	2883.36	3.56
Error	108	808.08	

*Significant at the .05 level or less.

that little change occurred over time for the control groups; neither was there a change in the self concept scores for the treatment group following real-life problem-solving training.

The Relation of Sex Difference to Real-Life Problem-Solving Ability

Another analysis of covariance on a 5 factor design (Sex x Race x Treatment x Teacher x Test) each factor having two levels, was computed to test the null hypothesis. In this analysis Sex and Race were factors rather than covariates. The three covariates utilized in this analysis were age, grade point average, and IQ. The null hypothesis associated with this area was: There will be no difference between the grand problem solving scores of the female and male students between the pre and post testing for the treatment and control groups.

The null hypothesis was tested by the interaction of treatment and time of testing with sex for female and male students. The dependent measure used in the analysis was the Grand Score of The Problem Solving Competence Measure. This score was obtained by summing the fluency, flexibility, originality, and structural analysis scores. Table 31 summarizes the results of the analysis. Since there was no significant interaction between the time of testing (pretest and posttest), treatment (treatment and control) and sex (female and male students) the null hypothesis was accepted. There was no significant differences in the real-life problem-solving ability of female and male students during training.

The Relationship of IQ to Real-Life Problem-Solving Ability

The scores individuals received on measures of intelligence have been found to be positively related to problem-solving performance (Bourne et al., 1971). Maltzman, Eisman and Brooks (1956) reported that subjects

Table 31

Analysis of Covariance for the Grand Problem Solving Score on Five Factors

Source	df	MS	F
Covariate			
Age	1	68.39	0.27
G. P. Average	1	4036.23	16.40*
IQ	1	118.72	0.48
Sex (A)	1	45.62	0.18
Race (B)	1	31.49	0.12
Treatment (C)	1	4732.95	19.23*
Test (D)	1	6236.68	25.34*
Teacher (E)	1	380.33	1.54
AB	1	332.55	1.35
CA	1	304.83	1.23
EA	1	54.29	0.22
DA	1	6.27	0.02
EB	1	37.63	0.15
DB	1	65.51	0.26
CB	1	186.41	0.75
CD	1	13316.74	54.11*
ED	1	47.28	0.19
CE	1	56.45	0.22
Error	102	246.08	

*Significant at the .05 level or less.

with higher intelligence test scores were better problem solvers. There appears to be little information about the relationship of IQ to Real-Life Problem Solving Ability.

The null hypothesis associated with this question was: The correlation coefficient for the relationship between students' pre-test Grand Score of The Problem Solving Competence Measure and IQ will be .00.

Pearson Product Moment Correlations were computed between student's Intelligence Quotients (IQ's) and the pretest scores of the following dependent variables associated with real-life problem-solving ability:

1. The Grand Score of The Problem Solving Competence Measure.
2. The Fluency Score of The Problem Solving Competence Measure.
3. The Flexibility Score of The Problem Solving Competence Measure.
4. The Originality Score of The Problem Solving Competence Measure.
5. The Structural Analysis Score of The Problem Solving Competence Measure.
6. The Grand Score of The Personal Problem Solving Competence Measure.
7. The Fluency Score of The Personal Problem Solving Competence Measure.
8. The Flexibility Score of The Personal Problem Solving Competence Measure.
9. The Structural Analysis Score of The Personal Problem Solving Competence Measure.

The alpha level was set at .05. Table 32 summarizes the result of this analysis. The correlation coefficient for the relationship between the pretest Grand Score and IQ was -.08 and non significant. In the absence of a significant negative or positive correlation coefficient between the pretest Grand Score of The Problem Solving Competence Measure and students' IQ's the null hypothesis was accepted. The very low negative coefficients summarized in Table 32 indicate that there was practically no relationship between students "real-life" problem-solving ability and IQ.

The Relationship of Grade Point Average to Real-Life Problem-Solving Ability

There appears to be little information about the relationship of Grade Point Average to Real-Life Problem-Solving Ability. In this study grade point average was a covariate used to adjust scores of the dependent measures.

The null hypothesis associated with this question was: The correlation coefficient for the relationship between students' pretest Grand Scores of The Problem Solving Competence Measure and grade point averages will be .00.

Pearson Product Moment Correlations were computed between the student's grade point average and the pretest scores of the following dependent variables associated with real-life problem-solving ability:

1. The Grand Score of The Problem Solving Competence Measure.
2. The Fluency Score of The Problem Solving Competence Measure.
3. The Flexibility Score of The Problem Solving Competence Measure.
4. The Originality Score of The Problem Solving Competence Measure.

Table 32

Pearson Product Moment Correlations between Pretest Scores of Factors Associated with Real-Life Problem-Solving Ability and IQ

Problem-Solving Factor	Pretest
Problem Solving Competence Measure	
Grand Score	-.08
Fluency	-.14
Flexibility	-.10
Originality	-.05
Structural Analysis	-.00
Personal Problem Solving Competence Measure	
Grand Score	-.03
Fluency	-.04
Flexibility	-.02
Structural Analysis	-.00

*Significant at the .05 level or less.

5. The Structural Analysis Score of The Problem Solving Competence Measure.

6. The Grand Score of The Personal Problem Solving Competence Measure.

7. The Fluency Score of The Personal Problem Solving Competence Measure.

8. The Flexibility Score of The Personal Problem Solving Competence Measure.

9. The Structural Analysis Score of The Personal Problem Solving Competence Measure.

The alpha level was set at .05. Table 33 summarizes the results of this analysis.

The coefficient for the relationship between students' grade average and the pretest Grand Scores of The Problem Solving Competence Measure was .37, was significant at the .05 level, and the null hypothesis was rejected. There was a low to moderate positive relationship between students' grade point average and Grand Scores of The Problem Solving Competence Measure. As students' grade point averages increase one would expect Grand Scores on The Problem Solving Competence Measure to also increase. Low to moderate positive coefficients were achieved on Fluency, Flexibility, Originality, and Structural Analysis. The correlation coefficients for these measures which comprise the Grand Score of The Problem Solving Competence Measure were also significant at the .05 level or less. As students' grade point averages increase one would expect their scores on these measures to also increase.

Table 33

Pearson Product Moment Correlations between Pretest Scores of Factors Associated with Real-Life Problem-Solving Ability and Grade Point Average

Problem-Solving Factor	Pretest
<u>Problem Solving Competence Measure</u>	
Grand Score	.37*
Fluency	.32*
Flexibility	.28*
Originality	.31*
Structural Analysis	.44*
<u>Personal Problem Solving Competence Measures</u>	
Grand Score	.13
Fluency	.13
Flexibility	.14
Structural Analysis	.09

*Significant at the .05 level or less.

The coefficient for the relationship between students' grade point average and the Grand Scores of The Personal Problem Solving Competence Measure (students' personal problem) was .13 and non-significant. This positive coefficient fell between the no relationship and low relationship range. The very low, non significant correlation coefficient indicated that practically no relationship existed between students' grade point average and the problem-solving skills they applied to their personal problems.

Problem-Solving Related Behavior

The question related to this area of concern was: Will real-life problem-solving training have an observable influence on students' behavior in areas such as study initiative, improved self concept, and problem solving related to curriculum and student life?

A letter was mailed to all teachers at Central High School before the beginning of the study to announce the study and to solicit their assistance in observing student behaviors (Appendix F). Teachers were requested to record the names of any students who exhibited any of the following student behaviors during a four week period: (a) students who showed increased initiative and responsibility, (b) students who showed any marked attitudinal change from negativism to optimism, (c) students who showed any marked attitudinal change from optimism to negativism or gloom, (d) students who demonstrated a noticable interest in solving problems related to the curriculum, student life, or any phase of school life, (e) typical problem students who demonstrate a new attitude of cooperation or involvement, and (f) non-problem students who became more problematic during this period. At the end of the four week period a letter reminding the teachers of the request for assistance and a form to record the names of any students who had exhibited any of the above behaviors was mailed to all teachers (Appendix T).

Of the 71 questionnaires distributed to the faculty, only 10 were returned. In retrospect, the procedure for soliciting the teacher's assistance appeared to be a poor one. Had the study been presented at a faculty meeting and individual questions answered, the percentage of faculty respondents may have been greater. A follow-up letter and telephone call may have increased the number of respondents. One teacher noted that the survey came too early in the school year to make valid judgments on students' behavior as they related to the above six behaviors. It was pointed out that it was difficult to know students well enough in the first month of school to make such judgments. When teacher responses were analyzed, only five of the students participating in the study were observed exhibiting any of the above six behaviors. Three students from the treatment group were reported as exhibiting a marked attitudinal change from optimism toward negativism or gloom (statement 3, Appendix T). One control student was reported to have exhibited a marked attitudinal change from negativism toward optimism (statement 2, Appendix T). One control student was reported to have exhibited a noticable interest in solving problems related to the curriculum, student life, and other phases of school life (statement 4, Appendix T).

The lack of sufficient returns from the high school faculty prevented statistical analysis of the data to respond to the question raised in this area. Answering questions like testing null hypotheses require large sample sizes to insure the power of the statistical procedures. Since the 10 respondents did not provide an adequate sampling of student behaviors evaluated by teachers, no response was made to the questions raised in this area.

Students' Responses to Real-Life Problem Solving Training

The following question was raised for this area of concern: Will students find real-life problem-solving training helpful for their personal lives?

A questionnaire regarding real-life problem-solving training (Appendix S) was administered to all 58 students in the Treatment Group who received real-life problem-solving training at the conclusion of the administration of measurement on the dependent variables. Nine of the statements could be answered by responding on a Likert-type scale. One statement asked the students to indicate the particular stage of problem-solving training which was most helpful to them. The remaining three statements gave students an opportunity to point out areas in their lives where the training was most helpful and to indicate suggestions for improving the training procedures. The data which follows are arranged and presented by statements on the questionnaire.

Statement 1

I find myself more aware of problems and challenges than before the training. (not at all) (very little) (somewhat) (a good deal) (a great deal)

The student responses summarized in Table 34 indicated that the majority of students believed that real-life problem-solving training had increased their awareness to problems. Over 90% of those responding to this statement reported some increased awareness of problems. Less than 10% of the respondents indicated that the real-life problem-solving had very little or no impact on their sensitivity to problems.

Statement 2

I find that I am more prone to try different approaches to doing something or to attacking a problem than before the training: (no) (I doubt it) (not necessarily) (probably) (definitely)

The student responses summarized in Table 35 indicated that the majority of students believed that real-life, problem-solving training had increased their willingness to try different approaches to problems. Over 80% of the responses to this statement reported that they were more prone to try different approaches to problems than before the training experience. Less than 20% questioned if they were more prone to try different approaches to problems after having the training.

Statement 3

Since participating in the training I find I tend to take more factors into consideration in making decisions than before the experience: (no) (I doubt it) (not necessarily) (probably) (definitely)

Table 34

Student Responses to Statement 1* of the Questionnaire Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. A great deal	5	9%
2. A good deal	28	48%
3. Somewhat	21	36%
4. Very little	3	5%
5. Not at all	1	2%

*I find myself more aware of problems and challenges than before the training: (not at all) (very little) (somewhat) (a good deal) (a great deal)

Table 35

Student Responses to Statement 2* of the Questionnaire Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. Definitely	19	33%
2. Probably	28	48%
3. Not necessarily	6	10%
4. I doubt it	4	7%
5. No	1	2%

*I find that I am more prone to try different approaches to doing something or to attacking a problem than before the training: (no) (I doubt it) (not necessarily) (probably) (definitely).

The student responses summarized in Table 36 indicated that the majority of students believed that after having real-life, problem-solving training they take more factors into consideration in decision-making than before training. A total of 86% believed that the training had influenced their consideration of more factors in their decision making. The remainder of the respondents indicated that they did not necessarily take more factors into consideration in decision making, or either doubted that the training influenced their consideration of more factors, or had any influence on the consideration of more factors.

Statement 4

I find myself more self confident than before the program: (not at all) (very little) (somewhat) (a good deal) (a great deal)

The student responses summarized in Table 37 indicated that the majority of students believed that real-life problem-solving training had increased their self confidence. A total of 90% of the respondents stated they were more self confident than before the training experience. The remaining 10% of the respondents expressed the opinion that the training had little or no influence on their self confidence.

Statement 5

Since taking the training I find that I tend to exert more effort in mental tasks rather than quitting so soon: (no) (I doubt it) (I don't know) (I think so) (definitely)

The student responses summarized in Table 38 indicated that the majority of students believed that real-life, problem-solving training had increased their endurance effort in the mental tasks. A total of

Table 36

Students Response to Statement 3* of the Questionnaire. Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. Definitely	26	45%
2. Probably	24	41%
3. Not necessarily	4	7%
4. I doubt it	3	5%
5. No	1	2%

*Since participating in the training I find I tend to take more factors into consideration in making decisions than before the experience: (no) (I doubt it) (not necessarily) (Probably) (definitely).

Table 37

Student Response to Statement 4* of the Questionnaire Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. A great deal	6	10%
2. A good deal	21	37%
3. Somewhat	25	43%
4. Very little	3	5%
5. Not at all	3	5%

*I find myself more self-confident than before the program: (not at all) (very little) (somewhat) (a good deal) (a great deal).

Table 38

Student Response to Statement 5* of the Questionnaire Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. Definitely	15	26%
2. I think so	24	41%
3. I don't know	16	28%
4. I doubt it	1	2%
5. No	2	3%

*Since taking the training, I find that I tend to exert more effort in mental tasks rather than quitting so soon: (no) (I doubt it) (I don't know) (I think so) (definitely).

67% of those responding believed that they exerted more effort in mental tasks rather than quitting so soon. The remainder of the students either did not know or believed that the training had little or no effect on their tendency to exert more effort with mental tasks.

Statement 6

Since taking the training, I find myself better able to cope with problems than before: (not at all) (very little) (somewhat) (a good deal) (a great deal)

The student responses summarized in Table 39 indicated that the majority of students believed that real-life, problem-solving training did increase their ability to cope with problems. A total of 95% of the students reported they believed that the training had some impact on their ability to cope with problems. The remainder of the students reported that they believed that the training had very little influence on their ability to cope with problems.

Statement 7

Since taking the training, I find myself better able to develop my ideas and put them to use: (not at all) (very little) (somewhat) (a good deal) (a great deal)

The student responses summarized in Table 40 indicated that the majority of students believed that they were better able to develop their ideas and put them to use since taking the training. Over 90% of the students reported that they believed that training had an influence on their ability to develop their ideas and put them to use. The remaining students indicated they believed the training had very little effect on their ability to develop and use their ideas.

Table 39

Student Response to Statement 6* of the Questionnaire
Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. A great deal	7	12%
2. A good deal	27	47%
3. Somewhat	21	36%
4. Very little	3	5%
5. Not at all	0	0%

*Since taking the training, I find myself better able to cope with problems than before: (not at all) (very little) (somewhat) (a good deal) (a great deal).

Table 40

Student Response to Statement 7* of the Questionnaire Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. A great deal	4	7%
2. A good deal	37	63%
3. Somewhat	12	21%
4. Very little	5	9%
5. Not at all	0	0%

*Since taking the training, I find I am better able to develop my ideas and put them to use: (not at all) (very little) (somewhat) (a good deal) (a great deal).

Statement 8

I have found the program very helpful in my school studies: (not at all) (very little) (somewhat) (a good deal) (a great deal)

The student responses summarized in Table 41 indicated that the majority of students believed that the training was of some help in their school studies. Over 61% reported that the training was of some help to them in their studies, while the remainder of the students indicated that the training was of very little or no help in their school studies.

Statement 9

As compared with my high school courses in general, I think this training will prove valuable to my life: (not at all) (very little) (somewhat) (a good deal) (a great deal)

The student responses summarized in Table 42 indicated that the majority of the students believed that real-life, problem-solving training in comparison with their high school courses would prove valuable to their lives. Over 90% reported that they believed that compared to their high school courses in general, problem-solving training would prove valuable to their lives. The remainder of the students believed that the training, as compared with their high school courses, would prove valuable to their lives.

Statement 10

Which of the following aspects of the training made the greatest impact on you? 1. general orientation, 2. problem definition, 3. generation of alternatives, 4. decision making, and 5. testing the decision.

Table 41

Student Response to Statement 8* of the Questionnaire
Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. A great deal	3	5%
2. A good deal	9	16%
3. Somewhat	24	41%
4. Very little	14	24%
5. Not at all	8	14%

*I have found this program helpful in my school studies: (not at all) (very little) (somewhat) (a good deal) (a great deal).

Table 42

Student Response to Statement 9* of the Questionnaire
Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. A great deal	15	26%
2. A good deal	24	41%
3. Somewhat	14	24%
4. Very little	3	5%
5. Not at all	2	4%

*As compared with my High School Courses in general, I think this training will prove valuable to my life: (not at all) (very little) (somewhat) (a good deal) (a great deal).

The student responses summarized in Table 43 indicated that the students were fairly evenly divided in their opinion on the training in which stage made the greatest impact on their lives. Approximately the same percentages of the students reported that training in problem definition, generation of alternatives, and decision making made the greatest impact on their lives. The students believed that general orientation training and training in testing the decision had little impact upon them.

Statement 11

If the training has helped you solve particular problems in any of the following areas please explain: (Family) (School) (Church) (Personal) (Other).

The student responses to this statement, summarized in Table 44 by the number of students receiving help for problem areas, indicated that students believed that the training helped them most in problems related to their families, school, and their personal lives. The school problems centered around relationships with teachers, home work, studies and personal organization. The family and personal problems were concerned more with interpersonal relationships with parents, peers, and boy-girl-dating relationships. Several students indicated they had received assistance with Church and a few miscellaneous problems.

Statement 12

How would you change the training procedures to make the program more effective?

Table 43

Student Response to Statement 10* of the Questionnaire
Regarding Real-Life Problem-Solving Training

Response	Number	Percentage
1. General Orientation	1	2%
2. Problem definition	16	27%
3. Generation of Alternatives	18	31%
4. Decision Making	22	38%
5. Testing the Solution	1	2%

*Which of the following aspects of the training made the greatest impact upon you? 1. general orientation 2. Problem definition 3. Generation of alternatives 4. decision making 5. testing the solution.

Table 44

Student Responses to Statement 11* of the Questionnaire
Regarding Real-Life Problem-Solving Training

Problem Area	Number Receiving Help
Family	17
School	15
Church	2
Personal	17
Other	4

*If training has helped you solve particular problems in any of the following areas please explain: (Family) (School) (Church) (Personal) (Other).

The student responses summarized in Table 45 by suggested changes and the number of students requesting them indicated that the majority of the students responding were pleased with the training program as it was presented. Other responses made specific suggestions for additions, deletions or modifications of the training program. These changes appeared to be minor.

Statement 13

Additional general or specific remarks: Thirteen students made general remarks that they liked the training program. Following are some responses which support or are critical of the training program:

1. "A very good course for awareness and quick problem-solving."

2. "I really got a lot out of the training and I don't think anyone who had it could forget about how to solve a problem."

3. "I didn't need the training, but I suppose if my procedures fail, I would use yours."

4. "Stress confidentiality more."

5. "The course made me more aware of problems."

6. "I think it should be taught in all high schools at some time."

7. "I really enjoyed this course. It helps you face problems instead of ignoring them. I especially think it's helpful to generate as many alternatives as possible."

8. "I thought the course was very interesting. You don't often get a chance in school to work with things personal and interesting to you."

9. "It was a great course."

10. "The main thing I got out of this is to 'stop and think,' and then define the problem clearly and generate many alternatives."

Table 45

Student Responses to Statement 12* of the Questionnaire Regarding Real-Life, Problem-Solving Training

Suggestion	Number of Students Requesting
1. Make no change in the program.	17
2. Give us more problems.	2
3. Have some films in the course.	2
4. Eliminate all the marriage problems.	1
5. Give students less paper work.	1
6. Use more of our personal problems.	1
7. Make the problems more realistic.	1
8. Have the classes do more group work on problems.	1
9. Have less repetition.	1
10. Have the instructor talk less.	1

*How would you change the training procedures to make the program more effective?

The Relation of Race Difference to Real-Life Problem-Solving Ability

The white and black races were the only two races represented in the study. There appears to be little information about the relation of race difference to real-life problem-solving ability. None of the literature suggested that there was a relation between race and problem-solving ability. Race was one of five covariates used to adjust students' scores in a three factor analysis of covariance. Race was also one of five factors in a five factor analysis of covariance design (Sex x Race x Treatment x Teacher x Test), each factor having two levels. Table 31 summarizes the results of the analysis (Table 31 also summarized the results of the relationship of sex differences to real-life problem-solving ability). There was no race main effect difference or any significant interaction between treatment, time of testing, and race. Since there was no significant interaction between the time of testing (pretest and posttest) and treatment (treatment and control) for black and white students, it was concluded that there was no relation between a student's race and problem-solving ability.

The Relationship of Age Difference to Real-Life Problem-Solving Ability

There appears to be little information concerning the relationship between age and real-life problem-solving ability. Bourne et al. (1971) have stated that "problem solving efficiency appears to improve with age through adulthood subsequently to deteriorate" (p. 99). Age was a covariate in the two analysis of covariance procedures (a 3 factor and a 5 factor design). No null hypothesis was tested, or a research question answered for this measure. Results data were available as a part of the statistical analysis computed by the Statistical Package for the Social Sciences.

Pearson Product Moment Correlations were computed between students' ages and the pretest scores of the following dependent variables associa- ated with real-life problem-solving ability:

1. The Grand Score of The Problem Solving Competence Measure.

2. The Fluency Score of The Problem Solving Competence Measure.

3. The Flexibility Score of The Problem Solving Competence Measure.

4. The Originality Score of The Problem Solving Competence Measure.

5. The Structural Analysis Score of The Problem Solving Competence Measure.

6. The Grand Score of The Personal Problem Solving Competence Measure.

7. The Fluency Score of The Personal Problem Solving Competence Measure.

8. The Flexibility Score of The Personal Problem Solving Competence Measure.

9. The Structural Analysis Score of The Personal Problem Solving Competence Measure.

The alpha level was set at .05. Table 46 summarizes the results of this analysis. The correlation coefficient for the relationship between the Grand Score of The Problem Solving Competence Measure was .10 and was non significant. Correlation coefficient for the other variables were similar. Since all the coefficients were non significant, the conclusion was reached that there was no relationship between the age of students and their real-life problem solving ability.

Table 46

Pearson Product Moment Correlations between Pretest Scores of Factors Associated with Real-Life Problem Solving Ability and Age

Problem-Solving Factor	Pretest
Problem Solving Competence Measure	
Grand Score	.10
Fluency	.12
Flexibility	.10
Originality	.04
Structural Analysis	.16
Personal Problem Solving Competence Measure	
Grand Score	.02
Fluency	.05
Flexibility	.01
Structural Analysis	.00

*Significant at the .05 level or less.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND REFLECTIONS AND SPECULATIONS

Summary

The purpose of this study was to examine the effects of real-life problem-solving training in the stages of the classical consensus problem-solving model (Davis, 1966, 1973; Dewey, 1910; Krumbotz, 1966; & Goldfried & D'Zurilla, 1972) on high school students' real-life problem solving ability. The study examined the effect of real-life problem-solving training on the level of students' self concept, and their perception of the locus of control of their behavior. Other questions investigated included sex differences in real-life problem-solving ability and the correlation of real-life problem-solving ability with IQ and grade point average. The study inquired into the effect of real-life problem-solving training upon students' behavior in such areas as study initiative, and problems related to curriculum and student life. Students participating in the study were asked to evaluate how helpful the problem-solving training had been to their personal lives and to suggest ways of improving the training. Also investigated were the relationship of Race and Age to problem-solving ability.

One hundred twenty-one high school students enrolled in three sociology classes and one psychology class participated in the study. Based on the Separate-Sample Pretest-Posttest Control Design (Campbell &

Stanley, 1963), the four classes were randomly assigned to the treatment and control groups. Within each of the four classes students were randomly assigned to pretest and posttest sub-groups. Students were tested only one time, either in the pretest or posttest. The two classes which composed the treatment group received 50 minute training periods each on ten consecutive school days. Two days of instruction were spent giving training in each of the five problem-solving stages:

1. training to develop an appropriate problem-solving orientation or "set,"

2. training in problem definition and formulation,

3. training in the generation of alternative responses or solutions,

4. training in decision making, and

5. training in testing the effectiveness of problem-solving.

Two class periods were given to drill on the application of the problem-solving stages to real-life problems of students. The control group class received no training in problem solving. They studied a co-ordinated unit which focused upon the history, development and organization of people living together.

Data used in the statistical analysis for the study were obtained from three sources: test data, information supplied by the administration from student records, and teacher-reported problem-solving behaviors.

An analysis of covariance on a three factor design (Treatment x Teacher x Text), each factor having two levels,was performed to test the null hypothesis associated with The Problem Solving Competence measure that there would be no differential increase in the grand problem-solving score between the pre and post testing of the treatment and control groups. The five covariates used were age, sex, race, grade point average, and IQ. Since there was a significant interaction between the time of testing (pretest and posttest) and treatment (treatment and control) the null hypothesis was rejected. The data revealed that there was very little difference between the pretest and posttest scores of the control group. In the treatment group, after real-life problem solving training, the posttest scores were greater. It was concluded that real-life problem-solving training does increase those skills associated with problem solving ability. Students who had received the training had more solutions (ideas) for problems than did the control. Treatment students had more different kinds of solutions. Also the ideas of the treatment group were more original than the ideas of the control group. Those students who had received training were able to combine and analyze solutions to propose several courses of action to a problem better than the students who had not received the training.

An analysis of covariance was performed to test the null hypothesis associated with The Personal Problem Solving Competence Measure that there would be no differential increase in the grand personal problem-solving scores between pre and post testing of the treatment and control groups. Because of the resulting significant interaction between time of testing (pretest and posttest) and treatment (treatment and control), the null hypothesis was rejected. It was concluded that real-life problem-solving training does increase the skills that students use in the solution of their personal problems. The students who had received the training had more solutions (ideas) for their personal problems than those students who had not received training. After training students generated more different kinds of solutions than the control group. Treatment students also demonstrated greater skill in combining and analyzing solutions to propose several courses of action, than did the students in the control group.

An analysis of Covariance was utilized to test the null hypothesis associated with the Locus of Control measure that there would be no differential change in the locus of control scores between the pre and posttesting for the treatment and control groups. Since there was no significant interaction between the time of testing (pretest and posttest) and treatment (treatment and control), the null hypothesis was accepted. It was concluded that training in real-life problem solving does not significantly change students' perception of the locus of control of their behavior.

Analysis of Covariance was performed to test the null hypothesis associated with the Self Concept measure that there would be no differential change in the self concept scores between the pre and posttesting for the treatment and control groups. No significant interaction occurred between the time of testing (pretest and posttest) and treatment (treatment and control), and the null hypothesis was accepted. It was concluded that real-life problem-solving training does not significantly change students' self concept.

Analysis of Covariance on a 5 factor design (Sex x Race x Treatment x Teacher x Test), each factor having two levels was computed to test the hypothesis associated with the relation of sex difference to real-life problem-solving ability that there will be no differential increase in the grand problem solving score of the male and female students between the pre and post testing for the treatment and control groups. The three covariates used were age, grade point average, and IQ. Since there was no significant interaction of the scores of the male and female students between the time of testing (pretest and posttest) and treatment (treatment and control), the null hypothesis was accepted. It was concluded that real-life problem-solving training had no differential effect on the problem-solving skills of female or male students. The absence of a significant main effect difference indicated that there was no significant difference in the real-life problem-solving ability of female and male students.

Correlation coefficients were computed between the students' pretest Grand Scores and IQ by the Pearson Product Moment technique to test the null hypothesis that the correlation coefficient for the relationship between students' pretest Grand Scores of The Problem Solving Competence Measure and IQ's would be .00. In the absence of a significant negative or positive correlation coefficient the null hypothesis was accepted. It was concluded that there was no relationship between the skills associated with real-life problem-solving ability and IQ.

Correlation coefficients were computed between the students' pretest and Grand Scores and grade point average to test the null hypothesis that the correlation coefficient for the relationship between students' pretest Grand Scores of The Problem Solving Competence Measure and grade point average would be .00. The resulting correlation coefficient for the relationship between the Grand Score and grade point average was .37 and was significant. Since the coefficient was greater than .00 the null hypothesis was rejected. The low to moderate positive correlation coefficient indicates that there was some relationship between students' Grand Scores and grade point average. As the grade point average increases, one would expect the Grand Score of The Problem Solving Competence Measure to also increase proportionately.

Teachers were requested to respond to questionnaires to evaluate the effect that real-life problem-solving training had an observable student behaviors in areas such as study initiative, improved self concept and problem solving related to curriculum and student life. Due to poor teacher response, insufficient data were collected to respond to questions raised in this area.

Students receiving real-life problem-solving training were administered a questionnaire to evaluate how helpful they believed the training had been to their personal lives. They were also encouraged to make suggestions for improving the training. The majority of the students indicated that they were satisfied with the course as it had been presented and made few additional suggestions.

Results were also reported on the statistical analysis of data concerning the relation of Race and Age to real-life problem solving performance. No hypotheses were stated or tested, nor were any research questions raised for these two areas. Analysis of covariance revealed that there was no differential increase in the Grand Scores of Black and White students between the pre and post testing of the treatment and control groups. It was concluded that race was not a determinant of one's real-life problem-solving ability.

Correlation coefficients were computed between the students' pretest Grand Scores of The Problem Solving Competence Measure and Age. The correlation coefficient for this relationship was .10 and non significant. This indicated that there was no relationship between the students' age and skills used to solve real-life problems.

Conclusions

The conclusions presented are based on the results of the study and may be related to the relevant real-life problem-solving literature. Training in the problem-solving stages increased the skills students used in solving hypothetical real-life problems. Following training, there was a significant increase in the number of solutions students generated for a problem. The students who had received the training generated significantly greater kinds or categories of solutions than the control students. Greater originality was exhibited in the solutions generated by the treatment group than in the control group. When comparisons were made between the ability of treatment and control groups to compare and analyze solutions and to propose several courses of action to problems students who had received training exhibited greater skill. The same conclusions were reached with reference to the effect of problem-solving training upon students' solutions of their personal problems. These conclusions are consistent with those reported in studies by Parnes and Noller (1973) with college students. They reported that "course students show a significant difference over comparable controls in the ability to cope with real-life situational tests, including not only the production of ideas, but also with their evaluation and development" (p. 14). Following short-term problem-solving training, Loupe (1972) reported a significant difference in the quality of problem solution of the experimental group over the control group in a study with college students. Similar conclusions were reported by Covington and Crutchfield (1965) in their studies with elementary children in the fifth and sixth grades. "Programmed instruction" in problem solving increased children's problem-solving ability.

Real-life problem-solving training had no observable effect on students' perception of the locus of control of their behavior. There are no other studies with comparable purposes or research questions to which comparisons can be made. Studies on this variable which report change due to some intervention such as therapy or training did not use subjects from a normal population. The writer observed that the pretest locus of control scores of students in the study were lower than the norms reported by Nowicki and Strickland (in press). These lower scores indicated that the students participating in this study were more internal in the perception of the locus of control of their behavior than were the students in the norm group of the same age. Penk (1969) noted that age was a determinant in locus of control scores. It is possible that significant changes in the locus of control did not take place in the short treatment period because the subjects were relatively internal with respect to other students of that age; and in addition, locus of control is a relatively stable characteristic and may require intensive treatment for changes to occur.

Real-life problem-solving training did not change the level of students' self concept. The mean self concept score in the study was obtained from a very homogeneous group of high school students with a restricted age range. This score is very similar to the norm score for a heterogeneous group from society at large. The mean self concept scores for both the treatment and control groups were higher than the mean score for middle-class high school students (Thompson, 1972). Self concept is a relatively stable characteristic and may require extensive treatment for change to occur. Training in the problem-solving stages may not be an adequate variable to change students' self concept.

Real-life problem solving training had no differential effect on the problem-solving ability of female and male students. This conclusion was inconsistent with Carey's (1958) report that females more than males benefited from problem-solving training which focused in part on problem-solving attitudes. The present study in problem-solving training also includes a focus on attitudes. The outcome of the present study was consistent with the report that girls and women are at least as able as boys and men to generate a variety of hypotheses and produce unusual ideas (Maccoby & Jacklin, 1974). Bourne et al. (1971) have reported that no simple general statement can be made about sex differences in problem-solving efficiency.

There was no relationship between students' real-life problem-solving ability and their IQ's. This conclusion was inconsistent with many of the results reported in the problem-solving literature. Maltzman, Eisman, and Brooks (1956) had indicated that subjects with higher intelligence test scores solved problems more efficiently. Raaheim and Kaufmann (1974) had found a clear relationship between success on problem scores and general intelligence scores for males, but not females. Others have reported that subjects who scored higher on intelligence tests also performed better on anagrams, and on lights-and-switches problems (French, 1958; & Mendelsohn, Griswold, & Anderson, 1971). The descrepancy in findings may be attributed to several factors. None of the studies cited above which report a relationship between problem-solving ability and IQ were concerned with real-life problems but rather impersonal tasks. In addition responding to the real-life problems in the pretest required a sustained effort by the students. On the other hand response to the questions in the Otis Quick-Scoring Mental Ability Tests (1954) was made by selection from multiple choice options, and consequently required less student effort.

There was a low to moderate, positive relationship between students' problem-solving ability and grade point average. This may have resulted because of a relationship between the kinds of activities students do in their studies and the questions of The Problem Solving Competence Measure. Motivation and persistent sustained effort are important contributors to students' success in school. These same behaviors are also exhibited in quality problem-solving.

High school students reported positive reactions to real-life problem-solving training. Not all students indicated a need for the instruction; however this represented a small minority. This conclusion was consistent with Parnes' and Noller's (1973) findings that college students had favorable responses to problem-solving training. On the basis of students' responses in this study it was concluded that real-life problem-solving training increased students' awareness of problems. They reported they believed they they were more prone to try different approaches to their problems following training. Students indicated that training resulted in an increase in the number of factors students considered in the solution of their problem. As a result of the program, students indicated they felt more self confident. However, posttest scores of the treatment group on the Tennessee Self Concept Scale do not support the students' self-report. Following training, students indicated that they were more likely to presist in various mental tasks. Idea development was enhanced by the training program. The training experience was reported to be of some help to students in their school studies, and they believed the training would be helpful to them more generally in their lives. On the basis of student reports it was concluded that training in problem definition, generation of alternatives and decision making made the greatest impact on them. Students found training in development of a problem-solving mind "set" and training in testing the decision to be the least helpful for their lives of the five stages. Training in orientation focused upon making students aware of their problematic environment and to inhibit them from taking precipitous action. It was possible that students were already aware of their problematic environment and did not need to be sensitized in this area. The heart of the emphasis were directions to inhibit hasty students to "stop" and "think." It was possible that the simplicity of the two statements had no appeal to students. When contrasted to training in problem definition, generation of alternatives, and decision making, training in testing was less specific. An appeal was made for students to use their imaginations in this area, while the other areas had specific things for students to do which involved learning new skills.

Students were able to identify problems in specific areas of their lives where they utilized the skills learned in the course. That is, skills learned in a classroom setting were applicable to real-life problems of a personal nature. Application of the principles centered around those problems which touched students' more intimate and personal world: family, school, and interpersonal relationships. It was concluded that the course was basically acceptable to students as it was presented. Several minor suggestions were given by students to improve the course content and presentation technique.

The study data supported a number of other conclusions. The change in real-life problem-solving behavior exhibited between the pretest and posttest in the treatment group was a result of the learning which occurred as a result of the real-life problem-solving training. The total training experience enabled students to develop a cognitive repertoire of real-life problem-solving skills. While unable to fully document the change it was the writer's opinion that training in the five classical problem-solving stages contributed to this change.

The writer could only speculate as to what real-life problem-solving repertories students possessed at the point the training was initiated; consequently, the instruction was aimed at an average point which contained concepts, illustrations, and exercises an average high school student would have been able to master. The writer believed that the sample group of achievement-oriented high school students would find the materials, attitudes, goals, values, reinforcers, techniques, etc. used in the training to be motivating and reinforcing. The daily quizzes and study results suggested that this was true for the majority of the participating students in the treatment group. Staats (1970) described this human motivational system "the attitude-reinforcer-discriminative (A-R-D) system." The system has three motivational stimuli functions: "(a) the attitude or emotional (classical conditioning), (b) the reinforcing, and (c) the discriminative controlling functions which such stimuli acquire" (p. 119). The conclusion that the real-life problem solving training was responsible for the change in problem-solving behavior by the treatment group appeared consistent with Staat's (1970) observation that "The A-R-D system in effect in schools has been developed by people with a particular socioeconomic conditioning history to be effective with children who have the same history, and thus have the same A-R-D system" (p. 161).

Reinforcement contributing to the change in problem-solving behavior came from approval exhibited by the instructor, approval from one's peer group, and a sense of pride and accomplishment gained through developing new skills. Staats (1970) described these "as the most important source of reinforcement for student behavior in the traditional classroom" (p. 122). The effectiveness of these positive social reinforcers are established according to Staats (1970) through "positive classical conditioning."

The attitudes that students had toward these social reinforcers are the product of each student's individual life history. Since every individual's history is unique, reinforcers vary by individual, social class, culture, nationality, language, etc. (Staats, 1970). During this study the instructor reinforced problem-solving behaviors by employing stimuli which were reinforcing to the students. Appropriate student responses were met by complimentary comments, smiles, nods, praise, etc. Such responses were intended to convey a positive attitude toward the students for appropriate problem-solving behaviors.

The discriminative controlling mechanisms employed by the instructor in the study included written prompts, verbal instructions, and imitative promps supplied by the instructor and other students as they successfully applied problem-solving skills to real-life problems. The instructor provided a number of models and examples of appropriate problem-solving procedures. One method was to describe a problem, and solve it step by step describing the sequence of the problem-solving stages being followed. This procedure was followed in the problem of the missing lectern. The chalkboard also provided a technique for modeling adequate problem-solving procedures. The problem was presented, then the class contributed to its definition. The class contributed to the solution of the problem as the instructor directed the students through the problem-solving stages which resulted in accepting a satisfactory solution. Other techniques used in modeling were printed pages which outlined the salient features of a particular stage and contained "programmed" instructions which guided students in the use of the particular stages. This conclusion was consistent with Krumboltz's (1966) observation from the problem-solving literature that programmed instruction and other written material are effective forms of modeling.

Of the five problem-solving stages, training in the generation of alternative solutions was responsible for the greatest change in problem-solving behavior. The number of solutions generated to a problem was indicated by the fluency score in the scoring criteria. Students who generated the most solutions to a problem had a greater possibility of receiving higher scores on the flexibility, originality, and structural analysis scoring criteria. The correlation coefficients between fluency scores and other measures were: flexibility .88, originality .80, and structural analysis .89. The conclusion that students who generated more solutions were better problem-solvers was consistent with Osborn's (1963) statement, "the greater the number of ideas, the greater the likelihood of generating useful ideas" (p. 156). Goldfried and D'Zurilla (1972) reported that the brainstorming technique, a basic part of the instruction in generation of alternative solutions, was effective in facilitating good quality response alternatives in problem solving" (p. 80).

Recommendations

An evaluation of the procedures of this study produced a number of recommendations for persons planning to implement real-life problem-solving courses in the public school. Though this study indicated that problem-solving training improved the problem-solving skills of a representative group of high school students, thought should be given to the methods by which students are solicited for the course. Consideration should be given to limiting enrollment to those students who were willing to commitment themselves to the class requirements, and goals. One way to achieve this is through the negotiation of a contract with the participants. The contract should outline behavioral requirements with reference to learning all material, completing all assignments on time, and contributing to class discussion. Such procedures would limit the ability of researchers to generalize the results of their studies, but the procedures would enhance the quality of the classroom experience. While students in this study were given an option to be involved or not involved, this experimenter would have preferred to present real-life problem-solving training to a class where all the members were fully committed to learning the real-life problem-solving stages and techniques for applying them to their real-life problems. Concurrent with the recommendation to screen participants is the recommendation to limit the size of the class. A reduced number of students would facilitate individual participation and involvement in the total classroom activities.

More feedback should be given to students on their performance on the quizzes administered following the instruction on each problem-solving stage. While general comments were made to the class as a whole, more attention should be given to individual performance. Time limitations prevented the experimenter from pursuing this to his satisfaction.

In retrospect the experimenter concluded that the basic teaching procedures were adequate to present the specific curriculum used in the study. In the future the curriculum should be collected and orga-in a work-book incorporating the theory associated with each problem-solving stage, its application to hypothetical problems through "programmed" steps, and exercises which direct students in drill. Instructional material distributed to participating students in the course of the training period would provide an ample beginning for the development of this work-book.

Recommendations are also made for persons anticipating future studies in real-life problem-solving training. One suggestion for further research would be to replicate the present study using a sufficient number of instructors of both sexes representing teachers, counselors, administrators, and possibly others. This would allow for an analysis of teacher effect. Would the results of such studies be consistent across sexes and the respective positions (teachers, administrators, counselors, others)? Questions remain as to who is the most appropriate person to lead students in real-life problem-solving training.

Replications of the study are needed which incorporate training periods over different time spans. Loupe (1972) demonstrated that it was possible to teach problem-solving skills in three hours with college students. At the conclusion of the study, the experimenter taught real-life problem solving to the students in the control classes and one additional class in five 50 minute sessions. This amount of time should be adequate under the most optimal conditions, i.e., small classes (approximately 15), with students who had agreed to meet the course requirements through a negotiated and signed contract. The control classes who received instruction after the study was concluded performed well on the quizzes on the stages, but no data were collected on other measures.

Replications of the study are needed which incorporate longitudinal measurements on students' real-life problem-solving ability. Posttest measurements on students' real-life problem-solving ability in this study were taken immediately after receiving real-life problem-solving training. What kind of results would be recorded if measurements were taken six months or a year following problem-solving training? Parnes and Noller (1973) collected data on students enrolled in their four semester training at the beginning and end of the experience and on control students. They reported a significant difference between the treatment and control. Data were also collected on students who had had one, two or three semesters of problem-solving instruction at the end of the second year of college. They reported an observable difference between these students and the control group; however, they indicated the absence of a statistically significant difference. There do not appear to be any studies which respond to the question of the long-term effect of real-life problem-solving training.

A study should be designed to respond to the question of the advisability of presenting real-life problem-solving training in small group sessions. Traditionally a small group is established for counseling purposes and is dependent upon the support and involvement of all members of the group. Each member is expected to participate and meet his responsibilities to the group. The instructor could assume the role of a group leader who guides the group through the problem-solving stages. This study was conducted in a classroom setting with a large number of participants in the model of the traditional group guidance format. The procedures utilized in this study were more didactic and did not require as much participation and involvement as do group counseling procedures.

One final recommendation for further research would be to duplicate the present study with students who are currently experiencing crises with real-life problems. This study was more oriented toward crises prevention by teaching students the skills necessary to respond to their real-life problems. Participants in the study were a sample from a normal student population. As far as could be determined, none of the members of the treatment or control group were experiencing any major crises. Are the curriculum and procedures of this study appropriate for those persons who are experiencing crises, such as youth who have broken laws and are being held in juvenile detention homes, or pre-delinquent youth who have been referred by the courts to agencies like The Youth Service Bureau, or youth who have been referred to mental health clinics?

Reflections and Speculations

This study was conducted to examine some of the issues that concern the counselor and his relationship and responsibility to one age level--specifically, high school students. The procedures and results of the study have been described. In this final section the writer will describe and add personal reactions on the place of problem-solving activities with high school students in the larger context of counseling.

Counseling, as it is practiced in the mid 70's, is complex and multifaceted. Once seen as simple advice giving from the experienced to the inexperienced, counseling is now concerned with the total development of the individual. Unlike psychiatry, which begins therapy by probing for unconscious origins for the present condition in the individual's past, counseling relates to persons on a cognitive level in the present. While psychiatry has concerned itself primarily with pathological conditions and disorders, counseling has attempted to help healthy persons who need assistance in becoming fully functioning persons, achieve personal identity and solve their personal problems (Shertzer and Stone, 1968).

Typically an individual seeks the services of a counselor because he has a "real-life" problem which he believes he cannot resolve alone. The services of the counselor are sought because he believes the counselor has the necessary intelligence, professional skills, and experience to assist him solve his problem.

One dilemma the counselor frequently encounters is that by the time an individual seeks his professional assistance the problem has become monumental. Distraught, frustrated, and at times ready to give up, the individual no longer has the patience nor the perspective to attempt to solve the problem. The counselor is approached by individuals in a way similar to that of a young boy who hands his father the tangled, knotted maze of his kite string with the exclamation,"I have a problem, can you help me?" The counselor, like the father, often wishes to respond, "Why didn't you come sooner, so we could have avoided this problem?" Which is the preferred use of a father's time, spending an afternoon untangling a maze of knotted, tangled string, or spending an afternoon teaching his son to fly a kite and a technique for retrieving and rewinding his kite string? Parallel questions can be raised by the counselor. What is the most advantageous use of my time and skills? Is my primary function helping persons "untangle" and resolve their problems or is my primary function teaching persons techniques and skills to prevent their problems becoming so unmanageable that they require professional assistance? Obviously there are no simplistic "either-or" answers to such provocative questions; however, the questions do raise important issues to which the counselor must address himself.

First of all, counselors know that problems for individuals are inevitable. To the individual living in the last half of the twentieth century the word "problem" has a familiar and monotonous ring. The morning newspaper, the radio, and television keep us well informed that society is facing monumental problems which demand solutions. The chief characteristic of the dilemmas that face this generation is that the dilemmas are "real-life" problems. The problems many thought would wait until the twenty-first century are the "real-life" problems confronting mankind today: how to limit population size, so that "human" qualities of life will not be suffocated by the cruelly impersonal demands of life in an overcrowded world; how to produce enough food and energy for the teeming masses resulting from a world-wide population explosion; how to cope with the technology of the computer age so that man, and not the machine, will be the master; how to find a sense of meaning, purpose and fulfillment, rather than futility and boredom in the leisure created by the shorter work week; how to develop creative jobs which give dignity to the individual; and how to reverse the trend of blight and decay in our cities; how to develop an educational system that will equip the individual with effective means of coping with today's problems with effective response alternatives.

Within the context of this larger problematic world, high school students wrestle with personal "real-life" problems which seem just as important, though they may lack staggering consequences when gagued by global standards. Much has been written about the problem areas confronting the student in his more personal world: drugs, alcohol, crime, unwanted pregnancies, youthful marriage, and sex,to mention a few.

Teenagers responding to questionnaires through the years have said that they were most concerned with the problems associated with: changes in physical development, such as breast size, body size and skin conditions; impersonal relationships such as friendships and popularity; school activities, such as homework, grades and study habits; family situations, relationships with the opposite sex. Adolescence, that transitional period between childhood and young adulthood, has been correctly described as a problematic age for high school students. There is apparently no way students can avoid "real-life" problems.

When the number and gravity of problems encountered by students are considered, it appears unreasonable to leave their solution to chance or to trial and error. Most "real-life" problems are frustrating and disruptive in the sense that they distract us, and claim a disproportionate amount of time individuals would prefer to use in the pursuit of work or pleasure. Skinner (1974) reminded us that the skills, strategies and insights necessary to solve these problems have their origins in two sources, from our exposure to raw contingencies and from what others have learned and transmitted to us through culture. While some things are learned better "the hard way," learning how to solve real-life problems does not appear to be one of them. Parents who sense the anxiety and needs of high school students have advocated training programs that teach real-life problem-solving skills (Olton & Crutchfield, 1969). The results of a public-opinion poll released by the High Point Public Schools early in 1976 revealed that parents ranked teaching students to solve problems as the number one educational program in the junior and senior high schools which should receive more attention. This priority was ranked second only to teaching students the skills of reading, writing, and arithmetic in the elementary schools. While this opinion poll sampled the views of only parents of children in the High Point City Schools, there is no reason to believe that the opinions of parents of children in other school systems would be radically different.

The basic enthusiastic response of students to the real-life problem-solving training presented in this study also suggests that high school students want to learn how to respond effectively to their problems. A number of students sought opportunities to discuss their problems in private with this writer. Generally, the students were anxious to learn real-life problem-solving techniques.

Counseling views as one of its *raisons d'etre* that of helping individuals respond effectively to their problems. Of course, the question of how this should be done has given rise to a number of theories and techniques. Krumboltz (1966) writing from the perspective of cognitively oriented counseling has suggested that the counselor teach the client how to solve his problem by going through the various problem-stages in connection with the client's problem. "The goal," Krumboltz states, "is learning the use of this sequence of problem-solving steps in the solution of personal, educational, and vocational decisions" (p. 12). Loveless and Brody (1974) believe that a more relevant, parsimonious effective approach to counseling can be created through active, problem-oriented, cognitive interactions between counselor and client.

If teaching persons how to solve their problems is a legitimate function of counseling, when does the counselor teach these skills? What is the proper setting for this instruction? Does the counselor wait until his assistance is solicited by the student before he offers his assistance through problem-solving training? Is this problem-solving activity to be confined to the dyad or group counseling session of the counselor's office? Does the counselor have the responsibility of advocating a program at all levels of education for teaching problem-solving patterns as a part of his commitment to helping people, that is, as a means of taking the steps to make appropriate responses by individuals to their "real-life" problems more probable? The answer seems obvious to this counselor. The counselor does have a responsibility to society in general that goes beyond the dyad or group counseling relationship which has been initiated by the client (Lipsman, 1969). Counseling like all helping professions must emphasize prevention as a major part of its services. It is never adequate to "treat and cure problems." While therapy is an important function of counseling, it is not the only function. The axiom,"An ounce of prevention is worth a pound of cure," is applicable to this issue.

It was this writer's opinion that one place where real-life problem-solving training could be initiated was in the public high school. If a problem-solving training program were undertaken in a typical high school classroom by a responsible teacher with representative high school students, it would enhance their real-life problem-solving skills. The schools appeared to be the proper place to begin, since the facilities necessary to implement such a program already existed and the individuals needing assisting were already involved in a learning experience.

The study revealed that following training in the five stages of problem solving in a daily class period of 50 minutes for ten consecutive days and two days of drill did improve students' problem solving skills. If individuals learn to use problem-solving steps to make adequate response to a problematic situation so that it is no longer problematic or disruptive, the person is freed to become a more fully functioning member of society. Making decisions and solving problems by individuals is the single means whereby a person asserts personal responsibility for his behavior (Cassel, 1973). Many of the problematic situations encountered daily would be less tension producing because the individual would know the procedures for making appropriate responses. Individuals who have mastered the steps for solving real-life problems have the potential of being self-sufficient. The need for professional assistance would be limited to those particularly difficult problems which require long-term therapy.

A number of observations of certain details of the study are encouraging. Training in real-life problem-solving was conducted in a typical classroom which held the usual equipment, chalk board, lectern, seating arrangement, lighting, etc. Existing public school facilities appear to be a very adequate setting for this type of instruction. This would eliminate the need of capital expenditures for additional facilities and equipment. The curriculum of problem-solving training is easily presented to students. In this study, after the curriculum had been developed from the real-life problem-solving literature, the salient features of each stage of problem-solving were presented to students on mimeographed sheets. "Programmed" instruction sheets prepared by the instructor to direct students through the problem-solving stages were mimeographed and distributed to the students. There was no great investment for special materials to provide curriculum materials. The teaching procedures and techniques followed were those all teachers know and use. The teaching methods courses required for teacher's certification should provide an adequate background for the skills necessary to teach real-life problem solving training.

A number of other important observations were made during the experience of conducting the study. Teaching persons problem-solving skills is not a counseling theory, but is rather a technique that can be utilized within the context of existing theories. Regardless of the counselor's orientation, the procedures and curriculum followed in this study could be adapted to his style of therapy. Since teaching students problem-solving skills is not indoctrination in any particular value system, it is compatible with a variety of creeds. The study was conducted within a public school which does not advocate any particular creed; however the writer believes it could be conducted in a synagogue, parochial school or Sunday school with little or no revision. The writer is aware that in some settings the choice of appropriate topics may be an issue. No restrictions were placed on this study other than "good judgment." Some school boards reserve the right to restrict the kinds of topics which may be discussed in the schools. This does not however limit the application of these training techniques, only the choice of real-life problems to be used in the study.

This study only examined the effects of real-life problem-solving training on the problem-solving ability of high school students. It is possible that the training should occur earlier. Perhaps training in real-life problem solving should begin in junior high school or even in the elementary schools. The writer is not attempting to rule out this possibility, nor is an attempt being made to eliminate involving parents in this process in the home. Parents have indicated that the public schools should be conducting problem-solving training in both secondary and elementary levels of the school system. It is possible that this is the responsibility of parents in the home. The writer is not debating the issue, but only raising the possibility of involving parents in implementing problem-solving training to students. The question has not been resolved concerning what age is most appropriate for an individual to receive problem-solving training. Studies need to be conducted which investigate the relationship of developmental issues and problem-solving training.

Before a training program in real-life problem solving can be established in the public schools on a permanent basis many questions remain to be answered. Can real-life problem-solving training programs be accomplished in the public high school? While this study suggests thatthey can, there is a need for additional studies before broad generalizations can be made. Where does real-life problem-solving training fit into the existing school curriculum? Is there a need for additional courses, or can this be presented within the framework of existing courses? Who should assume the responsibility of teaching real-life problem-solving within the school? Is this the responsibility of counselors, or do teachers and administrators also share in this responsibility? Still unanswered is the question concerning what "type" of person is most effective in presenting instruction in real-life problem-solving. Does the establishment of a special rapport and relationship between the instructor and student enhance a student's mastery of the problem-solving skills? There are questions about the most appropriate length of problem-solving instruction. Is two weeks adequate, or is more time needed? Can the training be presented in less time and still be effective? And obviously there are many other unanswered questions.

One needs to add a few notes of caution. The writer does not want to leave students with the impression that all problems can be solved. Obviously there are conditions and situations which are beyond the individual to solve. Problem-solving training does help individuals understand that problems are inevitable. This training does assure students that they are not helpless as they encounter real-life problems; they have a procedure for effectively response. While teaching skills and techniques are essential, instructors in real-life problem-solving stages should have an appreciation for students, possess a sensitivity to their problems, and be able to establish rapport with them. In addition, there is no guarantee that this training will have long-term influence on students' problem-solving ability. Longitudinal studies need to be conducted to respond to this question. Neither is there a guarantee that students will use these techniques outside the classroom to solve their problems. While students have reported that they were using the problem-solving stages in the solution of their personal problems, this remains an area of uncertainty.

Given these limitations, however, it is this writer's opinion that providing students with real-life problem-solving training does increase the probability of their emitting a response which is the solution to the problem. In view of the problems students are facing, this is no insignificant ability or capacity.

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APPENDIX A

PARNES' AND TREFFINGER'S CRITERIA FOR DEVELOPMENT OF NEW MEASURES

"The first step in developing new measures for assessing creative problem-solving in the Creative Studies Project was to establish general criteria for the development of measures. Following Miles (1968) and several criticisms of existing measures, the following criteria were established:

1. Relevance. The measure must sample from a domain of experiences and problems familiar to all subjects, to enable them to become actively involved in the problem as well as to use previous experiences and training. The performance required by the measure should be similar to other performances commonly involved in problems encountered by the subjects.

2. Scoring Criteria. The measure must include at least two general scoring dimensions: first, there must be an "effectiveness" dimension (which involves the possibility of actually implementing a solution to the problem presented) and secondly, there must be a "creative" dimension which may involve one or more of the following specific criteria:

(a) Fluency - the ability to enumerate many ideas related to the problem;

(b) Flexibility - the ability to "shift" readily among several kinds or classes of ideas and solutions;

(c) originality - the ability to produce unusual or uncommon ideas and solutions.

3. Variety of Solutions. The problems should be "open-ended," so that many different ideas and solutions can be given.

4. Problem-Solving Time. Every subject should have adequate time to solve the problem(s) presented in the new measure. The problems must be long enough to provide a challenge, but not so long as to lead to "fatigue" when administered as a part of a battery of experimental tests.

5. Experimental Control of Resources. All material and resources necessary for the development of adequate solutions for the problem should be presented and provided by the experimenter in the administration of the new measure.

6. Reliability. Scores derived from new measures should be significantly and positively intercorrelated, and reliable scoring should be possible with minimum training and time expenditure.

7. Complexity and Reality. The tasks or problems should represent moderately complex situations, and consequences of solutions should be real and able to be implemented. The problems should not be excessively formalized, simplified, impersonal or frivolous.

8. Number of Tasks. Rather than presenting the subject with a large number of discrete items, the problem should be a single problem, or a small set of interrelated problems.

9. Variety of Skills, Traits, and Abilities. The problem should not emphasize through content or direction, any single skill, ability or trait (such as ideational fluency, listing "wild" ideas).

10. General Directions. The directions for the problem should not be deliberately confusing or misleading, but there should be opportunities for the subjects to organize and manipulate the task independently" (Parnes & Treffinger, 1973, pp. 8-9).

APPENDIX B

INTER-RATER RELIABILITY FOR NEW SCORING CRITERIA DEVELOPED BY PARNES AND TREFFINGER

The reliability of the raters was checked through applicable correlation coefficients between the scores of independent raters. As indicated on the following table the reliabilities were acceptable.

Inter-Rater Reliability for All New Variables

	$\bar{X}$ Scorer 1	$\bar{X}$ Scorer 2	Correlation
1. Fluency	3.4	3.3	.93**
2. Flexibility	2.7	2.5	.82**
3. Originality	4.7	4.6	.94**
4. Structural Analysis	1.8	1.7	.74**

$^{**}r > 0,\ p < .01$

Inter-Problem Reliability

The correlations among the four scores derived from the College Situations Problems are presented as follows: "The Fluency, Flexibility, Originality and Structural Analysis scores for the College Situations Problems were all positively and significantly intercorrelated" (Parnes & Treffinger, 1973, p. 21).

Correlations of the Newly-Developed Parnes and Treffinger Variables with 23 Selected External Creativity Criteria *

Criterion	Fluency	Flexibility	Originality	Structure
A. Structure of Intellect				
Alt. Letter Groups (DFC)	27**	21**	16*	14
Mult. Social Prob. (DBI)	22**	12	19*	08
Utilities: Fluency (DMU)	29**	12	20*	06
Utilities: Flex. (DMC)	21**	10	17*	07
Mult. Behav. Group. (DBC)	17*	14	09	05
Varied Emot. Rel. (DBR)	14	03	01	00
Insight Probs. (DFT)	02	-02	-05	00
Verbal Pict. Transl. (CMT)	01	02	-03	09
Homonyms (MMT)	07	09	19*	06
Jumbled Words (EST)	09	05	03	07
B. Non Academic Accomplishments				
Leadership	12	06	05	15
Social Participation	19*	02	13	20*
Artistic	08	00	-03	-05
Social Service	20*	04	11	23**
Scientific	01	-03	05	08
Business	09	-10	04	08
Humanistic/Cultural	13	00	13	15
Religious	08	11	05	09
Musical	02	00	-05	-05
Writing	13	07	12	18*

*(Parnes & Treffinger, 1973, p. 23)

Criterion	Fluency	Flexibility	Originality	Structure
Social Science	07	-06	12	16*
Speech and Drama	-08	-04	04	-06

*$p < .05$ **$p < .01$

College Situations Problems

"For this measure, the Fluency scores were significantly and positively correlated with five divergent production abilities, and with the Social Participation and Social Service accomplishments scales. The Flexibility scores were significantly and positively correlated with a measure of divergent production of figural classes. The Originality scores were significantly and positively correlated with four divergent production abilities and with memory of semantic transformations. Two Structural Analysis scores were significantly and positively correlated with four non-academic accomplishment scales (Social Participation, Social Service, Writing, and Social Science)" (Parnes & Treffinger, 1973, pp. 23-24).

APPENDIX C

PARNES' AND TREFFINGER'S SCORING DIRECTIONS

"Four variables were derived and identified as: Fluency, Flexibility, Originality, and Structural Analysis. Descriptions of each of the scoring dimensions follow:

1. Fluency. This score represents the total number of ideas that the subject produces in response to the problem. "Ideas" include all things which the person says he will do. Award one point for each idea given, so long as some specific action or behavior is described. This also applies to specific actions which are incorporated into more complex responses. That is, an idea should be counted every time the student actually describes something he could do. Include the response, "do nothing about the problem," if the person actually says that this would be his course of action in dealing with the problem. The FLUENCY SCORE is the total number of ideas given.

2. Flexibility. This score represents the subject's ability to see different kinds of possible solutions . . . to see alternative ways of solving the problem.

We shall assess this by classifying the kinds of ideas the subject produces, using the categories listed below. For every idea that is awarded a point for fluency, one or more of these categories will apply. Try to select the category which best describes the major part of the idea being rated, although, if it is really clear, you may decide that one idea fits in more than one category.

So, the person will have category numbers for each idea that was awarded points for fluency. But we cannot just add up the number of points as we did for fluency, for we are concerned here with the number of different categories. Thus, you should go over the list of categories for all the subject's responses, and count a point for each category the first time it appears. Subsequent uses of the same category receive no points. The total Flexibility score is therefore the number of different categories used by the subject.

Most errors in scoring Flexibility will come from two sources: (a) missed categories; and (b) missed student responses. To solve these problems, be certain to study carefully the list of categories, so that you can classify every idea quickly and accurately. Read each paper closely, and remember that any response which has been given a point for fluency must also fit into one or more categories. If it fits into a category which the subject has not previously used, it gets a point for Flexibility.

The Flexibility Scoring Categories are:

1. Self-Improvement or Change. A solution in which the primary factor is increasing the student's own ability to do something (to think, to feel, or to act). The idea clearly involves self-betterment, and usually describes some cognitive or affective change in the person (I could better myself . . . in some way.) This category includes direct mention of incentives to motivate self.

2. Peers. Solutions or ideas which primarily involve peers as the means of solution (example: I'd ask my friends to help me with my homework, etc. . . . I'd get a new roommate . . .).

3. Parents or Guardians as the primary source or factor.

4. School Advisors or Counsellors as primary source of help or advice.

5. Counsellors Outside School. Clergy, medical, legal psychological assistance.

6. Group Processes. Solutions which principally involve improvements in interpersonal relations. (Not just getting a friend; emphasis here is on social groups rather than individuals).

7. Physical Environment. Changes in the structure of one's physical setting or environment (car, dorm, campus, etc.)--but not just adding new things (see Category 8).

8. Effective Use of Resources. Solutions which involve the natural and physical environment as it is, but stress more effective utilization of resources. (Making what I have work more effectively). Includes time and sleep. This category includes Increasing Tangible Resources. Solve the problem by getting more money, credit, or through possession (attainment) of new products. (Include getting a job, getting a loan, etc.) These responses involve adding some new resources or things to the existing environment, not just better use or modification of what is there. (Better use of self--Category 1.)

9. Fantasy. Obvious fantasy (make a money tree; find a long-lost millionaire relative, etc.)

10. Redefinition. Responses in which the person solves the problem by defining it in a different way. (Make the "problem" go away by looking at it in a new light.) Do Nothing is included in this category.

11. Rest and Relaxation. Solutions in which the principal act is avoiding the problem, taking one's mind off it, doing something else, etc.

12. Study Schedule and Pace. Solutions involving establishing a schedule or pattern for study (When? Whether to Cram? etc.)

13. Study Techniques and Aids. Emphasis in the solution on defining better ways or methods for study.

14. Emotional Release. Action taken as an integral part of the solution. The purpose is some emotional release (e.g., go scream out the window and then return to books.)

15. Non-Academic Reward.

16. Anticipation of Future Action.

17. Cheating.

18. Avoidance of Social Contact or Interaction.

3. Originality. Each response in the solution was tabulated, and frequencies were established for "key" actions in each response. Originality was computed by weighing the frequency distribution, following the procedure described by Wilson, Guilford, and Christensen (1962). The distribution of responses and weights is shown in the following Table:

College Situations: Frequency Distribution of Responses of 158

Rating	No. of Responses	Frequencies Included
3	138	1
2	132	2-3-4
1	119	5 through 18
0	108	19 and above
	497	

Thus, there were (a) 138 responses, each of which were given by only one subject. Each such response was assigned a score of three; (b) responses given by two, three, or four subjects totaled 132, and each received a score of two; (c) responses given by five or more subjects (but not by more than 18 subjects) totaled 119, and each received a score of one; and (d) 108 responses were given by more than 18 subjects, and each of these received a zero score.

After the scoring weights were computed, each subject received an originality score; thus represented the sum of the weights assigned for individual responses included in the subject's total solution to the problem.

4. Use of Structural Analysis. This score was derived by reading the student's entire response to the problem, and then assigning it a rating as follows:

3 points--The student has a very clear, complex plan, and states explicitly a sequence of several possible (successive or simultaneous) actions that would be included. He then takes each of these ideas, analyzes it, and proposes several possible courses that might be taken.

2 points--The student has a clear idea about what he would do, which may include more than one possible action, but it is not clearly organized. His ideas are presented for several courses of action, but not in an explicitly stated sequence.

1 point--The student merely gives one or more ideas which specify particular actions he might take. There is no evidence of plan or organization to his ideas.

0 points--No ideas, or completely irrelevant response" (Parnes & Treffinger, 1973, pp. 12-15).

APPENDIX D

PROBLEM SOLVING COMPETENCE MEASURE*

(Circle one)

NAME ______________________________ SEX: M F AGE _____

HOME ADDRESS ______________________________

TELEPHONE ______________________________ GRADE _____________

SCHOOL ______________________________

The purpose of this survey is to determine how you are likely to react to real-life dilemmas and problems encountered by individuals and groups in our modern society. On the following pages are a number of situations persons have experienced. As you read each situation put yourself in the place of the individual experiencing the dilemma. When you have the situation clearly in mind, think of how you would react in such a situation. Then, in the space below the situation, write down your total reaction in specific detail.

To clarify:

1. In reporting your most likely reaction, think only of how you yourself would actually react. There are no right or wrong answers for these situations as there are math problems. Your reaction should be based entirely upon your knowledge of yourself as a person.

2. In describing your total reaction to each situation report (2) your feelings, ideas, and thoughts, as well as (b) your observable actions.

*General directions adapted from "Freshman Survey" (Goldfried & D'Zurilla, 1972).

3. In describing your observable actions, we are particularly interested in the specific details of what you would do or plan to do. A person reading your description should be able to visualize not only what you would do, but also how you would go about doing it. This enables a person reading your response to see your solution or solutions to the problem.

4. You may find it somewhat difficult to respond to some situations because they contain details which are not exactly appropriate to you. If this occurs, use your creative imagination to place yourself in these situations.

With these clarifications in mind, read the following sample situation and possible reaction.

DILEMMA:*

"You have become friendly with a student who has recently moved into your block. When school opened you were pleased that he is in your math course, but recently you've noticed that he is becoming overly dependent, continually asking you for advice and help with his math homework. His dependency disturbs you, but for fear of losing him as a friend, you have said nothing.

Your new friend, looking very worried and upset, comes into your study hall where you are working. He asks if he can borrow all of this week's homework to copy it because he couldn't understand it."

THE REACTION:

"I would be pretty nervous about the situation. I don't want to lose my new friend, nor do I want to be dishonest. The question came to my mind, "How can I best help my friend."

*Adapted from Problem 130, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

I would tell my friend to come by my home and talk about it, since we could not talk in study hall. I would explain to my friend that continually borrowing my homework would not teach him the principles behind the problem. What would he do when the teacher gave the test? If he really didn't understand, he should see the teacher for some help. Perhaps she could help get a tutor. It may be that he needs to change his schedule and allow study time. This reflects the conversation I would have with my friend."

This is one student's response to the situation. Your response may be entirely different. The value of the questionnaire will depend in large part upon how frank and honest you are in reporting your responses. Needless to say your responses will be kept strictly confidential.

The questionnaire begins on the next page. You are to spend 6 minutes on each situation, after you have read the situation. Do not begin until instructed to do so.

Problem No. 1*

Ever since you arrived at senior high school, you have always found yourself to be very nervous about taking exams. Particularly during your senior year you have been experiencing "exam jitters." You need some top grades to get into college.

You are sitting in one of your large lecture classes, and the teacher announces the date of a midterm exam, which will be occurring in a couple of weeks. This is a course you particularly want to do well in, but you are afraid that because of your difficulties with exams, you are going to do poorly.

---

*Adapted from Problem 59, "Freshman Survey," (Goldfried & D'Zurilla, 1972)

Problem No. 2*

You are aware that another student, a friend in your neighborhood, is a regular user of drugs like marijuana, "speed," etc. When you have attempted to discuss the dangers of possessing and using these drugs, (he) or (she) has told you he is willing to take the chance, but has made you promise never to reveal the fact that he is a user.

His parents were away one evening and you dropped by to listen to some records. About one-half hour after your friend mentioned that (he) or (she) was going to take some drugs, you hear shrill screams and cries from (his) or (her) room. You go in and find (him) or (her) hysterical and extremely upset.

---

*Adapted from Problem 111, "Freshman Survey" (Goldfried & D'Zurilla, 1972).

Problem No. 3*

You have been invited to attend a dance on campus with a young man in whom you are developing a very strong interest. You are very pleased that he is still interested in seeing you, especially since there was a recent occasion when you had to break a date with him.

When you share the news with your parents, they inform you that they would like you to attend your cousin's wedding in two weeks in Asheville. You realize that this is the date of the dance, and although you tell your parents that you already have plans, they insist that you have an obligation to attend your cousin's wedding and reception.

---

*Adapted from Problem 93, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

Problem No. 4*

Two high school seniors have in time become increasingly interested and involved emotionally and psychologically. To date they have engaged only in heavy petting. They were considering "going all the way" and having sexual intercourse which they both wanted, but the girl refused because she believed that intercourse between unmarried persons was no different from "shacking up." She could not explain why she felt this way. The boy reasoned that if they had intercourse it would not be the same as "shacking up" and strongly pressured her to have intercourse with him. She did not want to loose the boy friend. You are the girl.

---

* "Premarital Sex," Hypothetical Dilemmas for Use in Moral Discussion (Blatt, Colby & Speicher, 1974).

Problem No. 5*

A young high school couple decided that they wanted to get married. Their parents were against that and told them that if they wanted to marry, they would have to provide for themselves. It is expensive for a young couple to set up a household. It appeared that if they got married one would have to drop out of school while the other finished. The question was, "Who should drop out?"

The boy felt that he should go on to get an education because he would eventually have to support the family. It was impossible to get a good job without an education. The girl did not want to drop out because she felt that a good education and a meaningful career were just as important to her as to her husband.

The boy insisted that she drop out of school if they married. He felt that being a man meant making major decisions for which education was a preparation. He felt that a woman should do what her husband wants her to do. You are the young woman.

Problem No. 6

(a) Describe a problem with which you are personally involved. It may come from any number of areas: courtship, sex, marriage, morals, religion, home, family, friends, drugs, alcohol, school, the future, etc.

(b) Write down your total reaction in specific detail as you have in the previous problems.

---

*Adapted from "Women's Liberation," Hypothetical Dilemmas for Use in Moral Discussions (Blatt, Colby, & Speicher, 1974).

APPENDIX E

LETTER TO PARENTS

August 29, 1975

Dear Parents,

During the Fall Semester students enrolled in psychology and sociology classes taught to Mrs. Lane and Mr. Hutchins will be involved in a study project in real-life problem-solving training. The purpose of the project is to provide students with skills and techniques to deal with the problems encountered in day to day living.

The curriculum has been reviewed and approved by school officials. Information gained from students through questionnaires, surveys and standardized tests will be used for educational purposes. The identity of individual students will remain anonymous.

If you have any questions please contact me.

Sincerely,

Kenneth D. Dickens,
Dean of Students
Central High School

KD

APPENDIX F

LETTER TO TEACHERS, CENTRAL HIGH SCHOOL

Attention: Teachers, Central High School

An educational study project is being conducted at our school during the Fall Semester. A portion of this study relates to the behavior of high school students. During the next four weeks (September 15-October 10) your assistance is needed to observe the following student behavior:

1. students who show increased initiative and responsibility (i.e., assume responsibility for homework, class participation, outside projects, etc.)

2. students who show any marked attitudinal change from optimism toward negativism or gloom.

3. students who show any marked attitudinal change from negativism toward optimism.

4. students who demonstrate a noticeable interest in solving problems related to the curriculum, student life or any phase of school life.

5. typical problem students who demonstrate a new attitude of cooperation, involvement, etc.

6. non-problem students who have become more problematic during this period.

Please observe these behaviors. At the end of the four weeks you will be requested to submit the names of your students who meet the above criteria. This information is confidential and will be used only for educational purposes.

Thank you for this assistance.

Larry D. Wilkinson

APPENDIX G*

PROBLEM

You and your (brother) (sister) share a room. To avoid possible arguments and resentments over the condition of your room, you had the wisdom to set up a cleaning schedule outlining responsibilities beginning with the new school year. Specifically, you agreed to take turns cleaning the room, alternating each week.

You and your (brother) (sister) have basically the same school schedule and a similar number of extra-curricular activities. Almost two weeks have gone by and your roommate still hasn't cleaned the room, nor has (he) (she) mentioned anything about it. When you remind (him) (her) that it's (his) (her) turn to clean, you are told that (he) (she) has been too busy with studies. Realizing that you spend just as much time studying as your roommate does, you feel growing resentment about the fact that the agreement has been broken and that your room is beginning to look like a pig sty. There is also the anxiety of what the parents will do about it.

*Adapted from Problem 121, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

APPENDIX H

SUPPLEMENTARY EXERCISE*

List below a challenge you face or will be facing. State it as an idea-finding question. Then restate it several times, trying to get to the broadest possible interpretation.

CHALLENGE: In what ways might I ______________________________

____

____ Why?

RESTATEMENT 1. In what ways might I __________________________

____

____ Why?

RESTATEMENT 2. In what ways might I __________________________

____

____ Why?

RESTATEMENT 3. In what ways might I __________________________

____

____ Why?

RESTATEMENT 4. In what ways might I __________________________

____

____ Why?

*Adapted from Creative Behavior Workbook, (Parnes, 1967).

SUPPLEMENTARY EXERCISE

Write below your best definition. Then list a variety of means helping to meet the challenge.

CHALLENGE: In what ways might I ____

____

____

MEANS (ideas): ____

____

____

____

____

____

APPENDIX I

REAL-LIFE PROBLEMS AND PROGRAMMED DIRECTIONS FOR THE USE OF CERTAIN PROBLEM-SOLVING STAGES BY STUDENTS IN PROBLEM-SOLVING TRAINING

Problem #1 *

You and your (brother) (sister) share a room. To avoid possible arguments and resentments over the condition of your room, you had the wisdom to set up a cleaning schedule outlining responsibilities beginning with the new school year. Specifically you agreed to take turns cleaning the room, alternating each week.

You and your (brother) (sister) have basically the same school schedule and similar number of extra curricular activities. Almost two weeks have gone by and your roommate still hasn't cleaned the room, nor has (he) (she) mentioned anything about it. When you remind (him) (her) that it's (his) (her) turn to clean, you are told that (he) (she) has been too busy with studies. Realizing that you spend just as much time studying as your roommate does, you feel growing resentment about the fact that the agreement has been broken and that your room is beginning to look like a pig sty. There is also the anxiety of what your parents will do about it.

<u>STOP</u> <u>AND</u> <u>THINK</u>!

DEFINE THE PROBLEM: What is the basic goal or objective you have? Write it below:

*Adapted from Problem 121, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

Problem #2*

Thus far in high school you spent most of your time studying and did little dating. Now that you are a senior at Central, you are more interested in social life. You consider yourself to be a poor conversationalist with girls in that you don't seem to be able to hold their interest.

You have just met a girl at a dance and as you are telling her about your courses and instructor, you notice by the expression on her face and by her manner that she seems to be bored and anxious to get away. You feel particularly uncomfortable, especially since this is not the first time this has happened.

<u>READ THE PROBLEM</u>--<u>STOP AND THINK</u>!

DEFINE THE PROBLEM: What is the basic goal or objective you have? Write it below:

BROADEN THE UNDERSTANDING YOU HAVE OF THE PROBLEM BY ASKING WHY? What am I trying to do? Write it here in crisp, clear language:

NOW BRAINSTORM THE PROBLEM--Keep in mind the rules--refer to the handout if you can't remember.

List the possible solutions you think up below.

1.

2.

3.

(List others on back of page)

---

*Adapted from Problem 59, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

BROADEN THE UNDERSTANDING YOU HAVE OF THE PROBLEM BY ASKING WHY?

What am I trying to do? Write it here in crisp, clear language.

NOW BRAINSTORM THE PROBLEM--Keep in mind the rules--refer to the handout if you can't remember.

List the possible solutions below:

1.

2.

3.

4.

5.

6.

7.

8.

9.

Problem #3*

After a number of weeks of the new school year have passed, you are invited to a party by some very good friends, whom you like very much. You arrive at the party and quickly notice that all the people are smoking marijuana and that this seems to be the main activity at the party. You do not want to smoke with them for fear that you might make a habit of it.

You are enjoying the party and the company of your friends without smoking marijuana. However, you are becoming more and more annoyed that they persist in trying to get you to join in, even though you have refused rather firmly several times.

READ THE PROBLEM--STOP AND THINK!

DEFINE THE PROBLEM: What is the basic goal or objective you have? Write it below:

BROADEN THE UNDERSTANDING YOU HAVE OF THE PROBLEM BY ASKING WHY? What am I trying to do? Write it here in crisp clear language:

NOW BRAINSTORM THE PROBLEM--Keep in mind the rules--refer to the handout if you can't remember.

List the possible solutions you think up below:

1.

2.

3. (List others on back of page)

---

*Adapted from Problem 137, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

Problem #4*

Judy was a high school junior. She and Jack were in love. Judy's parents did not want her to get involved in a serious relationship because they felt that young people were so passionate they could not act responsibly. They thought that she was too young and they did not like Jack very much. Judy had bitter fights with her parents but the parents would not change their minds. They told her to stop dating Jack!

READ THE PROBLEM--STOP AND THINK!

DEFINE THE PROBLEM: What is the basic goal or objectives you have? Write it below:

BROADEN THE UNDERSTANDING YOU HAVE OF THE PROBLEM BY ASKING WHY? What am I trying to do? Write it here in crisp, clear language:

NOW BRAINSTORM THE PROBLEM--Keep in mind the rules--refer to the handout if you can't remember.

List the possible solutions you think up below:

1.

2.

3.

4.

(List others on back of page)

---

*Adapted from "Lisa and Mike," Hypothetical Dilemmas for Use in Moral Discussions, (Blatt, Colby, & Speicher, 1974).

Problem #5*

One day sixteen year old Mary confided in her sister Judy that she had recently started shooting heroin. Judy became very concerned and pleaded with Mary to stop. Mary refused to stop. You are Judy.

READ THE PROBLEM--STOP AND THINK!

DEFINE THE PROBLEM: What is the basic goal or objective you have? Write it below.

BROADEN THE UNDERSTANDING YOU HAVE OF THE PROBLEM BY ASKING WHY? What am I trying to do? Write it here in crisp, clear, language.

NOW BRAINSTORM THE PROBLEM--Keep in mind the rules--refer to the hand-out if you can't remember.

List the possible solutions you think up below:

1.

2.

3.

4.

5.

6.

7.

8. (List others on back of page)

---

*Adapted from "Drug Addiction," Hypothetical Dilemmas for Use in Moral Discussions, (Blatt, Colby, & Speicher, 1974).

Problem #6*

A family had twins (a boy and a girl) who were in their late teens. The boy was much freer than the girl. Whenever he went out, the parents seldom asked him when he would be back and with whom he went.

With a girl on the other hand, they were much more strict. They always wanted to know with whom she was going, what she was doing, and they wanted her to be home by eleven o'clock. <u>You are the girl</u>.

<u>READ THE PROBLEM</u>--<u>STOP AND THINK</u>!

DEFINE THE PROBLEM: What is the basic goal or objective you have? Write it below:

BROADEN THE UNDERSTANDING YOU HAVE OF THE PROBLEM BY ASKING WHY? What am I trying to do? Write it here in crisp, clear language.

NOW BRAINSTORM THE PROBLEM--Keep in mind the rules--refer to the handout if you can't remember.

List the possible solutions you think up below:

1.

2.

3.

4.

5.

6. (List others on back of page)

---

*Adapted from "Daughter vs Son," <u>Hypothetical Dilemmas for Use in Moral Discussion</u> (Blatt, Colby, & Speicher, 1974).

TESTING THE SOLUTION

Problematic Situation #7*

All last year you were looking forward to coming to Central for your Senior year. You thought the courses would be interesting and stimulating, and hoped that after being here a while, you would discover what you wanted to do with your life in the future.

After two months, you find that the introductory courses in your major area of interest are not nearly as stimulating and interesting as you thought they would be. It occurs to you one day that you are being required to learn a lot of facts and details that do not seem to be very helpful to you in determining what you should do with your life. You feel depressed, disappointed, and find yourself losing interest in studying.

DEFINING THE PROBLEM: (How would you define it)

This problem could be approached several ways. You may want to define the problem as: "How to renew my interest in my subjects of special interest?" or "How to decide what to do with my life?" or "Now that these subjects I am doing poorly in have not solved the problem of what to do with my life, what do I do to make an intelligent decision about my life's work?"

The immediate problem: "How to renew my interest in subjects covering my major area of interest?" Test the following alternative solutions using <u>imaginative action</u>:

---

*Adapted from Problem 34, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

1. I would let these courses slide and concentrate on the courses I am doing well in.

2. I would tell the teacher he was doing a "lousy" job of teaching the course.

3. I would drop out of school for a week or two and rest so the depression and disappointment would go away.

4. I would talk to the guidance counselor and see if she could help me understand why I was feeling depressed and disappointed, and losing interest in my studies.

5. I would talk to the teacher about my interest in the subject, explaining my depression and loss of interest, and see if she could help me understand why these facts and details are important for someone going into this particular field.

6. I would talk to the guidance counselor about my confusion and depression with the subjects in my major area of interest and see if she has any suggestions or could help me resolve my problem perhaps through a vocational interest inventory or aptitude test.

7. I would ask for a conference with the teacher and the guidance counselor and share my frustration and lack of interest in the subject and apprehension about discovering what to do with my life. I would ask the two to help me reconcile my interest in the course on the one hand and any current low motivation in this particular course.

Problematic Situation #8*

You have had a hectic week at school Three major quizzes and the big game with Central and Andrews has left you pooped. You feel like relaxing. It is Saturday night and you go to your room.

While sitting in your room and listening to some music, your mother comes into your room and asks you whether or not you have some school work to be done. Once you admit that you are not completely up-to-date in all your courses, she starts to nag you about not using weekends for studying.

Defining the Problem: (How would you define it?)

"How to get my mother to see that I need some time off from studies to relax?"

Test the following alternative solutions suggested by students by Imaginative action.

1. I would tell my mother to leave me alone, I did not want to be bothered by her nagging now or in the future.

2. I would ask her to leave the room and stop bugging me.

3. I would turn the volume up on the music and let mom keep nagging.

4. I would get up, slam the door, and leave the house to show her I was angered by her nagging.

5. I would explain to mon that I was tired after three quizzes and the big game. I would explain that I was aware of being behind, but if I could relax tonight and clear my mind, I would catch up on everything on Sunday afternoon.

---

*Adapted from Problem No. 108, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

6. I would just sit and listen to the music and let mom's words roll off me like water off a duck's back.

7. I would explain my fatigue to mom and reassure her that I have every intent of catching up on my studies. I would reassure her that I wanted to do well in school and not to worry because I would make her proud when report cards came out.

8. I would go talk to dad and see if he knew why mom was nagging me over my studies; after all, it is Saturday night.

Problematic Situation #9*

Michael was a fourteen-year-old boy in a family of five children. The father was working but the family was always short of money. Michael's mother couldn't work because she had to take care of the entire family. Michael got a part-time job delivering groceries after school, which paid $15 per week. When he received his first pay check he wondered what to do with the money. He knew that his parents really needed the money. However, he wanted to go out for football at his school, but each player had to buy his own uniform and shoes. When he got home, his parents asked for the money but he hated to give up football for the year.

Define the Problem (How would you define the problem?)

How could Michael help his family with their financial needs and still play football?

Evaluate the following solutions suggested by students. Submit each to rigorous testing.

1. Michael decides to tell his parents that he lost the money, but the coach had agreed to help him secure his uniform and shoes from a special fund.

2. Michael decides the best thing to do is give his parents the money and give up on playing football this year.

3. Michael decides to give the money to his parents and talk to the coach about his problem to see if there was some way he could get help on the uniform. Perhaps he could hire himself out to a

*Adapted from "Parents' Control over Children's Property," Hypothetical Dilemmas for Use in Moral Discussions, (Blatt, Colby, & Speicher, 1974).

friend of the coach to do odd jobs around their home, or perhaps there was some work he could do around the school to earn the money needed for the uniform and shoes.

4. Michael decided to talk to his parents about his interest in football. He would explain how he understood the plight of the family's finances, but he would also explain that as a student he needed to be involved in school affairs. He planned to ask his father to go with him and talk to the coach in private to see if they could work out some situation where he and his dad could earn the money for the uniform and shoes. Michael said he would tell his dad if he would help him earn the money for shoes and a uniform he would do his part to help out with the family's finances.

APPENDIX J

GENERATING ALTERNATIVE SOLUTIONS

Generating alternative solutions has been called biting an apple on all sides. Like looking at a beautiful gem, one soon discovers there are many sides and facets to be observed to fathom its beauty.

The major reason a student should learn how to generate alternative solutions to problematic solutions is to produce a list of possible solutions to the problem, the most effective being among them.

Brainstorming:

The "heart" of learning how to generate alternative solutions to the "real-life" problems we encounter from day to day is learning how to BRAINSTORM. As the term suggests, brainstorming calls for storming a problem.

Underlying brainstorming are two very important basic rules to be followed:

1. deferment of judgment - which means do not judge or criticize any possible solution suggested by yourself or anyone else until you have exhausted all possible solutions to the problem in your list. THIS IS A NO! NO!--THOU SHALT NOT JUDGE POSSIBLE SOLUTIONS!

2. Quantity breeds quality. Research reveals that the more alternative answers or solutions an individual can "think up" or generate, the more likely he is to arrive at the potentially best ideas for a solution.

The Four Ground Rules for Brainstorming:

Originally developed in 1939 to increase the productivity of his creative business associates, Osborn formalized the technique in 1963 with the following four ground rules (p. 156):

1. "Criticism is ruled out." Adverse judgment of ideas must be withheld until later. The teacher, your friends, your classmates- and you in particular must not criticize or judge your ideas at this point.

2. "Free wheeling is welcome." You are encouraged to let your imagination run wild. Any idea may be a good one. The idea here-- the wilder the idea the better. It is always easier to tame down than to think up. Remember that this is not a waste of time, since "off-beat" ideas may trigger a valid solution.

3. "Quantity is welcome." The greater the number of ideas, the more likelihood of prize winners. It is far easier to whittle down a long list of possible answers or solutions than to lengthen one. Statistically, it is obvious that as the number of ideas increases, the number of potentially valuable ideas will also increase. Furthermore, the greater the number of ideas listed, the more they can enter into combination with other ideas mushrooming the total idea output.

4. "Combination and improvement sought." In adddition to contributing ideas of your own, you should suggest how ideas of others can be turned into better ideas; or how two or more ideas can be joint into still another idea. HITCHHIKING on another idea given by someone else is one of the plus factors of group discussion.

APPENDIX K

STAGE FOUR--PRINCIPLES OF DECISION MAKING

At this point in your experience in problem-solving training, you are asked to evaluate the alternatives and select the best one from among them. Thus far, you have been asked to define the problem and generate as many possible solutions as possible--deferring any judgment until this stage. Having developed some skill in generating alternative solutions, you will likely be faced with strategies of varying quality.

1. At this point take your list of alternative solutions and conduct a rough screening to eliminate any obviously poor alternatives which do not warrant more serious detailed consideration. The elimination of these inferior alternatives increases the efficiency of decision making.

2. What is left after rough screening your long list of alternatives is a much smaller number of solutions which you would be willing to seriously consider in your solution of this "real-life" problem. Look at each of the alternatives left. List them and expand each one by listing the specific steps or behaviors necessary to carry out that particular solution.

3. You are now ready to examine each solution remaining and ask the following specific questions:

(a) What are the consequences if I carry out this possible course of action?

1. What are the personal consequences? How will this course of action effect my own feelings, needs, and desires?

2. What are the social consequences? What effect will this particular course of action have on the important people in my life and what reaction will this decision cause others to make towards me?

3. What are the short-term consequences to my personal and social life if I follow this particular course of action?

4. What are the long-term consequences? What are the possible results of this particular course of action in the future?

(b) What are the likelihood of these consequences occurring?

(c) What values do I place on these consequences? Another way of stating this is, "If I go through with this course of action, can I live with the consequences?"

Every person solves his problems on the basis of his own value system--what you believe about yourself, life, God, the good, the true and the beautiful, etc. Typically we solve problems on the basis of our general knowledge and what we have learned from others.

4. NOW PICK THE BEST ONE! From the small group of alternative solutions remaining after the rough screening--take the action step--pick the one you think is best.

APPENDIX L

PROBLEM # ______

ROUGH SCREEN YOUR LIST OF POSSIBLE SOLUTIONS: List the solutions below which you believe are worth pursuing. As you list the remaining possible solutions, write after each what specific steps or behaviors are necessary to carry out each solution. Another way of stating this is: "What must I do to carry out each solution?"

1.

2.

3.

4.

YOU ARE NOW READY TO ANTICIPATE THE CONSEQUENCES OF EACH SOLUTION!

What are the consequences if I carry out this possible course of action?

1. What are the personal consequences? How will it affect me?

2. What are the social consequences? How will it affect the important people in my life?

3. What are the short-term consequences?

4. What are the long-term consequences?

What basic values do I place on these consequences? Am I willing to accept these consequences? Are they compatible with my values and religious beliefs?

NOW, PICK THE BEST ONE! In light of consequences and my value system I will take the action step and pick the one I think is best.

APPENDIX M

STAGE FIVE--TESTING THE SOLUTION

Training in this fifth stage of real-life problem-solving training primarily involves learning to observe the consequences of one's actions and predicting the possible consequences if certain actions are taken. Testing can take place once the problem solver has decided what he believes to be the most effective course of action to be taken. For training purposes there are basically two ways to test a solution:

1. One way is to observe your own actions. Once a problem-solver has made a decision and acts upon that decision, the decision is tested (verified) as we judge to what extent his prediction of the outcome was accurate. We are asking the individual to observe and record the consequences. We want to know, "What happened when you carried out your plan of action?" If you are satisfied with the outcome, then you can terminate the problem-solving process. Typically a problem is solved when the problematic situation is no longer problematic--when the inner tension and frustration and anxiety are gone. Some psychologists believe that testing a solution cannot be taught. They contend that many consequences of our decisions can only be evaluated after the passage of time. However, some real-life problems call forth decisions that must be acted upon immediately. When we cannot wait for a month, a year, or ten years to pass to evaluate and test our solution we must rely upon a second method of testing.

2. A second way to test a decision is by imaginative action. Imagination can be a helpful technique in evaluating the decision

made. At this point the student has defined the problem, generated alternatives, and chosen the best alternative from the several remaining after the screening process of the decision-making stage. The procedure is basically identical to the training in the fourth stage where the student is asked to anticipate the consequences of several courses of action with regard to his individual value system; only at this point the process is confined to the final alternative answer or solution chosen, and it is more intense than the process in stage four. Again you ask the following questions:

(a) What are the consequences if I carry out this possible course of action?

1. What are the <u>personal</u> consequences? What will this do to me?

2. What are the social consequences? What effect will it have on important people in my life? What will other people do if I take this course of action?

3. What are the short-term consequences of my personal and social life?

4. What are the long-term consequences?

(b) What are the likelihood of these consequences occurring?

(c) What value do I place on these consequences?

IF THE SOLUTION DOESN'T MEASURE UP--Go back to the drawing board. Here you become a "trouble-shooter" and try to find out what went wrong. Try one of the alternative solutions you chose in the first rough screening. USE THE SKILLS YOU HAVE--try something new. "Nothing ventured--Nothing gained."

APPENDIX N

WORK SHEET: TESTING SOLUTIONS

Problem # 1 (defined)

How to get my brother (sister) assume the responsibility of helping clean up our room without creating conflict.

(Use the second method (Imagination) suggested for solution testing and evaluate the following solutions suggested by students. Remember that you are evaluating from your personal view point.)

1. Clean up the room myself.

2. Force him to clean up the room.

3. Clean up my half of the room and throw the debris on his bed.

4. Let it stay dirty.

(Use the first method [observing results] suggested for solution testing and evaluate the following results to solutions suggested by students.)

1. You decide that the best solution to Problem #1 was to threaten and force your younger brother (sister) to help clean up the room. When you started pushing the brother around he hit you bending your eye glasses. You struck him back. What resulted was a free-for-all fight. The new desk lamp you had purchased was knocked into the floor and broken just as your dad opened the door.

2. You decided to invite your brother's best girl friend over to embarrass your brother. Only when you walk in with your brother's best girl friend, you discover that your brother has invited another female classmate over to study sociology. Your brother's best girl

friend "blows up" and throws his class ring in the floor and storms out and you get the feeling you are in deeper trouble than before.

3. You decided to talk to your brother about the problem and work out a cleaning schedule together. The two of you feel good about the decision since it is a joint venture. For one week now your brother has been doing his part to help with the room cleaning. Even your parents noticed the difference and complimented the both of you on the improvement.

APPENDIX O

WORK SHEET: TESTING SOLUTIONS

Problem #4--Judy's parents told Judy to stop dating Jack even though she loved him.

Defined: How to get Judy's parents to change their minds about Jack and let you date him.

(Use the second method [Imagination] suggested for solution testing and evaluate the following solutions suggested by students. Remember that you are evaluating from your personal viewpoint).

1. You decide the best course of action is to run off and marry Jack.

2. You decide to ignore your parent's ultimatum and date Jack secretly.

3. You decide to obey your parents and forget about Jack and begin dating boys that they like.

4. You decide to not date anyone and show your parents a thing or two.

(Use the first method [Observing results] suggested for solution testing and evaluate the following results to solutions suggested by students.)

1. You and Jack decided to get married but keep the marriage a secret. That way your parents cannot bother you. Everything is going fine, until you missed your monthly period. The doctor believes you are pregnant and suggests that you have some tests, but since you and Jack have no source of income you feel you must talk to your parents.

2. You decided to talk to your parents about Jack again. You suggest that they invite Jack over for a meal and get to know him better.

Your dad is hesitant, but your mom wins him over and suggests that he join you for a day trip to High Rock Lake. Once your parents got to know Jack they begin to have a different feeling, and began to let you date him for special functions.

APPENDIX P

PROBLEM SOLVING STAGES

1. General orientation--(a) accept the fact that problematic situations are a normal part of life, (b) accept the fact that you have the ability to handle most of these situations, (c) "STOP AND THINK"--recognize problematic situations when they occur.

2. Define the Problem--What is the problem? State it in clear crisp language. What are the facts? Questions like: What? When? Why? How? Where? Who? help. Once goals are identified and the major issues specified, the problem-solver is ready to begin generating alternatives. It is often helpful to define problems as . . . "How to . . ."

3. Generate and list all the possible alternatives: During this stage you defer judgment on the alternatives, remembering the more alternatives you have the better--quantity breeds quality. What you are doing here is: "BRAINSTORMING." Remember the four rules of Brainstorming (Osborn, 1965, p. 156):

(a) "Criticism is ruled out." Adverse judgment or ideas must be withheld until later.

(b) "Freewheeling is welcome." The wilder the idea, the better, it is easier to tame down than to think up. Use your imagination--let it have free reign--remember the sky is the limit.

(b) "Quantity is wanted." The more ideas or alternatives you have the better. The greater the number of ideas, the greater the likelihood of useful ideas. Statistically, it is obvious that as the total number of ideas increase, the number of potentially valuable ideas also increase.

(d) "Combination and improvement are sought." In addition to contributing ideas of your own, participants should suggest how ideas of others can be turned into better ideas or how two or more ideas can be joined into another idea.

4. Make a decison--Make a rough screening of the alternative solutions you have generated and narrow your list down to several solutions you would be willing to consider. Remember to ask such questions as: "What are the consequences if I carry out each of the particular solutions?" What are the personal, social, short-term and long-term consequences? How will each of these alternative solutions affect your family, your job, your friends, etc." NOW PICK THE BEST ONE!

5. Test your decision--It is possible for the problem-solver to test his decision in two ways. (a) One way is to make a decision, act on it and then observe your actions and feelings and see if the problematic situation goes away. However, because of certain limitations of this method you may want to test your decision by (b) imaginative action. This process is similar to the process described in the rough screening section of decision making, only it is more intense, and confined only to the one decision.

DON'T JUST SIT THERE----------------------------CARRY OUT THE SOLUTION!!!

APPENDIX Q

REAL-LIFE PROBLEM-SOLVING EXERCISES

On the following pages are a number of situations students are experiencing. Read each situation putting yourself in the place of the person in the dilemma.

When you have the situation clearly in mind, describe how you would react in such a situation. I am interested in the specific details. When I read your description, I should be able to visualize not only what you would do, but how you would go about doing it. This enables me to see your solution to the problem.

Remeber your Problem-Solving Training.

Your response should demonstrate your knowledge of the real-life problem-solving stages.

Important procedures include:

1. Stop!! and Think!!

2. Define the Problem - How to . . .

3. What alternatives are open? (Can any of these be combined?)

4. Which alternative is best? How do you go about doing this. Remember you need a <u>specific</u>, <u>detailed</u> <u>plan</u> <u>of</u> <u>action</u>.

5. What will the consequences be? Why do you think this will work?

You may find it somewhat difficult to respond to some situations because they contain details which are not exactly appropriate to you. If this occurs, use your creative imagination to place yourself in these situations.

Problem #10

I'm a senior in high school and will be 18 soon. Yet my mother gives me the feeling at times that I am still 15. In the near future, I will have to make decisions which will be very important to me as an individual nevertheless she thinks she must make my decisions. I want her to help me, still I want to be able to stand by myself. I don't want to hurt her feelings by telling her so.

Problem #11

Pete is an 18 year old senior from a low income family. He would like to get a job and help the family, but a full time job would force him to drop out of school. Graduating from High School had always been a goal he and his family had set for him. He had been dating his girl friend for some time now and he found the relationship a pleasant one. The telephone rings. It is his girl friend with the news that she is expecting a baby.

Problem #12

My girlfriend and I have been dating for one year. We are planning to get married when we both finish school. Her father doesn't want to get into an argument with his wife about me. At the present, the only time we see each other is when we are at Church. If her mother is there we can't get together at all.

Problem #13

Jane attends a Church with a large youth department. Three times a year the department goes on retreats to camps for workshops over the weekend. Jane doesn't particularly like the Church because none of her close friends go there. The workshops are even more unpleasant, because she doesn't like to leave her boyfriend. Her mother thinks it is good for her to go on these workshops. The mother gets very upset about the idea of Jane not attending the workshops. The law has been laid down--"If you don't go on the workshops, you can't date that particular week-end."

Problem #14

Kathy and Dan are high school students and have been dating. Eventually Dan proposed and Kathy accepted. Things were going great until one day Kathy met Jim. Jim was totally different from any guy she had ever met. Jim asked her for a date. Kathy was unsure what she would do. She was engaged to Dan, yet, she wanted to date Jim, even if only once, to satisfy her curiosity.

APPENDIX R

REAL-LIFE PROBLEM-SOLVING EXERCISES

On the following pages are a number of situations students are experiencing. Read each situation putting yourself in the place of the person in the dilemma.

When you have the situation clearly in mind, describe how you would react in such a situation. I am interested in the specific details. When I read your description, I should be able to visualize not only what you would do, but how you would go about doing it. This enables me to see your solution to the problem.

Remember your Problem-Solving Training.

Your response should demonstrate your knowledge of the real-life problem-solving stages.

Important procedures include:

1. Stop!! and Think!!'

2. Define the Problem - How to . . .

3. What alternatives are open? (Can any of these be combined?)

4. Which alternative is best? How do you go about doing this. Remember you need a <u>specific</u>, <u>detailed</u> <u>plan</u> <u>of</u> <u>action</u>.

5. What will the consequences be? Why do you think this will work?

You may find it somewhat difficult to respond to some situations because they contain details which are not exactly appropriate to you. If this occurs, use your creative imagination to place yourself in these situations.

Problem #15

I like this guy and don't know how to tell him. We haven't really been dating, but I run into him every weekend and go off with him. When we're together he acts as if he likes me, but I can't be sure. I really like him and want him to know how I feel about him.

Problem #16*

A lengthy composition is due in your English class this Friday. It was assigned a week ago, and is on a rather difficult topic, which you really don't understand.

On Wednesday afternoon when you sit down to work, you find that you have absolutely no idea about what to include in the paper. You realize, however, that you must start writing the composition soon in order to have it in on time.

*Adapted from Problem 29, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

Problem #17*

You are enrolled in introductory psychology. You have recently had your first quiz for the first nine weeks of class. When you receive your paper back you discover you have received a grade of C.

In the cafeteria following class you and some of your friends are comparing papers and grades. Your best friend received a grade of B. Looking at his paper you are surprised and somewhat upset to find that his answers were essentially the same as your own.

*Adapted from Problem No. 89, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

Problem #18*

You have met this great girl on campus with whom you seemed to get along nicely. You called her for a date a day in advance; she said that she was busy, but asked you to call her again another time. The next time you called her a week in advance, set a tentative date, and were to call back again in a few days to confirm it. You called back and she indicated that she had made a mistake and already had a date for that weekend, asked you to forgive her, and suggested you call her again another time.

You would really like to date this girl; however, at this point, you're wondering how she really feels about you. You are particularly very hesitant about calling her again for a date and risking being turned down again.

Problem #19

I will be going to college next year. I am worried about how I will fit into the social and academic activities of college. Right now I have anxieties of how bad I will do in my grades and if I can pass the courses. This is a very big step to take and I hope I can handle it.

---

*Adapted from Problem 107, "Freshman Survey," (Goldfried & D'Zurilla, 1972).

APPENDIX S*

QUESTIONNAIRE REGARDING REAL-LIFE PROBLEM-SOLVING TRAINING

NAME ______________________________

A QUESTIONNAIRE REGARDING REAL-LIFE PROBLEM-SOLVING TRAINING*

Important: Many students in the future will be affected by decisions that will be based on your reactions as the first "test pilots" for the real-life problem-solving training conducted at Central High School. Therefore, your answers and comments on this questionnaire are highly significant. Please read each question carefully, and give serious thought to your answers and comments. Be completely frank in your response. You may use the back of the sheet if more space is needed.

Please circle one reaction in each multiple choice statement and provide as much information as possible for each item.

1. I find myself more aware of problems and challenges than before the training: (not at all)(very little)(somewhat)(a good deal)(a great deal)

Comment: ______________________________

____

2. I find that I am more prone to try different approaches to doing something or to attacking a problem than before the training: (no) (I doubt it) (not necessarily) (probably) (definitely)

Comment ______________________________

____

*Adapted from Toward Supersanity (Parnes & Noller, 1974) by permission.

3. Since participating in the training I find I tend to take more factors into consideration in making decisions than before the experience: (no) (I doubt it) (Not necessarily) (Probably) (Definitely)

Comment: ______________________________

____

4. I find myself more self-confident than before the program: (not at all) (very little)(somewhat) (a good deal) (a great deal)

Comment ______________________________

____

5. Since taking the training, I find that I tend to exert more effort in mental tasks rather than quitting so soon: (no) (I doubt it) (I don't know) (I think so) (definitely)

Comment ______________________________

____

6. Since taking the training, I find myself better able to cope with problems than before: (not at all)(very little) (somewhat) (a good deal) (a great deal)

Comment: ______________________________

____

7. Since taking the training, I find I am better able to develop my ideas and put them to use: (not at all)(very little)(a good deal)(a great deal)

Comment: ______________________________

____

8. I have found this program helpful in my school studies: (not at all) (very little) (somewhat) (a great deal)

Comment: ______________________________

____

9. As compared with my High School Courses in general, I think this training will prove valuable to my life: (not at all) (very little) (somewhat) (a good deal) (a great deal)

Comment: ____

____

10. Which of the following aspects of the training made the greatest impact upon you? (1) general orientation (2) problem definition and formulation (3) generation of alternatives (4) decision making, and (5) verification

Comment on the reason ____

____

11. If the training has helped you solve particular problems in any of the following areas, please explain:

Family: ____

____

School: ____

____

Church: ____

____

Personal: ____

____

Other: ____

____

12. How would you change the training procedure to make the program more effective: ____

____

13. Additional general (or specific remarks: ______________________________

____

____

APPENDIX T

LETTER TO TEACHERS, CENTRAL HIGH SCHOOL

ATTENTION: Teachers, Central High School

Several weeks ago you were requested to observe and record the names of any students in your classes who exhibited any of the behaviors listed on the form below during the last four weeks.

This information is confidential and will be used only for educational purposes. Please complete the form below; fold and staple, or place in a sealed envelope and place in Mr. Kenneth Dickens "Mail box."

Thank you for this assistance.

LARRY D. WILKINSON

STUDENTS WHO EXHIBITED THE FOLLOWING BEHAVIOR DURING THE LAST FOUR WEEKS:

1. Students who exhibited increased initiative and responsibility (i.e., assume responsibility for homework, class participation, outside projects, etc.)

NAMES:

(1) ____________ (2) ____________ (3) ____________

(4) ____________ (5) ____________ (6) ____________

2. Students who exhibited any marked attitudinal change from negativism toward optimism.

(1) ____________ (2) ____________ (3) ____________

(4) ____________ (5) ____________ (6) ____________

3. Students who exhibited any marked attitudinal change from optimism toward negativism or gloom.

(1) ____________ (2) ____________ (3) ____________

(4) ____________ (5) ____________ (6) ____________

4. Students who demonstrate a noticeable interest in solving problems related to the curriculum, student life, or any phase of school life.

NAMES:

(1)________________ (2)____________________ (3) ___________________

(4)________________ (5)____________________ (6) ___________________

5. Typical problem students who demonstrated a new attitude of cooperation and involvement, etc.

(1)________________ (2)____________________ (3)___________________

(4)________________ (5)____________________ (6)___________________

6. Non-problem students who have become more problematic during this period.

(1)________________ (2)____________________ (3)___________________

(4)________________ (5)____________________ (6)___________________

Signed ____________________________________

APPENDIX U

PROBLEM-SOLVING TABULATION SHEET

Name ______________________________

Criteria	Problem 1	Problem 2	Problem 3	Problem 4	Problem 5	Total
Fluency						
Flexibility						
Originality						
Structure						
TOTAL						

APPENDIX V

PERSONAL PROBLEM-SOLVING TABULATION SHEET

NAME ____

Criteria	Problem 6
Fluency	
Flexibility	
Structure	
GRAND SCORE TOTAL	

APPENDIX W

DATA ON THE FIVE PROBLEMS OF THE PROBLEM SOLVING COMPETENCE MEASURE

The following tables summarize the Results of the Analysis of Covariance, Tables of Adjusted Means for the Treatment and Control Groups Categorized by Time of Testing and Figures Presenting the Joint Effect of the Treatment and Time Variables for Each of the Five Problems of The Problem Solving Competence Measure.

Table A

Analysis of Covariance for Problem No. 1 Scores of The Problem Solving Competence Measure

Source	df	MS	F
Covariates			
Age	1	18.40	0.66
Sex	1	57.78	2.07
Race	1	136.03	4.88*
G. P. Average	1	56.52	2.02
IQ	1	18.64	0.66
Treatment (A)	1	44.97	1.61
Teacher (B)	1	18.83	0.67
Test (C)	1	302.76	10.87*
AB	1	25.08	0.90
AC	1	875.51	31.43
BC	1	0.59	0.02
ABC	1	1.65	0.05
Error	108	27.85	

*Significant at the .05 level or less.

Table B

Adjusted Means of Problem 1 of the Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	7.34	16.07	11.70
Control Group	11.68	9.50	10.54
	9.54	12.57	

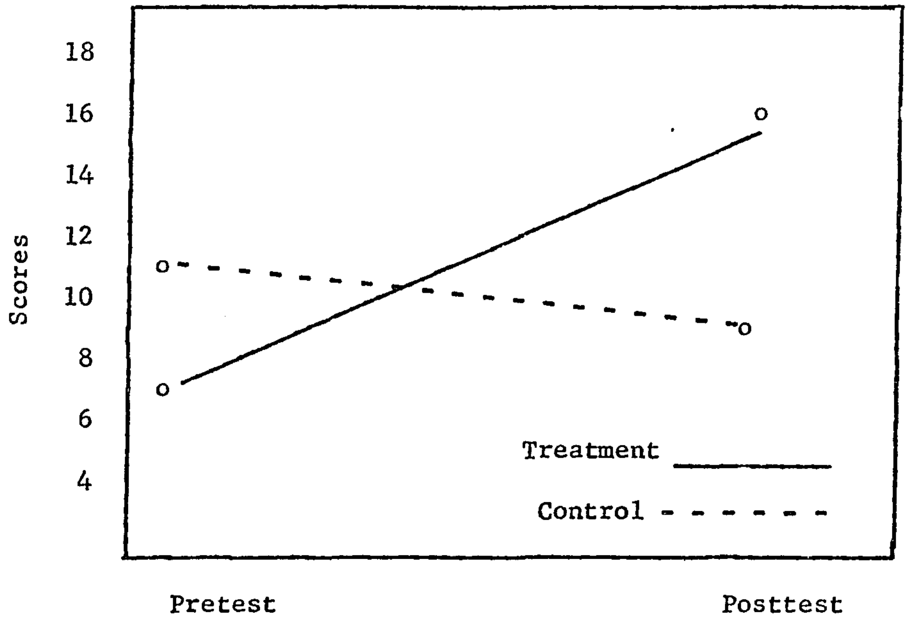

Figure A. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Problem No. 1 Score of The Problem Solving Competence Measure.

Table C

Analysis of Covariance for Problem No. 2 Scores of The Problem Solving Competence Measure

Source	df	MS	F
Covariate			
Age	1	13.37	0.60
Sex	1	0.57	0.02
Race	1	259.49	11.43*
G. P. Average	1	35.75	1.57
IQ	1	7.66	0.33
Treatment (A)	1	137.28	6.05*
Teacher (B)	1	0.72	0.93
Test (C)	1	186.96	8.24*
AB	1	0.87	0.03
AC	1	229.95	10.13*
BC	1	2.70	0.11
ABC	1	0.05	0.00
Error	108	22.68	

*Significant at the .05 level or less.

Table D

Adjusted Means of Problem 2 of the Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	3.21	10.19	12.80
Control Group	10.77	10.57	10.66
	10.44	12.88	

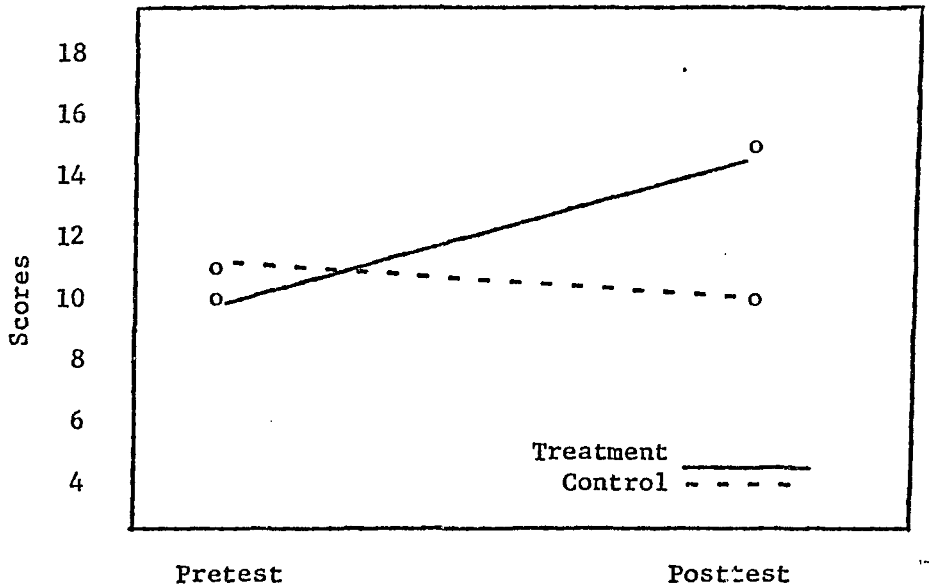

Figure B. Interaction of The Treatment Variable and the Time of Testing for Adjusted Means on the Problem No. 2 Score of The Problem Solving Competence Measure.

Table E

Analysis of Covariance for Problem No. 3 Scores of
The Problem Solving Competence Measure

Source	df	MS	F
Covariate			
Age	1	0.35	0.01
Sex	1	39.66	1.69
Race	1	24.60	1.05
G.P. Average	1	130.66	5.58*
IQ	1	8.71	0.37
Treatment (A)	1	182.36	7.79
Teacher (B)	1	14.76	0.63
Test (C)	1	44.04	1.88
AB	1	4.60	0.19
AC	1	315.58	13.48*
BC	1	17.76	0.75
ABC	1	1.41	0.06
Error	108	23.40	

*Significant at the .05 level or less.

Table F

Adjusted Means of Problem 3 of the Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment	8.51	13.06	10.78
Control Group	9.37	7.39	8.33
	8.95	10.04	

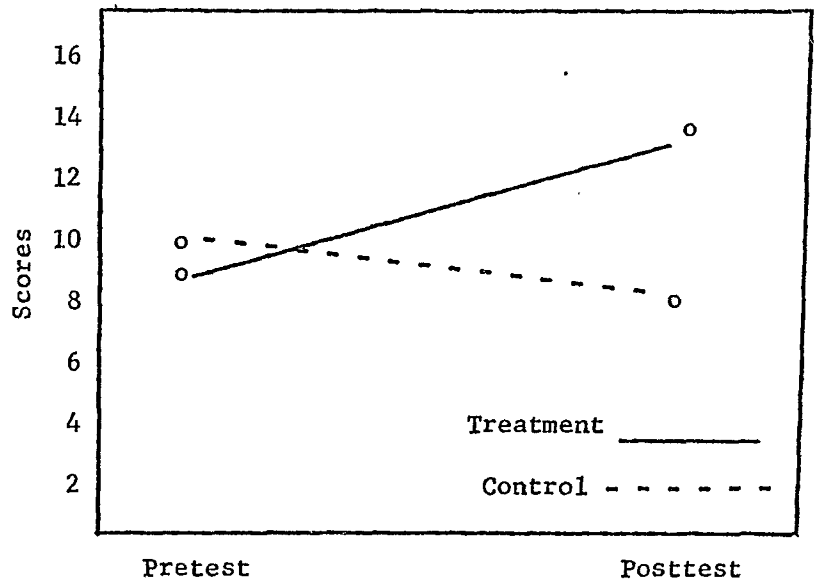

Figure C. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Problem No. 3 Score of The Problem Solving Competence Measure.

Table G

Analysis of Covariance for Problem No. 4 Scores of
The Problem Solving Competence Measure

Source	df	MS	F
Covariate			
Age	1	18.88	0.92
Sex	1	11.95	0.58
Race	1	38.13	1.85
G.P. Average	1	12.11	0.59
IQ	1	65.66	3.23
Treatment (A)	1	360.49	17.73*
Teacher (B)	1	9.59	0.47
Test (C)	1	636.81	31.32*
AB	1	6.83	0.33
AC	1	1048.85	51.59*
BC	1	0.44	0.02
ABC	1	76.05	3.74
Error	108	20.32	

*Significant at the .05 level or less.

Table H

Adjusted Means of Problem 4 of the Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	4.99	15.77	10.38
Control Group	7.50	6.40	6.92
	6.27	10.78	

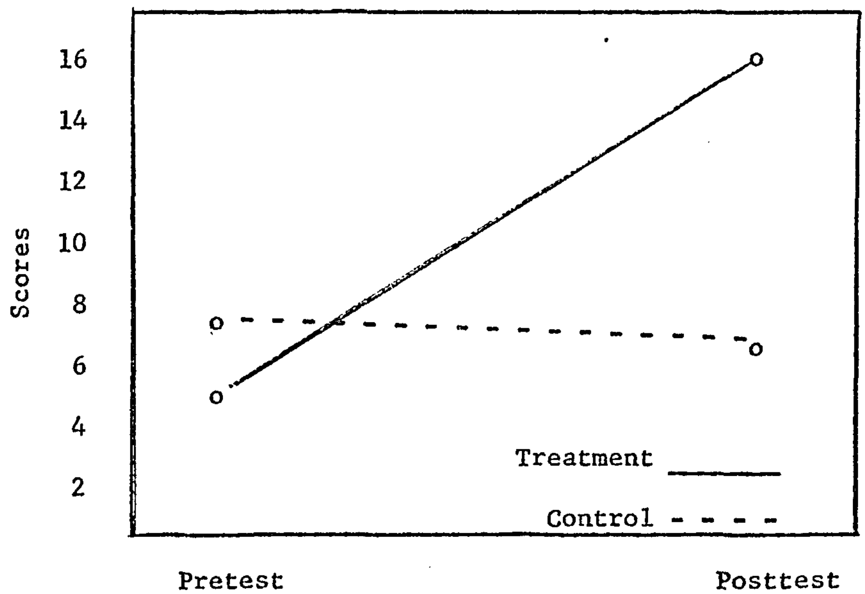

Figure D. Interaction of the Treatment Variables and the Time of Testing for Adjusted Means on the Problem No. 4 Score of The Problem Solving Competence Measure.

Table I

Analysis of Covariance for Problem No. 5 Scores of The Problem Solving Competence Measure

Source	df	MS	F
Covariate			
Age	1	15.76	0.68
Sex	1	107.93	4.72*
Race	1	13.15	0.57
G. P. Average	1	207.75	9.08*
IQ	1	1.82	0.07
Treatment (A)	1	265.40	11.60*
Teacher (B)	1	17.87	0.78
Test (C)	1	332.81	14.55*
AB	1	0.12	0.00
AC	1	475.68	20.80*
BC	1	50.37	2.20
ABC	1	39.68	1.73
Error	108	22.86	

*Significant at the .05 level or less.

Table J

Adjusted Means of Problem 5 of the Problem Solving Competence Measure for Levels of Treatment and Test

	Pretest	Posttest	
Treatment Group	6.44	13.92	10.18
Control Group	7.51	6.93	7.21
	6.98	10.20	

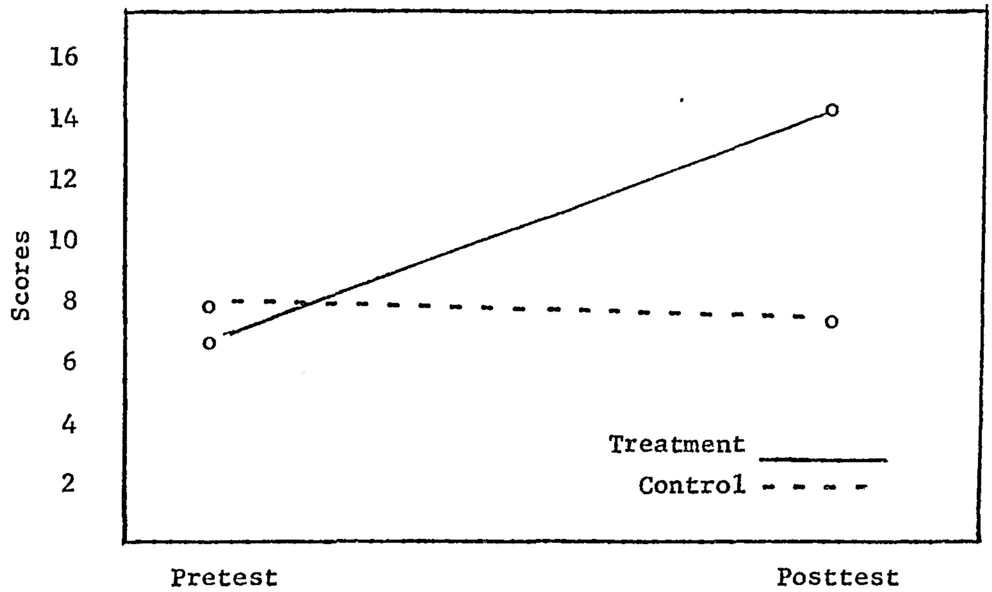

Figure E. Interaction of the Treatment Variable and the Time of Testing for Adjusted Means on the Problem No. 5 Score of The Problem Solving Competence Measure.