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1963
TEACHING PROBLEM-SOLVING WITH TELEVISION TO COLLEGE FRESHMEN IN HEALTH EDUCATION

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Robert Kaplan, B.S., M.A.

*****

The Ohio State University 1962

Approved by

[Signature]

Adviser
Department of Physical Education
DEDICATION

To my wife Beverly and sons Bruce, David, and Ronald for their forbearance so that this work could be accomplished.
ACKNOWLEDGMENTS

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CHAPTER I

THE PROBLEM

Statement of the Problem

This study is concerned with the teaching of problem-solving, as both method and objective, to college freshmen enrolled in Health Education 400 at The Ohio State University. In addition to meeting educational objectives, this research was stimulated, in part, by the limitations of education-by-television or television teaching. It is characteristic that this work is not concerned with the problems of television versus non-television but rather with problem-solving versus conventional methodology as used with television. Specific concern is, however, with objectives related to thinking and the solving of health problems.

In recent experience, staff members of the Physical Education Department of The Ohio State University have expressed considerable consternation regarding the emphasis of factual information versus the lack of problem-solving in the required Health Education 400 course. As a result of a study supported in part by the Ford Foundation in 1959, the Men's and Women's Department
of Physical Education combined their efforts to experiment with educational television. A series of experiments in class organization and the utilization of television were run and evaluated by the Bureau of Educational Research and Service of the University.¹ Suffice, at this time, to say, the experiments showed that teaching with television was as good as, and some instances better than non-television.² The measure of achievement was a gain score of an objective-factual pre and post test. During the early stages of the study, the Advisory Committee and other staff members raised the question of teaching with television for other than factual achievement, namely problem-solving, and eventually the present study was undertaken.

Background of the Problem

In all the history of man, knowledge has never accumulated at as rapid a rate as in this modern era. It is said that knowledge will double in ten years whereas centuries were required before. Facts are not only

¹Bureau of Educational Research and Service, "The Greater Columbus Area Instructional Television Project" (Columbus, Ohio: WOSU-TV, The Ohio State University, 1962), pp. 58-114. (Mimeoographed.)

²This finding is in agreement with numerous studies in a variety of fields; see, Ford Foundation and Fund for the Advancement of Education, Teaching by Television (New York: The Foundation, 1959), p. 87.
accumulating at a rate difficult to comprehend, but old facts and concepts are being replaced. "Whatever goes up, must come down," is now no longer true. "The atom is the smallest existing particle of matter" is now no longer true. Diseases once thought absolutely uncontrollable are now practically non-existent. More and more, research attacks old problems, recognizes new ones, and the ensuing technology requires a better-educated, thinking, active citizenry. Indeed, the progress of mankind can only be attributed to the thinking individuals in history.

It is necessary to consider, too, that new problems, more complex than the old, will require a greater proportional number of thinkers than in the past. Space technology, automation, overpopulation, degenerative diseases, viral diseases, air-pollution, democracy versus communism, are but a few designated terms for problems which responsible citizens of today and tomorrow must face.

The rapid increase in man's ability to understand and change the world and himself has resulted from an increased application of his powers of thought. These powers have proved to be his most potent resource, and, as such, the likely key to his future.³

The objectives of American education have always included improving the ability to think. Our knowledge of

what thinking is or how we think is still speculative, it has long been recognized as a most, if not the most important objective. The Educational Policies Commission indicates that the seven cardinal principles of 1918 include "fundamental processes" as an objective which is directed toward the development of the ability to think. There is little room for doubt that the six other cardinal principles, "health, worthy home membership, vocational competence, effective citizenship, worthy use of leisure and ethical character," cannot be attained automatically or by rote. In addition to developing ability in the "fundamental processes," there must be learning to apply them to problems the students will face. "Health" depends upon knowledge, interrelations of scientific phenomena and action taken to improve mental and physical condition. "Worthy home membership" requires knowledge of roles, emotions, personality and the making of reasoned judgments. "Vocational competence" involves more and more the use of rational powers as well as the use of the hands. "Effective citizenship," more difficult due to the

4Ibid., pp. 5-7.

remote factors of modern life, requires greater intellectual powers to study, evaluate, decide the actions to be taken. "Worthy use of leisure" requires a capacity to understand and choose for the achievement of purpose and satisfaction. "Ethical character" implies a commitment to thoughtful choices of ethical, moral and religious values rather than conformity to authority. The "Purposes of Education in American Democracy" might similarly be equated to the development of the ability to think. Here are listed (a) self-realization; (b) human relationships; (c) economic efficiency; (d) civic responsibility.6

One of the distinctive characteristics of man in his ability to reason and use the recorded experience of mankind in so doing. It is fitting that the cultivation of this ability be the focus and end of all education.7

Higher education is vitally concerned with similarly constituted objectives; perhaps more so than other levels of education. These objectives are expressed in terms of general rather than specified education in the 1947 Report of the President's Commission on Higher Education:

The purpose of general education should be understood in terms of performance, of behavior, not in terms of mastering particular

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bodies of knowledge. It is the task of
general education to provide the kinds of
learning and experience that will enable
the student to attain certain basic outcomes,
among them the following:

1. To develop for the regulation of
one's personal and civic life a code
of behavior based on ethical principals
consistent with democratic ideals . . .

2. To participate actively as an informed
and responsible citizen in solving the
social, economic, and political problems
of one's community, state and nation.

3. To recognize the interdependence
of the different people's of the world
and one's personal responsibility for
fostering international understanding
and peace . . .

4. To understand the common phenomena
in one's physical environment, to apply
habits of scientific thought to both
personal and civic problems and to
appreciate the implications of scientific
discoveries for human welfare . . .

5. To understand the ideas of others
and to express one's own effectively . . .

6. To attain a satisfactory emotional
and social adjustment . . .

7. To maintain and improve his own
health and to cooperate actively and
intelligently in solving community
health problems . . .

8. To understand and enjoy literature,
art, music, and other cultural activities
as expressions of personal and social
experience, and to participate to some
extent in the form of creative activity . . .
9. To acquire the knowledge and attitudes basic to a satisfying family life . . .

10. To choose a socially useful and personally satisfying vocation that will permit one to use to the full his particular interests and abilities . . .

11. To acquire and use the skills and habits involved in critical and constructive thinking . . .

In the foregoing discussion of the objectives of general education there are two main themes to be related. The emphasis placed on thinking is amply demonstrated. The other of considerable note is the theme relative to health, both personal and societal. In its 1961 explanation of the seven cardinal principles, the Educational Policies Commission explains "health" as an objective attained through rational powers. Conversely, it points out that health, physical and mental (though health educators would deplore the dualistic explanation), is a prerequisite of rationality. Without health, the likelihood of developing the capacity for effective mental performance is drastically reduced. In its 1938 document, 

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9Educational Policies Commission, 1961, op. cit., p. 5.

10Educational Policies Commission, 1961, loc. cit., p. 15.
the Commission discusses under the objective of "self-
realization" specific characteristics of the health-
educated person: "The educated person understands the
basic facts concerning health and disease . . . The
educated person protects his own health and that of his
dependents . . . The educated person works to improve
the health of the community . . ." 11

These, in addition to the obvious relationship of
objectives of general education numbers, 2, 4, 6, 7, 9,
in the President's Commission 12 to health education
highlight the concern of educators to both thinking and
health as objectives of general education. 13

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12 President's Commission on Higher Education, op. cit., pp. 50-57.

In describing the attitudes of an educated person, Oberteuffer points out:

A person well educated in health matters is one who lives as well as knows. He not only knows the basic facts concerning health and disease but he takes all scientifically approved steps to preserve his health and prevent disease. He is not victimized by humbug or by the charlatan. He has sense enough to know the difference between falsehood and truth, between science and quackery, and, perhaps even more important, between a life dedicated to "just getting by," or "just well enough," and the life of abundant, vital, creative energy which lifts him above the commonplace and allows him to live at his best.\(^\text{14}\)

In spite of considerable literature and opportunity, there is much evidence that the objectives of general education are not being adequately met. Indeed, it might be said in some situations, some of the objectives are not being met at all. That the situation is not unique is noted in several instances. Thorndike,\(^\text{15}\) in 1950, reaffirmed the writings of Moore,\(^\text{16}\) and Strauss,\(^\text{17}\)


\(^{17}\)Sam Strauss, "Some Results for the Test of Scientific Thinking," Science Education, 16: 89-93, December, 1931.
that there exists a real gap between factual knowledge and ability to solve problems. More recently Aylesworth\textsuperscript{18} and Habte\textsuperscript{19} developed evidence of this vital inadequacy in teaching. In the area of Health Education, Potthoff,\textsuperscript{20} and Cushman\textsuperscript{21} have pointed to the need for more effective and direct teaching of thinking and problem-solving in health education in accord with the concepts and principles of general education. The objectives of the course Health Education 400 are

1. to provide information and set up appropriate processes useful in the solution of health problems inherent in adjustment to college life;
2. to acquaint students with the agencies and other resources on campus and in the community which are useful in solving the personal health problems of students. (Student counseling services, clinics, and health service);
3. to assist in the development of a well integrated personality;

\textsuperscript{18}Thomas G. Aylesworth, "Problem-Solving: A Comparison of the Expressed Attitudes with the Classroom Methodology in Selected High Schools" (unpublished Ph.D. dissertation, The Ohio State University, 1959).


4. to clarify thinking about personal and public health matters, to remove superstition, false beliefs, ignorance, to substitute scientific thinking for falsehood and misbelief;
5. to establish the ability in students as they analyze health problems to see cause and effect, to recognize consequences, to use the scientific method in the conduct of their lives and thus to preserve life and the fullness of it.\textsuperscript{22}

It is the concern of the staff that these objectives be met as fully as possible. With as many as 49 sections of approximately 45 students in each section in each of three quarters (in 1961-1962) one could expect an administrative and staff load that precludes methodology involving difficult preparation and evaluation, unfamiliar techniques, and all in a one-hour per week course! The particular difficulties notwithstanding, reasons for the lack of thinking as a method by teachers in general are suggested by Dressel:

\begin{quote}
\ldots\ the dependence of thinking on knowledge has led to the misconception that thinking proceeds automatically out of knowledge;
Learning about historical personnages and their ideas is considered by many to be more important than giving students a chance to set forth ideas of their own;
\end{quote}

\textsuperscript{22}\textit{Department of Physical Education, "The Contributions of Health Education and Physical Education to the General Education of Students at The Ohio State University: An Interpretation of the Program" (Columbus, Ohio: The Department, 1960), p. 3; see also Oberteuffer, \textit{op. cit.}, p. 75.}
Some teachers are inclined to view this emphasis on critical thinking as likely to result in an underemphasis on meeting other needs of a large percentage of students; The lack of understanding of the nature of reasoning and of how to teach it encourages retreat to the more familiar grounds of emphasis of knowledge.²³

In the aforementioned study by Habte, thirty-nine obstacles to the development of reflective thinking were generalized from the literature.²⁴ A checklist of twenty-five obstacles was developed and evaluated by administrators and then teachers. Apparently, many reasons can be found for not teaching through and by thinking.

### Definition of Terms

**Problem-solving.** Thus far we have used synonymously, terms such as thinking, powers of thought, fundamental processes, rational powers, intellectual powers, reason, scientific thought, critical thinking, constructive thinking, problem-solving, scientific method, and reflective thinking. These and other terms, such as rational and creative thinking are frequently used in the same way. Specifically authors will define the limits to which they extend their meaning. There is apparent agreement, however, that their meaning is

derived from the most influential work on thinking in education by Dewey.

We may carry our account further by noting that reflective thinking in distinction from other operations to which we apply the name of thought involves (1) a state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates, and (2) an act of searching, hunting, inquiring, to find material that will resolve the doubt, settle and dispose of the perplexity.25

"Other operations" refers to thinking as a stream of consciousness, imagination, and believing. Dewey also refers to the scientific method and the solving of problems synonymously with reflective thinking. Risk states:

Problem-solving in relation to learning may be defined as a planned attack upon a difficulty or perplexity for the purpose of finding a satisfactory solution.26

He then points out the importance of Dewey's reflective thinking in contrast to mere recitation of facts without critical evaluation.

Actually, most definitions of problem-solving describe it as a series of steps, procedures, abilities or skills. There are an intriguing variety of treatments of this


subject some of which follow and others in the chapter on related literature.

In Education for Effective Thinking, there are given various basic abilities:

One may be said to think effectively to the degree that he behaves in any of the following ways:
1. Recognizes and defines problems, identifies issues.
2. Formulates, extends and verifies feasible hypotheses.
3. Collects, selects, or selectively recalls relevant data, differentiates between reliable and unreliable sources, between factual and non-factual sources.
4. Recognizes reliable experiments.
5. Draws reasonable inferences regarding cause and effect, logical implication, valid generalization, reliable prediction, and accurate description.
6. Recognizes and evaluates implicit assumptions, uses postulational arguments logically, recognizes relevant value systems and uses them reasonably.
7. Recognizes errors and fallacies.
8. Comes to decisions or conclusions, tests them, applies them to pertinent situations.
9. Applies semantic principles to language employed.\(^27\)

On a seemingly more practical level and perhaps better related to a study of this kind in the area of health education, Cushman lists an organization of steps in the problem-solving approach:

I. Selecting and Defining the Problem.
II. Working on the Problem.
   1) organizing known facts, principles, and relationships, 2) advancing tentative

solutions to the problems and selecting methods of procedure, 3) gathering facts through reading, observing, surveys, interviews, films, 4) selecting facts pertinent to solution of problems, and 5) interpreting and analyzing facts.

III. Conclusion and Plan of Action.28

At this point in seeking to understand and define problem-solving, there is considerable agreement with Thorndike that "problem-solving and reflective thinking do not follow an orderly or uniform pattern."29 The steps or procedures used to define or explain skills in problem-solving are not rigidly fixed in the order presented. Suggestions are that these are models or descriptive phases some of which are omitted, reduced in importance, occur "out-of-sequence" (if a definite pattern is thought of) or occur simultaneously. Variety of process is well noted as in a highly regarded study of Bloom and Broder.30 Also Risk says:

Under some circumstances the gathering of data looms rather large because without sufficient data, no plausible solutions can be proposed nor can proposed solutions be critically evaluated. For these and

28 Cushman, op. cit., p. 156.
29 Thorndike, op. cit., p. 197.
other reasons, the steps enumerated above, while essential, cannot be followed as a guide in organizing learning and teaching steps in schoolroom problem-solving.\textsuperscript{31}

While in complete agreement with the first sentence, it can be noted that even Risk proceeds to contradict himself on the latter issue on subsequent pages in his book. Meaningful, indeed more practical, is the realization that teaching for problem-solving does not require (nor is it always advantageous) proceeding from step 1 to step 2 and so on. A given lesson or series of lessons may dwell on one step, phase or skill.

It also follows if a problem be defined as a situation which gives rise to perplexity, uncertainty, or doubt requiring solution or explanation which is not immediately evident,\textsuperscript{32} then problem-solving is the process or procedure employed to satisfactorily resolve a problem situation.

Presented to delimit the variety of thinking skills or abilities involved in problem-solving as an operational definition is the following:

**PROBLEM-SOLVING SKILLS**

1. Ability to Define a Problem

Identifying and defining a problem in a clear and precise manner enables an individual to begin to attack

\textsuperscript{31}Risk, op. cit., p. 458.
\textsuperscript{32}Adapted from Dewey, op. cit., p. 12.
the problem more efficiently. This avoids the frustration of attempting to settle a difficulty without knowing what the difficulty is. It enables ideas to crystallize or fall into some sort of pattern. This skill is also important for good reading and understanding as well as personal problem-solving.

2. Ability to Select Pertinent Information for the Solution of a Problem

After definition of the problem, one needs to know what kinds of information would be most helpful. Thus, information must be adjudged on the basis of relevancy or pertinence and also of reliability so that superfluous and misleading evidence is discarded or disregarded. There is also an interaction between information and the definition of a problem as well as the intelligent solution achieved.

3. Ability to Recognize Stated and Unstated Assumptions

An assumption is a part of the argument that may be taken for granted (unstated) without any argument to justify it. If it is stated, it is simply "said" to be true, not "shown" to be true. In either case, assumptions make an important difference as to whether the argument or conclusions ought to be accepted or rejected. Critical thinking, logical thinking, and sound judgment are most apparent at this stage.

4. Ability to Formulate and Select Relevant and Promising Hypotheses

To consider as many possible solutions to a problem increases the likelihood of the best possible one being selected for the given situation. To explore mentally, think through consequences or results can eliminate both the misfortunes of poor choice and the frustrations of trial and error.

5. Ability to Draw Conclusions Validly and to Judge the Validity of Inferences

Correct reasoning or logical thinking enables one to draw conclusions which are truly based on the evidence and naturally follow from it. Good information is useless if the wrong conclusions are drawn from it. A valid
conclusion follows the evidence. To infer something or accept something which is inferred but is not validly related to the information, may be due to personal bias rather than objective thinking. Drawing valid conclusions and judging the validity of arguments or presentations which we read or hear, are critical skills in problem-solving.33

**Problem-solving course.** Most of the writers referred to earlier were in the process of not merely explaining problem-solving but, more pointedly, making an appeal for the direct teaching of problem-solving. Merely to teach about problem-solving does not suffice but if the educational objectives are to be attained skill must not only be developed, it must be used and wherever possible transferred. Direct teaching, for the desired skills and attitudes to promote their continued use, is the only recourse.

The teacher's point of view is crucial. He must recognize the importance of critical thinking as an objective of instruction, must allow time for the discussion of controversial issues, must see that all sides of a question are presented, and must emphasize the process of working toward an answer rather than the correctness of the answer itself . . . As members of a group check inconsistencies in a statement, ask if a conclusion is justified, present new evidence, and study consequences of particular conclusions they are developing abilities in critical thinking.34

33Adapted from Dressel and Mayhew, op. cit., p. 179. Modified and reproduced with permission of the publishers.

Since the above quotation refers to children rather than college students, a discussion on the relative importance of the correctness of answers is omitted and agreement made with the emphasis on process.

On the theory of transfer (particularly regarding teaching to think), Burton lists characteristics of which methods of teaching is the most important:

1. Transfer is not automatic.
2. Transfer is not inherent in any subject, but it is possible from any field. Transfer is not dependent upon a set of formal exercises, but on methods of teaching which utilize lifelike situations as to methods, materials, problems.
3. Transfer is facilitated by teaching directly for conscious transfer.
4. Transfer varies. There is much transfer (a) on common things easy to generalize, and (b) by persons of good intelligence. There is little on items difficult to generalize, and by duller individuals.35

Thus, the problem-solving course is defined as being consciously, actively engaged in the direct teaching of problem-solving insofar as problem-solving has been described. Additional insight may be gained in the following discussion and definition of the conventional course.

Conventional course. There are varying degrees of teaching ability and the use of imagination in education.

35 Burton, op. cit., p. 290.
Undoubtedly many teachers do exceedingly well in achieving most of their course objectives. However, in the light of the foregoing discussion, a course can be considered conventional or traditional if it does not teach for thinking. The "mere recitation of fact;" the use of rote; the exercise of memorization; evaluation and teaching not including problem-solving, are considered to be conventional or traditional.

There exists a similar relationship of terms in the development of the psychological versus the logical or factual approach to teaching. The latter may be considered to neglect problems vital to the student and to present information "extrinsic" to the students' needs, interests and perhaps maturation. Also, it may make little or no effort to motivate learning except by coercion, grades, or punishment. Oberteuffer explains the techniques of acquiring meaningful problems for developing course content and says of the psychological approach:

The psychologically constructed unit of work is based on the demonstrated or revealed student needs and interests. Its material is alive and meaningful. Its point of view is

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37 Oberteuffer, op. cit., pp. 84-93.
predominantly contemporary and it aims more at the solution of immediate problems than at the accumulation of information for possible later use...  

Thus, it would present material "intrinsic" to the students' needs and interests and employ the elements of problem-solving techniques. Allowing that the conventional health education course is psychologically constructed to the extent that it deals with contemporary student and community problems, the conventional or traditional course may be defined as lacking in an organized effort to teach problem-solving directly but rather emphasizing factual information.

One further consideration for the distinction between the problem-solving class and the conventional is the element of teacher-student exchange. The lecture system or lecture-discussion where the students ask questions to be answered by the teacher is the antithesis of the problem-solving class. Oberteuffer discusses the "one-way or didactic methods" versus the "two-way or Socratic methods." The essence of the method is student participation; teacher-student exchange. Risk would use "problem-solving by the teacher" as a lecture-demonstration and warns of the need for "problem-solving by the teacher."
group" and "problem-solving by individual pupils." The teacher's role would be more that of guide than lecturer.

Television course. The use of television in Health Education 400 will be described in greater detail in the chapter on experimental procedures. At this point it is necessary only to reiterate that the course was taught with television and not solely by television. Co-educational classes met in groups of three hundred and fifty students for a half-hour viewing session and then met in groups of forty to fifty for "discussion" sessions for one hour (actually forty-eight minutes) two days later for eight out of ten weeks.

As was implied early in this chapter, concern was not only with improved methodology for the course but also with expanding the limitations of educational television to go beyond the presentation of factual information.

Definition of the Problem

The problem presented and treated in this study may be defined as "comparing the problem-solving method with the conventional method in Health Education 400." Stated more explicitly, the sub-problems were:

Sub-problem one: To determine the effectiveness of each method on factual achievement and to evaluate the differences, if any.

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Sub-problem two: To determine the effectiveness of each method on problem-solving achievement and to evaluate the differences, if any.

Sub-problem three: To compare the attitudes of the students in the problem-solving experience to those of the conventional experience.

In the process of solving the problem through its sub-problems, the following tasks were to be completed:

1. To devise and present a problem-solving approach to multiple sections of the Health Education 400 course in which television was used;

2. To construct a teacher's guide, student's guide and arrange for in-service training in problem-solving for participating teachers;

3. To adopt, adapt, or construct an evaluative tool (test) for the measurement of achievement differences, if any;

4. To establish an experimental design and procedure for satisfactorily evaluating results and comparing the two groups;

5. To adopt, adapt, or construct an evaluative tool (attitude scale) to compare the attitudes of the two groups.

Hypotheses of the Study

The solution of the sub-problems, and thus the problem itself, is inherent in the testing of ten
hypotheses; two major hypotheses and eight minor hypotheses of considerable interest. The hypotheses and brief considerations follow:

1. There is no significant difference in knowledge achievement (factual information gained) between the two groups, and;

2. There is significant difference in problem-solving achievement between the two groups.

In accord with the foregoing statement of the problem, and as reiterated in the literature, the above hypotheses are the primary concern of a study such as this. Of secondary concern, or minor hypotheses, are the following:

3. Both the problem-solving group and the conventional group were equal in knowledge and problem-solving at the beginning of the course.

Though testing the third hypothesis was not an absolute necessity (the groups could be assumed to be equal), it should help to verify the sampling procedures and add to the effectiveness of statistical inferences.

4. There is a significant correlation between the scores on the Ohio State Psychological Examination and gain in factual information.

5. There is no significant correlation between the score on the Ohio State Psychological Examination and problem-solving achievement.

6. There is a significant correlation between the score on the Ohio State Psychological Examination and course grade.
Hypotheses four, five and six were formulated as a consequence of evidence in the literature that problem-solving ability is not dependent upon intelligence as measured by certain tests. In addition, the availability of the OSPE coincides with the expressed interest of instructors who would use it as a predictor of success in their courses.

7. There is no significant correlation between problem-solving ability and year in college.

8. There is no significant correlation between problem-solving and sex.

The seventh and eighth hypotheses were to be tested to support or oppose the findings of previous studies regarding the factors of year in school and sex.

9. There are significant differences in gains among specific problem-solving skills.

The ninth hypothesis was to be tested to demonstrate where, if any, differences in problem-solving abilities between the two groups developed.

10. There are significant differences in the attitudes of the students in each group toward the course.

The tenth and last hypothesis is not to be construed as least consequential. Indeed, the solution of sub-problem two depends upon its verification. This hypothesis appears in last place only because it was necessary to
process it at the end of the experiment. Its role in the analyses of the results of this study is self-evident.

Limitations of the Study

As indicated, this study was limited to freshmen (men and women) enrolled in Health Education 400 at The Ohio State University specifically in the autumn quarter 1961.

There was no attempt to study actual changes in behavior except as inferred from pencil-paper tests.

Scheduling, grouping of classes, and assignment of teachers were limited in a large part by normal administrative procedure.

While approximately 2000 students in 39 sections were enrolled in the course, the study was conducted with a sample from 14 sections of approximately 50 students each in the problem-solving group and 14 sections of a similar number in the conventional group.

The evaluation of results and ensuing inferences was based on group performances rather than on individuals.

Importance of the Study

In view of the earlier discussion on the importance of meeting the objectives of general education and health
education; the concern expressed by various writers (i.e. Cushman,\textsuperscript{41} Potthoff,\textsuperscript{42} and others) regarding the need for teaching through problem-solving in health education; the contradiction between attitude and practice as evidenced by Aylesworth\textsuperscript{43} and the variety of reasons by teachers for failing to employ problem-solving techniques as developed by Habte;\textsuperscript{44} the concern with the limitations of educational television; and finally, a desire to improve teaching in health education specifically for the writer and hopefully for health educators everywhere, it is a modest expectation that this study will make a contribution through the improvement of teaching techniques and evaluation in problem-solving.

\textsuperscript{41}Cushman, op. cit.
\textsuperscript{42}Potthoff, op. cit.
\textsuperscript{43}Aylesworth, op. cit.
\textsuperscript{44}Habte, op. cit.
CHAPTER II

REVIEW OF RELATED LITERATURE

Health Education. Thinking as a process and technique has been a topic of philosophical discourse throughout the ages. It is only recently in history that experimentation and scientific study of thought processes and man's behavior in his environment have been conducted. While scientific thinking, or methods, were formerly related only to the physical sciences, it appears that the development of new sciences such as psychology, sociology, anthropology and other disciplines or fields of study have adopted scientific study techniques.

In psychology, controversy developed over theories of behavior and it was not long before the impact of such theories was felt in the educational systems of the United States. There is little doubt that the single greatest contributor to the educational process through problem-solving or, "reflective thinking" was John Dewey.¹ The first edition of "How We Think" in 1910 and its

¹John Dewey, How We Think (Boston: D. C. Heath and Company, 1933).
revision in 1933 have set the pattern for most of the educational and much of the psychological literature on this subject that was to follow. In the first chapter, it was shown that many definitions of problem-solving are based on Dewey. The steps or procedures used to explain problem-solving were also treated in the first chapter of this study and were shown to be based on the work of John Dewey. Several authors such as Russell, Dressel and Mayhew, and, throughout their book, Burton, Kimball, and Wing, attest to the importance of Dewey's role in modern thinking concepts. This is not to establish Dewey as an original proponent of reflective thinking; actually, he merely developed further the concepts of such men as Bacon, Descartes, Hebart, Spencer and James; however, he gave new impetus to thinking as an educational aim.

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2Ibid., p. 12.
3Ibid., p. 107.
While the impact of the new educational psychology-philosophy was felt in all fields, it is with Health Education which we would be particularly concerned. It can be noted that experimental studies in problem-solving are practically non-existent in this area. Much of the writing has been of a descriptive or expository nature.

There is an implied relationship between the project-method and problem-solving in that a student project frequently is related to drawing conclusions or actually solving a problem. Though problem-solving is not specifically alluded to, Averill is among the early advocates of the project-method in Health Education.  

The project-method appears throughout the literature mostly with generalized references to problem-solving. The Joint Committee on Health Problems referred to problem-solving through a brief discussion of the need for the experimental approach in 1930.

The psychology of the past which employed the philosophical method of discussion and dialectic has been replaced by a science of psychology which collects facts on the basis of testing and experimentation. This mode of approach has extended to health education, a field in which workers are becoming more and more critical, and increasingly submitting the devices and procedures used in building up healthful behavior to scientific study. . .

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Is healthy behavior to be thought of as a series of habits, or is it expected that a person should approach each situation involving health as a problem to be solved in which reasoning and judgment are to be used? . . .

Mere book learning, memorization of rules, and recitation cannot be depended on to produce health behavior.

It is unfortunate that its second revision eleven years later made no more specific recommendations along these lines. However, a subsequent edition, discussed later, is more helpful.

Another inference to our topic was made by Oberteuffer who pointed out that "learning about health proceeds from the particular problem to the generalization, from specific interests to broader relationships." This reference to inductive method of reasoning might be considered an allusion to problem-solving but, again, is non-specific. If the previously mentioned project-method may be considered related, it is well to include


references to the problems-approach. Almost always problem-solving is implied but never actually executed (in presentation). Oberteuffer,\textsuperscript{11} Gordon,\textsuperscript{12} Staley,\textsuperscript{13} Byrd,\textsuperscript{14} Sliepcevich,\textsuperscript{15} Lantagne,\textsuperscript{16} and Malfetti\textsuperscript{17} are among many authors who propose as a meaningful point of departure or for selection of course content, the problems and interests of students. Of the authors listed, only Sliepcevich advocates the problem-solving approach in the use of everyday problems to modify student behavior.\textsuperscript{18}

\textsuperscript{11}Delbert Oberteuffer, \textit{Personal Hygiene for College Students}, Contributions to Education, No. 407 (New York: Teachers College, Columbus University, 1930).


\textsuperscript{18}Sliepcevich, \textit{loc. cit.}
Years earlier problem-solving was briefly discussed in a special group meeting of the Eighth Health Education Conference chaired by Reba Harris. It was agreed to keep an open-mind about this approach. In 1938, Williams and Shaw indicated that problem-solving was being much used and referred to Dewey's five phases of reflective thinking:

Problem-solving may lead to original thinking and action; under a skillful teacher scientific attack upon problems may be readily acquired. It is the foe of traditional recitations marked by vague personal opinions upon matters for which facts are available...

...Skillful teacher guidance and interesting scientific reference materials are essential to effective problem-solving.

They also support the Thorndike theory of transfer by stating, "Habits, attitudes and knowledge acquired in one situation, transfer only when there is much in common between the situation in which training was given and the new situation." Herein lies a major reason for teaching

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21 Ibid., p. 250.
through problem-solving. In addition, knowledge is placed in perspective: "Knowledge in and of itself does not necessarily influence conduct . . . Knowledge must serve some drive before it functions in conduct . . . Knowledge is to be thought of as a tool. It helps to achieve ends and reach goals." Strang and Smiley added to this theme: "Knowledge is most likely to function in healthful living if it is gained in response to a felt need and if it is arrived at through the process of problem-solving." An illustration of a dietary problem is given and procedure proposed: (1) a question that clearly states the problem, (2) look for facts, (3) evaluate and weigh facts, (4) organize facts into tentative solution, (5) test and apply proposed solution. In 1943, Williams, who as a co-author, had made specific reference to the topic, discusses scientific method in terms of scientific progress.

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22 Ibid., p. 251.
24 Ibid.
25 Williams and Shaw, op. cit.
and does not relate it to teaching method. An excellent article by Potthoff treats the subject:

Health education today emphasizes facts; its contribution otherwise to the thinking discipline appears to be fragmentary . . .

There are several bad effects from emphasizing facts. Students come to regard fact possession as the great objective of education and to minimize the importance of other objectives. They tend to regard scientific facts as unassailable, failing to appreciate the limitations which even reliable facts have.

Examples of good and bad thinking are presented through possible topical approaches: (1) the scientific method; (2) values as a guide to good judgment; (3) awareness of problems; (4) problem-solving and the use of relevant data: (5) problem-solving and avoiding the use of irrelevant data (pity, prejudice, humor, etc.); (6) selected errors in inference (post hoc, false analogy, and hasty generalizations); (7) statistics and good thinking. In this article there appears to be a reasonably meaningful synthesis of reasoning related to logic and reasoning related to judgment in the solution of problems.


Grout contends that the project-method employs, or should employ, the problem-solving procedure. In this and a later (1953) edition, Grout lists (1) selection of a problem for attention; (2) definition of the problem; (3) collection of data; (4) interpretation of data; (5) drawing conclusions; (6) apply the conclusions to the solution of a problem or to a plan of action; and (7) evaluating results. She makes the further recommendation that problem-solving be applied through group planning and action. In the same year, Sharman wrote, "It is usually recommended that techniques of problem-solving and group discussion should be used to a great extent." No further explanation or example was presented. A slight variation on the theme, again without example, appeared the next year; "No one method of teaching is recommended. The problem-solving method is most useful when conditions are appropriate . . .".

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29 Ibid., pp. 105-110.


In discussing the unit approach, Williams and Abernathy state:

... it should be clear that pulling together materials in related wholes will include the problem-solving approach and that the unit should present situations essential to problem-solving. One of the major purposes of health teaching is to assist students at their own maturity levels to solve current problems and to achieve proficiency in applying previous learnings to changing situations. The problem-solving approach is helpful in assisting pupils to achieve the ability to apply the results of previous experience to new problems. Many teachers have developed a high degree of expertness in guiding children to use problem-solving techniques. Briefly stated, the steps in problem-solving are:

1. The identification of the problem;
2. Finding the facts which relate to the problem;
3. Applying those facts to the problem;
4. Drawing conclusions;
5. Acting upon the conclusions;
6. Rechecking periodically as the situation changes to see if the conclusions drawn and the action taken are justified in the light of additional information or experience.

Making application to research, Cureton writes:

In the following outline of steps, it is difficult to determine which is being better described, Dewey's steps in logical thinking, or the steps in scientific method:

1. Formulation of a definite problem;
2. Data collecting;
3. Working up the data;
4. Statement of tentative or trial conclusions;

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5. Test the conclusions;
6. Revision of the conclusions if necessary;
7. Write up and publication of the findings in permanent form . . .

. . . There are many evidences that the steps of scientific method (critical thinking) may be applied to very broad problems. 33

Problem-solving or scientific method related to research in the fields of Health, Physical Education and Recreation appear as well in the works of Cowell, 34 Larson, Fields, and Gabrielsen, 35 and Scott. 36

A yearbook concerned with the combined fields is directed, by its title, toward "Developing Democratic Human Relations" and employs problem-solving in more than one instance. 37 Jones and others, in a section on


"Programs for Children" and dealing with "Methods," say that teacher sponsored projects and student selected problems are a problem-solving approach to enriching community living.\(^{38}\) Treating the adolescent, Deitz and co-authors contend that group action closely approximates problem-solving and describe the steps of the process.\(^{39}\) Under "Concepts and Attitudes To Be Developed," the need for problem-solving skills and Dewey's logical sequence of problem-solving are shown.\(^{40}\)

Cushman presents an excellent case for the use of problem-solving when he says (1) our methods should promote ways of democracy and cooperative group action; (2) we must keep immediate goals of students in mind and remember that learning is better when related to needs and interests; (3) methods are more effective when they include first-hand experiences; (4) clearly understood, well-defined objectives increases effectiveness of learning; (5) opportunities for satisfaction, success, and achievement must be made available; (6) our methods must allow for reflective thinking and thinking begins

\(^{38}\) Edwina Jones, Helen M. Starr, and Frances Wayman, Ibid., p. 193.

\(^{39}\) Dorothea Dietz, Rose Strasser, and Harry C. Thompson, Ibid., p. 288.

\(^{40}\) Milton A. Gabrielsen, William F. Meredith and Dorothy E. Nyswander, Ibid., p. 458.
with a problem; (7) we must provide an organized systematic body of subject matter leading to understanding of principles; (8) we should continuously impress with the importance of scientific method applied to everyday living. Cushman then introduces the problem-solving method as a developmental approach compared to the authoritative approach. A suggested organization of steps is selecting and defining the problem, working the problem, and a conclusion and plan of action. The working of the problem implies the gathering, organizing and interpreting of acts, and advancing tentative solutions. The last step involves summarizing, drawing conclusions and planning action.

What are the values of the problem-solving method: It can provide for individual differences . . . The problem method allows for the democratic methods . . . It promotes the use of scientific method . . . When one applies the scientific method to a problem, reflective thinking results.

A study by Reid, purports to deal with problem-solving. Actually, problem-solving is not defined nor

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42 Ibid., p. 157.

are the phases one would go through to solve a problem dealt with. The purpose was to develop a pencil-paper test which presents a situation and true or false items related to the situation are to be indicated. This appears to be merely a new and perhaps more interesting way in which to evaluate factual knowledge. Evidence of problem-solving skills is not required. The inference is unfortunately made that this test evaluates problem-solving ability.

Oberteuffer, in discussing planning for effective teaching appeals again for teaching from the specific to the general and indicates the need for the formation of scientific attitudes, and the practice of scientific behavior.\(^4\) In leading class discussions he presents a problem-solving-critical thinking pattern. After recognizing various kinds of discussion available as the first point, choosing and defining the problem, dividing the problem into subdivisions, searching for valid evidence (and applying critical appraisal) and choosing the best conclusions are subsequently indicated.\(^5\)


A recent revision of a classic book in the field by the Joint Committee on Health Problems in Education dwells on problem-solving in several instances and in some detail.\(^\text{46}\) Its emphasis on goals related to problem-solving was discussed in the first chapter of this study. As in other works, this one deals with problem areas to be considered in curriculum and course work. Indeed, a problem-solving approach is outlined as an aid to curriculum improvement.\(^\text{47}\) In discussing related subjects it states that "Related learnings are brought together in core programs and problems courses in which emphasis is placed on ways of exploring and solving problems rather than on mastery of subject matters."\(^\text{48}\) For kindergarten and primary grades an objective is cited; "The teacher uses the problem-solving method to help each child work out his personal-social relationship problems."\(^\text{49}\) The problem-solving approach, an example problem, and some methods applicable to junior high schools are discussed.\(^\text{50}\) Advocating problem-solving for the high school, the book


\(^{47}\) Ibid., p. 117.

\(^{48}\) Ibid., p. 121.

\(^{49}\) Ibid., p. 151.

\(^{50}\) Ibid., pp. 207-211.
states, "When properly used, problem-solving facilitates understanding, develops individual judgment, and promotes decision making."\(^{51}\) It then lists component parts of the problem-solving method as outlined in the Citizenship Education Study:

I. Defining the problem; (a) Encountering the problem, (b) Selecting the problem, (c) Wording the Problem, (d) Setting up tentative solutions.

II. Working the problem; (a) Recalling known information, (b) Determining need for more information, (c) Locating sources of information, (d) Selecting and organizing information, (e) Analyzing and interpreting information.

III. Drawing a conclusion; (a) Stating possible conclusions, (b) Determining the most reasonable and logical conclusions, (c) Reaching a conclusion.\(^{52}\)

In a reference to textbooks, The Joint Committee points out, "For effective learning, the health information is accompanied by problem-solving experiences in which knowledge is brought to bear upon real life situations."\(^{53}\) It would seem, then, that this volume, which is considered a classic in health education holds problem-solving in high esteem as an educational method. At least it devotes

\(^{51}\textit{Ibid.}, \text{ pp. 236-237.}\)

\(^{52}\textit{Ibid.}, \text{ See also the Citizenship Education Study, Problem-Solving (Detroit: Wayne State University Press, 1957).}\)

\(^{53}\textit{Ibid.}, \text{ p. 301.}\)
more attention to the method than other books in the field.

There appeared to be little of the problem-solving procedure and more concern only with the application of fact to conclusions, much like the aforementioned work of Reid,\(^5^4\) in an article by Byrd.\(^5^5\) While Myers mentions problem-solving as a method used in teaching a personal health course, he confusingly lists teaching models, films, slides and overhead projectors as methods, too.\(^5^6\) Indicating he has found a fairly strong resistance to problem-solving and seminar techniques, and attributing this to indoctrination through the textbook lecture approach, Veenker describes an experiment to evaluate the lecture, discussions, and problem-solving methods.\(^5^7\)

Problem-solving skills or abilities are not measured, however. It was found that the three methods were equally effective as measured by the Kilander Health Knowledge Test, 

\(^{5^4}\) Reid, op. cit.


\(^{5^6}\) Frank H. Myers, "Personal Health," Student Medicine, 10: 456-462, April, 1962.

Byrd Health Attitude Scale, and Whitely Health Interest Checklist, for knowledge, attitudes and interests. In correspondence, this author learned that problem-solving procedures were employed but not emphasized. It was observed that the problem-solving group seemed to have a "set" against problem-solving till late in the semester but then "tended to develop greater ability for critical analysis and the application of information in working toward the solution of health problems." 

Physical Education. References to problem-solving appear in the closely allied field of physical education. Wood does not elaborate but refers to problem-solving as a method of "natural gymnastics as in solving the problem of learning a skill." Reba Harris, mentioned earlier in the section on health education, appeals for the use of problem-solving through a variety of opportunities in physical education:

The child, we find, learns more readily from first hand experiences in which he has opportunities to ask questions, to explore and experiment, to evaluate, and to have a part in the changing . . .

59 C. Harold Veenker, op. cit., p. 468.
Problem-solving, then, according to our interpretation is not a mechanical classroom method or device. It is an aspect of real reasoning—the essence of Thinking through the bio-psychological process of learning. Its end result is action—action based on scientific facts which have been collected, weighed, and evaluated by the group concerned—action sold on values which have received the emotional acceptance of the individuals of the group.61

In considering values and curriculum in both physical and health education, Smith and Coops write:

... The school curriculum in physical and health education must be constructed in full consideration of its problem-solving value, ...

The process includes preliminary experience and experimentation, opportunity for insight and reflective thought, and the development of ability to solve problems and to evaluate conclusions.62

Writing in Guidance of Children Through Physical Education LaSalle says:

This process in skill development follows the steps usually given for problem-solving; recognition of the problem; collection of data to solve it (analysis of the skill and discovery of faults); and evaluation (determination of degree of success and reasons for failure). As analyzing, practicing and evaluation proceed, learning takes place.63


"Life is a continuum of problem-solving situations," writes Kozman and further points out that group planning in order to conduct business is quite similar to scientific problem-solving.

Brownell and Hagman, under appraisal of knowledge and understanding and the use of problem-situation testing, feel that it is desirable to have students give reasons for the answer to the problem.

Though mentioned earlier with books on research in the combined fields, Cowell titles his first chapter "Problem-Solving, Research, and the Scientific Method" and then discusses problems in both physical and health education.

Kozman, Cassidy and Jackson represent the "sequential logical" steps of problem-solving by a series of questions:

What is the problem? What do I know about it? What else do I need to know about it? Where can I get the information needed? In the light of all information available, what

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65 Ibid., pp. 121-123.


are the alternative ways leading to a solution? Which way seems best suited to my ends? What plan do I need to make to reach this solution? Did the plan work? \(^6^8\)

Quite interestingly, these authors indicate that "the democratic group process, learning as problem-solving, and the teaching process require the same steps to be taken and similar skills utilized":

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<thead>
<tr>
<th>Analysis of the Three</th>
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<tbody>
<tr>
<td><strong>The Democratic Process</strong></td>
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<tr>
<td>1. Solution of a common problem sought by a group</td>
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<tr>
<td>2. Fact finding</td>
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<tr>
<td>3. Joint decision on action to be taken</td>
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<tr>
<td>4. Planning what to do</td>
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<tr>
<td>5. Carrying out plans</td>
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<tr>
<td>6. Estimating results</td>
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<tr>
<td><strong>The Teaching Process</strong></td>
</tr>
<tr>
<td>1. Assigned responsibilities as a teacher</td>
</tr>
<tr>
<td>2. Exploring pupil's needs</td>
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<td>3. Setting up objectives</td>
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<td>4. Selecting program content</td>
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<tr>
<td>5. Carrying out plans</td>
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<tr>
<td>6. Evaluating outcomes</td>
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<tr>
<td><strong>Problem-Solving</strong></td>
</tr>
<tr>
<td>1. A felt difficulty defined</td>
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<tr>
<td>2. Seeking information about alternative solutions</td>
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<tr>
<td>3. Selecting a solution to be tried</td>
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<tr>
<td>4. Deciding what to do to move toward a solution</td>
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<tr>
<td>5. Acting to solve problems</td>
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<tr>
<td>6. Resolution of a problem or another solution tried (^6^9)</td>
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\(^6^9\) Ibid., p. 70.
Science Education. Declarative or expository articles appear in profusion in other educational fields and at all levels. It appears that in science, undoubtedly due to the development of scientific methods, much has been written and several experimental studies are reported. Moore tested the assumption that scientific attitude is developed by a knowledge of scientific facts and varies directly with such knowledge. Using data from the Otis Group Intelligence Test and her own tests of fact and judgment from various age levels with and without science education, Moore found (1) a high relation between ability to distinguish a valid explanation and knowledge of facts and principle, but (2) ability to apply knowledge is not in direct proportion to knowledge of facts.\footnote{Evelyn B. Moore, "A Study of Scientific Attitudes as Related to Factual Knowledge," \textit{School Review}, 38: 379-386, May, 1930.}

Using a test by Downing, "Some Elements of Scientific Thinking," Strauss found students in grades eight to twelve had good ability to recognize problems and powers of observation. However, ability to reason, to analyze, to see essential relationships was poor. Except in some abilities, there was little difference between the sexes. Conclusions were that (1) there is no marked relationship between thinking and general intelligence (using the Otis Intelligence Test) but a positive relationship is
indicated and (2) increase in ability to reason with increase in age (up to college freshmen) is negligible. 71 Downing later administered his own test and confirmed Strauss' findings. In addition, having surveyed high school science textbooks, he concluded, since there were no provisions for direct teaching of problem-solving, there was no evidence that students acquired skill in scientific thinking from their courses. 72

Downing three years later indicated that general intelligence or IQ is different from scientific thinking. 73

Barnard and Robertson found that students who participated in the preparation of their study guide required less time to solve problems and performed at a higher level than those whose teacher prepared their guides. 74


Comparisons of direct applications of problem-solving teaching versus traditionally taught groups favor the former in studies by Burnett, Blair and Goodson, Wessell, Barnard, Teichman, Baker, Dawson and Heiss.

Mild dissent was registered in one study in general science when measuring attitudes. After seven months there was no significant difference regarding expressed attitudes.

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between a traditionally taught group and a problem-solving group.  

Pointing out the similarity between everyday problem-solving and scientific method, Van Deventer writes they differ only in motivation, kinds of problems, and greater conservatism (in scientific method).  

Though there has been much literature in the science education field, as shown by the references previously cited and a vast amount of less relevant, thus not cited, literature, apparently there is still much concern over the lack of classroom application of problem-solving method.

Aylesworth's study, using Obourn's checklist, found a great disparity between what science teachers felt

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about the importance of problem-solving method and what they did about it.

Other educational fields. Perhaps no field is left untouched in consideration of the appropriateness and concern for the use of problem-solving. Considered a classic in the area of mathematics is the work by Fawcett. In English, Glaser studied problem-solving and demonstrated highly favorable results. Consequently this led to the publication of and the widespread use of the Watson-Glaser Tests of Critical Thinking and its revision, 'Watson-Glaser Critical Thinking Appraisal.'

An excellent treatment in its area is "The Problems Approach and the Social Studies" first published in 1955


and more recently revised. Bayles reports on the "problem-solving aspects of reflective-scientific study" as applied to some social studies courses.

In the application of reflective thinking to teacher education in various subject fields, Bayles has written extensively in both an earlier and more recent volume. A still more recent volume in the same vein was written by Hullfish and Smith.

Relating to General Education, the work of Dressel and Mayhew, which contributed significantly to the accepted operational definition of problem-solving in the previous chapter is most meaningful and helpful. The book was a result of the cooperative Study Evaluation in General Education.

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Education of the American Council on Education of which this reference is the "Final Report," and in which several tests of critical thinking were developed. 97

Another interesting by-product of the study is "Science Reasoning and Understanding." 98 This work is an application of five abilities of scientific reasoning to textbook materials and current publications. 99 A mimeographed guide for teachers interested in critical thinking was prepared by Dressel and Hill and has application to several subject areas. 100

An excellent reference designed to help teachers in service and in training in critical thinking and its application has also been cited earlier. 101

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97 Ibid., p. 287-288; The test cited were found to be no longer distributed by the firm indicated. They were made available through the Office of Institutional Research, Michigan State University, East Lansing, Michigan.


99 Ibid., p. 6.

100 Paul L. Dressel and Walter H. Hill, "Critical Thinking--A Guide to Instruction and Evaluation" (East Lansing, Michigan: Board of Examiners, Michigan State University, September, 1955), p. 84. (Mimeographed.)

While it is not the purpose of this survey of literature to include all references (indeed, there are far too many for treatment herein), it is necessary to mention two earlier influential writings by Brownell and Thorndike. The latter accepts as the theory of transfer a widely quoted and adapted passage from Glaser.

In psychology and educational psychology there is a vast literature dealing with thought processes which includes problem-solving. Difficulty in experimental measurement, design and application has caused findings to be less fruitful than hoped for. Nevertheless, there are some relevant findings to be applied to problem-solving method in theories of learning and behavior. Summaries in this regard appear in Glaser, Johnson, William A. Brownell, "Problem-Solving," The Forty-First Yearbook of the National Society for the Study of Education, The Psychology of Learning, Part II (Chicago: The University of Chicago Press, 1942), pp. 415-443.


Ibid., p. 208; see also Glaser, op. cit., and page of this study.

Glaser, Ibid., pp. 69-72.

An excellent study by Habte, mentioned in the previous chapter, surveys the literature, generalizes as to obstacles preventing the development of reflective thinking, and by questionnaire, demonstrates some practices used to overcome the obstacles.


Still relevant and applicable today are the generalizations made by Glaser:

1. . . . content alone of any subject is not likely to develop a generalized ability to think critically.

2. In general the research indicates that if the objective is to develop in pupils an attitude of "reasonableness" and regard for the weight of evidence and to develop ability to think critically about controversial problems, then the component attitudes and abilities involved in thinking critically about such problems must be set up as definite goals of instruction. Specific training for the given objectives should be provided, and the processes and principles of reasoning which are involved must be made clear and usable to the students . . .

3. Training in abstracting, analyzing, outlining, summarizing and generalizing have been found effective for improving both reasoning and reading ability.

4. One's ability to apply knowledge to the solution of given problems is not in direct proportion to one's knowledge of facts in the field pertaining to those problems . . . In general, however, persons tend to make the fewest errors in judgment and reasoning in the situations in which they have had the most experience and concerning which they do know the pertinent facts.

5. Attitudes of open-mindedness, intellectual responsibility, and a desire to have evidence for one's belief, as well as knowledge of the principles of logical reasoning and specific skills in applying those principles, are susceptible to appreciable improvement.
6. The efficacy of given training to improve ability to think critically and the amount and quality of transfer which occurs will be greatly influenced by: (1) the method of presentation, (2) the degree to which self-activity and personal experience are induced, (3) the means of furnishing precision, definiteness, and stability to the course of the activity, (4) the extent to which the desired outcomes are set up as definite goals of instruction, (5) the extent to which the process of reasoning and guiding principles are made clear to the students, and (6) the degree of relationship or similarity between specific elements in the training and their existence in the new situations to which transfer is desired.115

After reviewing twenty-eight studies dealing with reflective thinking, Smith makes the following generalizations:

1. The ability to do reflective thinking consists of specific skills which can be acquired, to varying degrees, and through suitable instruction, by high school pupils of all ability levels.

2. The abilities which go to make up reflective thinking are separable and measurable.

3. The abilities involved in reflective thinking correlate with measured intelligence but the correlation is not high.

4. The ability to do reflective thinking is very likely to be accompanied by good academic marks but good marks do not necessarily indicate the presence of this ability.

5. A good memorizer is not necessarily a good thinker.

6. The ability to do reflective thinking is present in a child younger than one of junior high school age.

7. No significant difference exists between the sexes as far as the ability to think reflectively is concerned.

8. Pupils who learn quickly and organize their material tend to retain what they learn better than do pupils who learn slowly.

9. The ability to do reflective thinking on the part of the high school pupil depends to a large extent on the training he has had in the elements of the process.

10. The ability to think reflectively is increased when the learner is afforded the opportunity of self-expression and uses this opportunity well.

11. The teacher does little to help the child think reflectively by pointing out generalizations to him.

12. We have not yet learned to teach the elements of reflective thinking nor have we accepted them as valid aims of teaching in the high school.\textsuperscript{116}

Para-phrasing problem-solving for reflective thinking and college freshman for high school students, all but the last generalization is acceptable. The literature, including that of health and physical education has shown a wide acceptance of thinking abilities as an aim or educational objective. That we have not learned to teach the elements of reflective thinking or problem-solving is

\textsuperscript{116}Smith, \textit{op. cit.}, pp. 127-36.
evidenced by the studies of Aylesworth\textsuperscript{117} and Habte,\textsuperscript{118} the book by Burton;\textsuperscript{119} the general literature; and is in a large measure the motivation for this study.

In summary, as a result of the brief review of the literature herein made, the following generalizations are offered:

1. The great many articles and studies in the combined areas of education and psychology dealing with problem-solving, reflective thinking and related forms of thinking are evidence of a desire to create a more scientific approach to educational process.

2. Ambiguities and difficulty in formulating definitions and meanings have retarded, somewhat, progress in understanding and development in teaching for thinking as well as basic experimentation.

3. Traditional procedures, adverse attitudes, reliance on the textbook and difficulty of measurement are among the causes of lack of widespread acceptance of the problem-solving method (and related forms) of teaching.

4. There is an expressed need for the teaching about problem-solving and through problem-solving in most subject areas which is not being met.

\textsuperscript{117} Aylesworth, op. cit.
\textsuperscript{118} Habte, op. cit.
\textsuperscript{119} Burton, Kimball, and Wing, op. cit.
5. There are apparently inadequacies in teacher training and information which hinder the development of problem-solving curricula.

6. Evidence indicates that there is considerable agreement that problem-solving is amenable to transfer-of-training.

7. That problem-solving has recognizable procedures, not appearing in a fixed order, has been widely accepted.

8. Studies have shown there appears to be no significant differences in factual information gained between problem-solving and conventionally taught groups.

9. It is accepted that knowledge of facts does not necessarily lead to the proper application of facts.

10. There seems to be little evidence of a significant relationship between either intelligence or age and reasoning ability.

11. Direct teaching for, and practice in problem-solving is necessary for proper and effective utilization of the method.

12. There are few experiments for teaching through problem-solving and apparently few that measure problem-solving skills in Health Education, thus far.

13. Both health and physical educators have had opportunity to be made aware of the significance of the problem-solving method as potentially applied to their fields.
14. Health education is considered an applied or life science and should employ methods of instruction that lend themselves to application such as problem-solving.

15. General education, which includes health education, has been endeavoring to improve the awareness and utilization of the problem-solving method as a significant part of the educational process.
CHAPTER III

EXPERIMENTAL PROCEDURE

Task number one: To devise and present a problem-solving approach to multiple sections of the Health Education 400 course in which television was used.

The conventional course, Health Education 400, had been prepared (and was in use) for presentation on television under the guidance of the Television Advisory Committee of both the Women's and Men's Division of Physical Education of The Ohio State University in the year 1959-1960. Under a grant from the Ford Foundation and with the cooperation of WOSU-TV and the Bureau of Educational Research and Service of the university a study was conducted to compare courses taught with television to those taught without television.

As a continuation of the original project and an on-going program to improve, where possible, the freshman health education course, the Television Advisory

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1 The names of personnel on the Television Advisory Committee are shown in Appendix I.

2 Bureau of Educational Research and Service, "The Greater Columbus Area Instructional Television Project" (Columbus, Ohio: The Ohio State University, 1962), pp. 58-144. (Mimeographed.)
Committee proposed, and WOSU-TV and the Ford Foundation accepted, an experimental project using a problem-solving approach for the year 1961-1962. The author, a member of the committee, accepted the responsibility for defining and conducting this study.

The original health education course, which formerly met for one hour per week for eleven weeks (the last hour for final examinations), had evolved, as a result of the television experiment, to meetings twice a week. On eight occasions, for one-half hour, students in large sections of approximately three hundred and fifty, viewed a television lesson which had been prepared on video-tape and was broadcast at various scheduled times over WOSU-TV, Channel 34. These sections were supervised and attendance was taken by two assistant instructors or graduate assistants. The first weekly meeting presented no television and was used for orientation and organizing discussion sections. A mid-week meeting, without television presentation, was to be used for the discussion section instructor for mid-term examinations, additional discussion or the use of films. Discussion sections met on another day in groups of approximately fifty students with teachers of the rank of Instructor or higher.

Originally the course was administered and taught by the separate divisions of the Physical Education
Department. As a consequence of television experimentation, the sexes were integrated and a joint administration established. Different proficiency examinations, designed to excuse the well-prepared student and formerly administered by the separate divisions, was also jointly revised, combined, and administered.

The topics for course presentation in this study were patterned after (except for methodology) the units developed for the original television experiment. Copies of weekly schedules and reading assignments may be seen in Appendix II and III. It will be noted that the same reading assignments are required of both groups. In selecting topics and materials for presentation and discussion, a teacher's guide, prepared before the television experiment by the Men's Division, some earlier results of the use of the Mooney Problem Checklist and suggestions by the Television Advisory Committee were considered. For the revision to include problem-solving the Cushman-Bennett Checklist and a list of student's

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4 Ross L. Mooney, "Problem Checklist--College Form" (Columbus, Ohio: Bureau of Educational Research, The Ohio State University, 1941).

problems were considered as well. Actually, since these checklists involved mostly male students and there appeared to be no substantial difference in areas of concern, no changes were effected.

With approval of the Television Advisory Committee, outlines were written for the eight half-hour television presentations using, where possible, the problem-solving approach. In the spring of 1961, the first six video-tapes were produced. The last two were made while the course was in progress during the autumn quarter.

As a consequence of the earlier considerations of the limitations of television and of the considered application of the problem-solving method, some of the experimental video-tapes did not attempt to cover as many topics in one-half hour (horizontal treatment) as did the conventional telelessons, but included one topic in some depth (vertical treatment). For example, in the first television lesson for problem-solving, considerably greater detail on the process is presented than in the conventional video-tape. The example used in presenting

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Delbert Oberteuffer, "Examples of Personal Health Problems" (unpublished mimeograph from Health Education 644, Department of Physical Education, The Ohio State University, Columbus, Ohio, March, 1961).
problem-solving processes was more extensively covered than in the conventional lesson. In the unit dealing with mental health, a brief skit enacted by two female dramatics students and depicting a conflict between roommates, was shown twice. The second showing was to aid in the analysis of the elements of problem-solving and behavior mechanisms as well. This problem-solving lesson also presented an interview with a psychologist as did the conventional lesson, but the former attempted to utilize suggested problems for discussion more directly related to the problem situation presented on television. Throughout the other tele-lessons, problem-solving techniques and various thinking skills were frequently referred or alluded to, and the suggested problems for discussion sessions required the exercise of problem-solving skills. Opportunities to make assumptions, formulate hypotheses, define problems, and other thinking skills were pointed out even if the presentation did not include a completed attack on a problem. Interviews with authorities in fields related to the topic discussed were directed towards highlighting contemporary problems, preventative procedures, and methods of solution. Some examples of the differences between the two courses may be seen by comparing the unit outlines shown in Appendixes II and III.
The schedule for television broadcasting and class meetings, pre-arranged by the requirements imposed on WOSU-TV and other administrative necessities, was adapted to by this experimental study. Agreement was reached that the 12:00 P.M. sections would be the experimental group as necessitated by the involvement of several instructors, conflicting schedules, and broadcasting limitations. Therefore, seven sections meeting in one large group (approximately 350) on Tuesdays from 12:00 P.M. to 12:30 P.M., would view problem-solving tele-lessons. They would meet their instructors in small discussion groups (approximately 50) on Thursdays from 12:00 P.M. to 12:48 P.M. The same arrangement was held for seven more sections meeting on Wednesday and Friday at the same hours. Thus, fourteen classes in all, taught by seven instructors, each with two sections, were the experimental problem-solving group. Fourteen sections, taught by six instructors with two sections each and two instructors teaching one section each⁷ and meeting at other variously scheduled times would receive the original television lessons and be the conventional-control group. They too, met for tele-lessons in large groups and discussions in

⁷Due to schedule conflicts it was necessary to accept two instructors teaching one conventional section each.
small groups at corresponding hours and days (though varied between sections).  

Due to the imposition of additional responsibilities for teachers engaged in this experiment, volunteers were accepted and personal invitations to participate were extended to the necessary number of instructors. Five teachers volunteered their services and of the others approached all but one readily accepted. It should be noted that four of the five volunteers preferred to try to teach using the problem-solving method "for the first time." Again, because of teaching loads and schedule conflicts, as well as to equate groups, three volunteers were able to teach at 12:00 P.M. and two taught in the control group. In all, fifteen teachers and twenty-eight classes with approximately fourteen hundred students were involved in the experiment.

Task number two: To construct a teacher's guide, student's guide and arrange for in-service training in problem-solving for participating teachers.

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8 The effect on learning of meeting at different hours and days was considered to be negligible for purposes of this study.

9 The possible effect of superior attitude, motivation and skill in those teachers eager to cooperate was discounted as negligible for the purposes of this study. An attempt to equate staff in both groups was made by considering years of experience in the field.
Though some teachers probably had some experience in problem-solving methods, as a consequence of both experimental procedure (attempting to control as many confounding variable as possible) and the need of most teachers (the author included) for orientation and training in the use of the method, it was necessary to establish periods for in-service training. The seven instructors of the experimental group would, in a meeting room, view the tele-lesson at the same time as their students were viewing television in an auditorium elsewhere on the campus. Thus, on Tuesdays from 12:00 to 12:30 P.M. the instructors would pre-view the video tapes and then remain for an additional half-hour. The author, who was one of the seven instructors, endeavored to explain the objectives and the method for the particular lesson. In the half-hour discussion, all the teachers and particularly those of greater experience proferred various valuable suggestions for making the unit more meaningful. ¹⁰

As in the original television study, guides for each unit for both teachers and students, and accompanying suggested problems for discussion were prepared,

¹⁰ Though the teachers of the conventional group were not attending in-service meetings on a regular basis, in regard to this experiment, it was not felt to be necessary and the possible effect of this difference on the results of the study were considered to be negligible.
mimeographed and distributed in advance.11 Basically, the guides are outlines of the television presentation. The Teacher's Guide is more comprehensive than the Student's Guide as are many of the Suggested Problems. Samples may be seen in Appendixes II and III.

Both the tele-lesson and the "Suggested Problems" were the basis for the discussion of the in-service meetings for the teachers participating in the experimental group. In addition, mimeographed materials on teaching problem-solving were distributed to each instructor. A "Wheel of Health" used somewhat in the tele-lessons to link the units together and present a total concept of health was included in these materials. Copies may be seen in Appendix IV. The "Wheel" is shown in Appendix II.

Task number three: To adopt, adapt, or construct an evaluative tool (test) for the measurement of achievement differences, if any.

A considerable handicap in the development of a test to evaluate and compare the conventional teaching method to the problem-solving method was the restriction of a one-hour time limit. It was felt to be necessary as a consequence of both the usual examination procedures

[11] The guides for the original experiment were prepared by the Co-ordinator of the Health Education--Television Experimental Program, Dr. Mary K. Beyrer. See Appendix III.
followed by most of the teachers involved and of the necessary time limit imposed by attempting a pre-test during the first class hour of the quarter. Close on the heels of the earlier television experiment, the likelihood of inadequate volunteer participation by many students and some instructors outside of regular class hours, if requested, would be great. It was decided, therefore, to attempt a one-hour examination allowing approximately one-third the time for an objective test and two-thirds of the time for problem-solving.

Delay occurred in the development of testing materials until the television tapes, giving direction to course content, were produced. Only the first six units were completed before the course started in the autumn of 1961.

Nevertheless, during this time several related tests were studied. A list of these tests may be found in the bibliography. Early attempts to adopt specific items and then to adapt items by reconstructing them were rejected. It appeared that the tests were not ideally suited to the course objectives of Health Education 400.  

In addition, many items were outdated, presented all the necessary facts, or required a great deal of time in reading comprehension and test execution (considering time limitations). The tests of the "General Education Series in Health Education" were also found wanting under the circumstances.\(^\text{13}\)

The test items, it was felt, would not only have to measure problem-solving abilities, but require health knowledge in the examinee rather than offer it in the stem of the question or item. This would, in effect, tend to meet the objectives of the course involving knowledge and its consequent application, and in addition, reduce lengthy items involving extended reading time. Attempts to devise an objective type of problem-solving test were abandoned due to insufficient experience in formulating effective questions and response-choices for the particular situation and with so little time remaining. The decision was made to construct items which the examinee could answer subjectively while exhibiting knowledge in the subject.

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\(^{13}\) Cooperative Study in General Education, "Health Activities--Health Inventory No. 1; Health Information--Health Inventory No. II; Health Interest--Health Inventory No. III; Health Attitudes--Health Inventory No. IV; Analyzing Health Problems--Health Inventory No. V; Judging Sources of Information in Health Problems--Health Inventory No. VI" (Los Angeles: Cooperative Test Division, Educational Testing Service, 1950).
In view of the limitations imposed by the course and the time allowed for the examination, an original attempt to incorporate into the course five problem-solving abilities cited in General Education was modified further. Short four or five sentence paragraphs were composed to present a health problem. For example, one reads:

Frank was talking to his classmates between classes; "I have read that there is a definite relationship between cancer and smoking. This worries me from time to time but, nevertheless, I haven't quit. I feel sort of leary about getting a chest X-ray because of what it might show."

Allowing space for writing, the student was asked to (1) define the problem, (2) list assumptions made, (3) list hypotheses, (4) choose the best hypothesis, and as a subsequent part included with four, (5) give facts to support the choice. A copy of the test may be seen in Appendix V. In addition to an example problem, along with instructions on the face page, were given the meanings of the terms problem, assumption, hypotheses, and warranted. These may be seen in the previously cited Appendix.

In the formulation of this test, several questions or criteria were considered:

1. Are the instructions for taking the test clear and understandable?

14Dressel and Mayhew, op. cit., p. 179; see also Appendix IV.
2. Are the items equitably spread among the various categories of skills which the test purports to measure?

3. Are the items equitably spread among the various divisions of knowledge or subject matter with which the test purports to be concerned?

4. Do you believe students could be expected to finish the test within the time specified for it?

5. Do the items seem to you to range from fairly easy to fairly difficult items?

6. Do the items represent sufficiently varied tasks so as to maintain student interest?

7. Do the test items reveal any discernible work or concept pattern?

8. Does the total test appear to be well suited for the educational level at which it will be used?

9. What is your general reaction to this test?\(^\text{15}\)

Additional helpful criteria for tests of critical thinking appear in the same source.\(^\text{16}\)

Insofar as timing, it was felt that three items would require thirty-five minutes and this was the time limit imposed. The remaining fifteen minutes of the hour examination period would be used for an objective-factual test.

\(^{15}\)Dressel and Mayhew, op. cit., p. 182.

\(^{16}\)Ibid., pp. 183-184.
A highly regarded proficiency examination has been used at The Ohio State University for college freshmen.\textsuperscript{17} This is comprised of eighty-five multiple-choice items covering the scope of the Health Education 400 course. Thus, it seemed appropriate that an abbreviated form of this examination would suit the purposes of this study. A distribution of items over topical areas according to relative importance was made and a thirty-five question test derived. The cover sheet with instructions for the objective test may be seen in Appendix V.

Since neither the objective-factual test nor the subjective-problem-solving test had been standardized or tested for validity, it was necessary to accept them on face or curricular validity.\textsuperscript{18} In addition to applying the previously cited criteria,\textsuperscript{19} a grid, arranging a list of skills in the left-hand column, and subject areas across the top, was adapted to insure adequate distribution

\textsuperscript{17}This examination was adopted for nation-wide use by the School Health Education Study of the Bronfman Foundation and the American Association of Health, Physical Education and Recreation, Elena P. Sliepcevich, Director.


\textsuperscript{19}Dressel and Mayhew, op. cit., p. 182.
of measurement of abilities within the various course topics.\textsuperscript{20} Since only three problems could be dealt with, the grid was abandoned. Several of the members of the Television Advisory Committee, and the author's Graduate Advisory Committee, all experts in Health Education and experienced in testing rendered opinions and constructive criticism in the development of these tests.\textsuperscript{21}

There was no problem of selecting correct responses for the objective-factual test. Many experienced and highly competent health educators at The Ohio State University had worked and re-worked the questions and their appropriate responses. A key was readily available. Furthermore, this test allowed for the use of electric scoring by IBM. This actually was done by the Counseling and Testing Center of The Ohio State University.

In order to develop a guide or scale by which to maintain consistency to grade the subjective-problem-solving test, thirty pre-test papers chosen systematically from the pre-test examinations by an impartial secretary were read. Compiling lists of responses, adding others, rejecting unacceptable responses, and weighing responses,

\textsuperscript{20}\textit{Ibid.}, p. 111.

\textsuperscript{21}For the purposes of this study, it is assumed that the tests actual reliability is of no significant consequence.
a scale-guide was drawn up. For the best definition of a problem nine points would be awarded. Allowance was made for a variety of equally weighted responses. For definitions in a second-best category, six points was to be awarded. For a poor but perceptible definition, three points were awarded. For no definition no points were scored.

For making assumptions, the development of a scale appeared to be too cumbersome. Since it was also inherent in the method that one be able to recognize as many assumptions as are pertinent, it was an objective to first recognize as many as possible without particular regard to value. Thus, one point could be scored for each acceptable assumption.

Hypothesizing was treated in the same manner as assumptions and one point scored for each. Thus, there was no fixed limit for scores on these two items.

Choosing the best hypothesis was weighted on a six, four, two, zero scale similar to the item on definition.

The last item, presenting facts, was scored by awarding one point for each fact presented to defend the hypothesis chosen. Unfortunately, the treatment of this item in the example problem of the test and the wording of the item itself was not conducive to the production of
factual information. There is a tendency to apply logic rather than factual information. In addition, the item detracts from the desired response by asking to show why other hypotheses are not warranted. An attempt was made to correct this in in-service meetings and the item was nevertheless evaluated on a one-point for one fact basis according to the judgment of the investigator. Theoretically, each student should score many points by presenting facts. As implied this was unfortunately a weak section of the test. A copy of this Scale-Guide may be seen in Appendix V.

To enhance objectivity in grading the subjective responses, in addition to the development of the scale-guide, all test papers brought in by participating instructors or collected in cartons by the experimenter, were given to a secretary for coding by numbers. Cover pages with names of subjects, class hours and instructor's names were removed. The secretary then selected systematically every third paper, totaling fifteen, from each section to be given to the experimenter for grading.²² This was done for approximately fourteen hundred papers, selecting a sample of four hundred and twenty subjects

²²The possibility of an ordering effect was rejected due to the apparent haphazard collection of papers.
(two hundred and ten in the experimental group and two hundred and ten in the control group) for both the pre-test and the post-test. To maintain consistency in the administration of the tests, letters of instructions were given to the teachers.  

**Task number four:** To establish an experimental design and procedure for satisfactorily evaluating results and comparing the experimental-problem-solving group with the conventional-control group.

Early conceptions of this study involved only an investigation and comparison of gain in problem-solving ability and/or factual information. As was indicated in the first chapter, there were ten hypotheses being tested. A brief explanation for the difference follows the presentation of the hypotheses:

1. There is no significant difference in knowledge achievement (factual information gained) between the two groups.

2. There is a significant difference in problem-solving achievement between the two groups (favoring the problem-solving group).

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23 An effort was made to reduce the possibility of the "Hawthorne effect" (i.e., enhanced performance due to motivation caused by being part of an experiment) by asking instructors to avoid extended discussions about the experiment. For the purposes of this study, this effect was assumed to be negligible.
3. Both the problem-solving group and the conventional group were equal in knowledge and problem-solving abilities at the beginning of the course.

4. There is a significant correlation between the score on Ohio State Psychological Examination and gain in factual information.

5. There is no significant correlation between the score on the Ohio State Psychological Examination and problem-solving achievement.

6. There is a significant correlation between the score on the Ohio State Psychological Examination and the course grade.

7. There is no significant correlation between problem-solving ability and year in college.

8. There is no significant correlation between problem-solving and sex.

9. There are significant differences in gains among specific problem-solving skills.

10. There are significant differences in the attitudes of the students in each group toward the course.

The above hypotheses were to be tested by comparing the differences between means. A Pre-Test-Post-Test Control Group Design was employed. While earlier

conceptions of the problem, with fewer hypotheses, would have called for a simple test between treatment groups (i.e., problem-solving treatment and conventional treatment), expansion to ten hypotheses with multiple variables developed as a consequence of a more extensive review of the literature. A request was made to enlist the cooperation of the Statistics Laboratory of The Ohio State University. Thus, the test data were transferred to IBM cards to be run on a 7090 computer doing an analysis of covariance. For each factor a multiple regression equation was computed. Significances were determined by the Fisher "t" test. A 5 percent level of significance was used to reject the "null hypothesis" and 1 percent levels shown where possible to indicate greater significance.

**Task number five:** To adopt, adapt, or construct an evaluative tool (attitude scale) to compare the attitudes of students in the problem-solving experience to those of the conventional experience.

While the actual comparison is a statistical procedure which lends itself to task number four through hypothesis

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25 The 7090 Computer is a service of the Research Center of the Research Foundation of The Ohio State University.

ten, the development of an attitude scale requires separate treatment. Unfortunately, the limit of time for both a more thorough developmental procedure and the administration of this attitude scale was a considerable handicap. Fortunately, questionnaires, though more extensive than desired, had been developed by the Bureau of Educational Research and Service for the original television experiment.27 Employing the earlier used scale as a guide, an eighteen item "Student Reaction Schedule" was prepared. The last five items required write-in responses and were not treated for this study. The first thirteen items required responses weighted from one-to-six: 1. Agree strongly; 2. Agree somewhat; 3. Agree slightly; 4. Disagree slightly; 5. Disagree somewhat; 6. Disagree strongly. The responses were treated as numerical values, means established, and the "t" test of significance employed for comparing groups. A copy of the scale may be seen in Appendix VI.

For this part of the study only four classes in each group were asked to participate. A sub-sample of eight classes was considered to be sufficient for detecting attitudinal differences if they exist.

27Bureau of Educational Research and Service, "Personal Relevance Scale and Student Reaction Schedule" (Columbus, Ohio: The Ohio State University, 1959). (Mimeographed.)
Summary

To compare the effect of conventional teaching methods to a problem-solving method for teaching health education with television to college freshmen at The Ohio State University the following procedures were employed:

1. From within a population of thirty-nine sections of Health Education 400, fourteen sections taught by conventional-traditional methods with television were designated as a control group and fourteen sections taught by a problem-solving approach with television were the experimental group.

2. Eight television lessons, teacher's guides, student's guides and class procedures for the conventional group had been established in the previous school year and were continued. For the problem-solving group eight comparable television lessons, teacher's guides, student's guides and class procedures were developed for this study.

3. For seven teachers designated as "problem-solving teachers" and teaching two sections each, in-service meetings to preview the tele-lessons and prepare for discussion sections were arranged. The eight teachers of conventional classes received no special in-service treatment.
4. An objective-factual information test and a problem-solving test were devised and administered as a one-hour pre-test and again as a post-test in the autumn quarter of 1961. An attitude scale was also devised and administered.

5. Of approximately fourteen hundred students subject to both treatments, a sample of fifteen subjects, from each class, totaling two hundred and ten subjects in each group (four hundred and twenty in all), was drawn.

6. Analysis of covariance was employed from data punched on IBM cards and treated by a 7090 computer. Comparisons of groups were made from the mean scores and mean gain scores of the tests administered and with consideration of Ohio State Psychological Examination scores, sex, college, age and course grades.
CHAPTER IV

EXPERIMENTAL RESULTS

Inasmuch as the first three tasks, described in the previous chapter, are not subject to statistical treatment, their resultant effect is to be inferred from the analysis of the results of tasks four and five. Tasks one to three will be considered in the concluding chapter which follows. The experimental results expressed herein are primarily concerned with the three sub-problems presented in chapter one as expressed in ten hypotheses.

To aid the reader in identification of data from the tables, it should be noted that the effect of the variable on a group is designated by a positive or negative sign. (Actually, the positive sign is not shown.) Near the top of the column, the groups are designated by a 1 or 0. Thus, if the "t" value shown in the column is positive, this refers to the group assigned 1. A negative sign indicates that group 0 is larger. For example, in Table 1, on the next page, the class (or group) "Females" score higher on Problem-Solving item I-1 than "Males" (0.86 is positive). A footnote on Table 1 helps to clarify this point.
TABLE 1

PRE-TEST

Table of "t" Statistics

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<th>Group</th>
<th>Age</th>
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<td>1 - F.</td>
<td>1 - Con.</td>
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<td>0 - Other</td>
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<td>0 - Exp.</td>
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</tr>
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<td>2.02*</td>
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<td>-0.96</td>
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<td>1.11</td>
<td>-0.13</td>
<td>2.03*</td>
<td>0.43</td>
</tr>
<tr>
<td>5</td>
<td>0.09</td>
<td>1.30</td>
<td>-0.78</td>
<td>-0.36</td>
<td>0.57</td>
</tr>
<tr>
<td>Problem-Solving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-1.88</td>
<td>3.55**</td>
<td>-1.24</td>
<td>1.29</td>
<td>5.85**</td>
</tr>
<tr>
<td>Grade</td>
<td>-2.90**</td>
<td>+6.38**</td>
<td>+3.10**</td>
<td>+1.35</td>
<td>+11.49**</td>
</tr>
</tbody>
</table>

1 Positive "t" occurs when group one is larger than group zero on that particular measurement.

*Significant at 5 percent level (df = 300) = 1.968
**Significant at 1 percent level (df = 300) = 2.592
The "t's" listed under the various factors are used to test the hypothesis that a given factor has no effect on a given test item score. For the factors under the "Hypothesis of No Group Difference," the "t's" test whether or not the groups differ significantly on that test item score. For example, in Table 1 under the factor "Year" Problem-Solving Test item II-1 indicates a significant difference and favors the group "Other" (not Freshmen).

For the factors under the "Hypothesis of Zero Regression Coefficients," the "t's" test whether or not there is a significant correlation between the given continuous variable or factor and the test item score. For example, under "Age" in Table 1 only Problem-solving test items I-1, III-3, and III-4 show a significant correlation. Since these are positive, the older the age the higher the score.

The Problem-solving Test items are divided into three problems sub-divided into five abilities: 1. defining the problem; 2. making assumptions; 3. formulating hypotheses; 4. choosing the best hypothesis; and, 5. presenting facts defending the hypothesis. Only the item numbers are indicated in the tables. The means for the Problem-solving Pre-Test and Post-Test by item are shown in Appendix VII, Table 6.
Where the number of subjects (N) varies between tables, this is due to the rejection of subjects with inadequate data. At least one section was known to have had a room conflict at examination time which prohibited completion of all materials. When the term "correlation" is used, it signifies a correlation but not of the statistical procedure usually designated by "r." The "t" test of significance is interpreted to show an association or relationship between variables. The values determining significance at the 5 percent level, which is acceptable for this study, or at the 1 percent level which is merely a "bonus" indication, are taken from the Fisher Tables of the "t" distribution.¹

The means for the Pre and Post Test Scores and the means for the Difference Between Pre and Post Test Scores (gains in achievement) are shown in Appendix VII in Table 7. Means for the Ohio State Psychological Examination, Age, and Grades are shown in Appendix VII, Table 8.

Grades earned for the course were recorded on the basis of A=4, B=3, C=2, D=1, and E=0. The factor of "College" or whether or not enrollment in certain colleges was significant was to be considered. However, due to the

breakdown of subjects into very small groups, the significance of the results would have been questionable. When this factor was divided into approximately representative groups by the designation "Arts" or "Other" for IBM treatment meaningful evidence was lost. Of 358 students 158 were in Arts. In addition, when treatment on this basis showed no significant relationships to the test items, the factor was eliminated from presentation. However, it should be kept in mind that the effect of "college" is included in the analysis of covariance. Results will be considered by their respective hypotheses.

**Hypothesis One:** There is no significant difference in knowledge achievement (factual information gained) between the two groups at the end of the course.

Post-test data are indicated in Table 2. A "t" of -0.23 shows no significance between Control and Experimental groups in the Objective Difference or gain. Nor is there a significant difference indicated on the Objective Post-Test score (-0.31). This would indicate that each group achieved as much factual information from the course as the other.

An item of considerable interest is noted when the Objective Pre-Test is related to the Objective Post-Test and the Objective Difference. Under the "Hypothesis of
### Table 2

**POST-TEST**

Table of "t" Statistics

<table>
<thead>
<tr>
<th>Hypothesis of No Group Difference</th>
<th>Hypothesis of Zero Regression Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>College</td>
<td>Year</td>
</tr>
<tr>
<td>1 - Arts</td>
<td>1-Fresh.</td>
</tr>
<tr>
<td>0 - Other</td>
<td>0-Other</td>
</tr>
</tbody>
</table>

| Objective Post Test | -0.97 | -1.33 | 0.28 | -0.31 | 3.43** | 2.05* | 1.95 | 6.11** |
| Objective Difference | -1.12 | -1.42 | 0.60 | -0.23 | -14.27** | 1.67 | 2.02* | 6.13** |
| Problem-Solving Post-Test | -0.80 | -1.40 | 2.12* | -7.87** | 1.06 | 6.13** | 1.87 | 2.36* |
| Problem-Solving Difference | -0.73 | -1.42 | 2.05* | -7.80** | 1.12 | -9.15** | 1.85 | 2.34* |

---

1. Positive "t" occurs when group 1 is larger than group 0 on that particular measurement.

*Significant at 5 percent level (df = 290) = 1.968

**Significant at 1 percent level (df = 290) = 2.592
Zero Regression Coefficients," 3.43 indicates a relationship at the 1 percent level of significance. That is, those who scored high on the pre-test, also scored high on the post-test. However, the negative relationship indicated by -14.27 points out that those who score high on the pre-test gain less at the end of the quarter. The 1 percent level of significance would indicate that some specific "Ceiling Effect" was in evidence. A short 35 item objective examination, which would of necessity be limited in scope, could well be a cause.

Another point of interest is the indication by "t" = 2.05 under "Prob."-Pre-Test that those who score high on the problem-solving pre-test also score high on the objective post-test. The lack of more specific discrimination between the abilities measured would lead to the expectation that better students would most likely do better in both areas under study. When considering the same item with "Objective Difference", no significance is indicated thus reinforcing the possibility of a "ceiling effect."

_Hypothesis Two:_ There is a significant difference in problem-solving achievement between the two groups.

While "no group difference" or the null hypothesis is used in "t" tests of significance, experience would suggest that the hypothesis be stated positively. This
is borne out at the 1 percent level of significance with -7.87 and -7.80 on Table 2 indicating the Experimental Group had both higher scores and greater achievement in problem-solving as would be expected.

The lack of significance between the Objective Pre-Test and either the Problem-Solving Post-Test or Problem-Solving Difference as indicated by 1.06 and 1.12 respectively may well be an indication of the discrimination between the two abilities. However, the possibility of "ceiling effect" and other inadequacies of the tests per se without additional information can only leave the raised question unanswered.

The \( t = -9.15 \) showing at 1 percent level of significance that those who scored high on the Problem-Solving Pre-Test had a lower Difference between the two tests may well be an indication of the test "ceiling." Unfortunately, it may also be due to such factors as poor instruction in problem-solving, loss of motivation by better students and poor test instructions. Some consolation is indicated by the inference that those who scored lower on the Pre-Test gained more on the Post-Test. The \( t = 6.13 \) indicates the high scorers on the Problem-Solving Pre-Test were high scores on the Post-Test as well.

**Hypothesis Three**: Both the problem-solving group and the conventional group were equal in knowledge and
problem-solving abilities at the beginning of the course.

Table 1 presents Pre-Test data on the significance of factors to test items. In the column "Group" under the hypothesis of no group difference, 0.44 shows no significant difference between groups on the Objective Test and -1.24 indicates no significant difference of the Problem-Solving Test. Only on part 3 of Problem I is a significance favoring the experimental group indicated and this might well be attributed to chance. By using analysis of covariance as the statistical procedure, equating groups would not otherwise be necessary. This technique takes into account all factors concerned.

However, the third hypothesis was tested to establish the adequacy of the sampling procedure used.

**Hypothesis Four:** There is a significant correlation between the score on the Ohio State Psychological Examination and gain in factual information.

The relation between the OSPE and the score on the Objective Pre-Test is significant at the 1 percent level as seen in Table 1. This significance pertains in Table 2 where 6.11 and 6.13 indicate a high positive relationship between the OSPE and Objective Post-Test scores and the OSPE and the Objective Difference. The hypothesis is amply supported by this evidence.
Hypothesis Five: There is no significant relation between scores on the Ohio State Psychological Examination and problem-solving achievement.

The relationship between OSPE and pre-test problem-solving ability was indicated in Table 1 by a "t" of 5.85 at the 1 percent level of significance. The above hypothesis was formulated in the expectation, by virtue of the related literature, that a truly discriminating problem-solving test would show little or no relation to the OSPE. Apparently, the test devised for this study is not discriminating enough or OSPE can predict problem-solving achievement. The "t's" 2.36 and 2.34 for Problem-Solving Post-Test scores and Problem-Solving Differences respectively, in Table 2, indicate a positive relationship at the 5 percent level of significance. There is no basis for making a comparison between the pre-test relationship with OSPE at the 1 percent level and the post-test at the 5 percent level of significance. Under these conditions, there is a significant relation between OSPE and problem-solving achievement and the original hypothesis is not acceptable.

Hypothesis Six: There is a significant correlation between the scores on the Ohio State Psychological Examination and the course grade.
As a prediction of success in college, the OSPE has been adequately supported.\(^2\) Its ability to predict the grade to be earned in Health Education 400 specifically is shown in the positive high \(t = 11.49\) on Table 1. That is, those who score high (are in the higher percentiles) on the OSPE earn higher grades in the course. Hypothesis Six is, therefore, acceptable.

**Hypothesis Seven:** There is a significant correlation between problem-solving ability and year in college.

Since there are a substantial number of upper classmen, particularly sophomores who did not take Health Education 400 as freshmen the above hypothesis was formulated. Actually, there were 126 upper classmen in the tested sample at the start. On the pre-test, \(t = -1.88\) indicates a tendency but not a significant one for the upperclassmen to do better on problem-solving (Problem-Solving Total) than freshmen as seen in Table 1. This tendency is also demonstrated in Table 2 in the "Year" column but again no significance is shown. Returning to Table 1, it is interesting to note that a significant difference favoring upperclassmen is seen for the Objective

\(^2\)Frank R. Peters and Eugenia L. Plog, "The Effectiveness of the American College Testing Program Examinations for Selection and Placement" (Columbus, Ohio: University Counseling and Testing Center, The Ohio State University, July, 1961). (Mimeographed.)
Pre-Test \((t = -2.05)\) and also for the earned course grade \((t = -2.90)\). However, the likelihood that freshmen gained more on both tests is implied.

**Hypothesis Eight:** There is no significant correlation between problem-solving and sex.

Females scored significantly higher on both the Objective and the Problem-Solving Pre-Tests (Table 1). A significant difference pertains in the Problem-Solving Post-Test and Problem-Solving Difference (Table 2). That females are better students than males at the freshman level at The Ohio State University is also borne out by the significant difference in their grades as shown in Table 1. Since the post-test results of the Objective Test are not significant, perhaps due to the test's limitations, it would seem that females are better problem-solvers than males in Health Education 400. It is also possible, as was indicated earlier in discussion of Hypothesis One, that the problem-solving test is not discriminating enough and these results are due to the females being in the group of better students.

**Hypothesis Nine:** There are significant differences in gains among specific problem-solving skills.

The relationship between certain factors and problem-solving skills as determined by scores on the parts of
the Problem-Solving Post-Test are shown in Table 3. Problem I deals generally with the topic of "cancer and smoking," Problem II with "exercise and weight control," and Problem III with "heterosexual relations." (See Appendix V.) The abilities for each problem are:
1. defining the problem, 2. making assumptions, 3. formulating hypotheses, 4. choosing the best hypothesis, and 5. presenting facts to support the hypothesis.

It can be seen in the table that "Year" (in college) is significant in only two places involving two separate skills in separate problems. The prevalence of the negative sign, going down the column, gives the impression that upperclassmen tend to score higher on most skills.

In the column "Age" we find that the older students (mean age = 19.0 years) define Problem II significantly better than younger students (mean age = 18.5 years). The practical significance may indicate that this topic is more meaningful to the older students since ability to define problems is not indicated in Items I-1 or III-1.

Females apparently presented significantly more facts in the second problem (weight control) and in the third problem (heterosexual relations). They also chose better hypotheses for the latter problem. But no generalization is indicated.
### Table 3

PROBLEM-SOLVING PARTS

Table of "t" Statistics for Testing the Hypothesis of Zero Regression Coefficients

<table>
<thead>
<tr>
<th>Problem-Solving</th>
<th>Year (1-Fresh)</th>
<th>Age</th>
<th>Sex (1-Female)</th>
<th>OSPE</th>
<th>Group (1-Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Test Parts</td>
<td>(0-Other)</td>
<td></td>
<td>(0-Male)</td>
<td></td>
<td>(0-Experim)</td>
</tr>
<tr>
<td>I.  1</td>
<td>-1.32</td>
<td>0.27</td>
<td>1.10</td>
<td>1.29</td>
<td>-3.32**</td>
</tr>
<tr>
<td>2</td>
<td>0.13</td>
<td>0.41</td>
<td>0.83</td>
<td>0.27</td>
<td>-6.85**</td>
</tr>
<tr>
<td>3</td>
<td>-1.98*</td>
<td>0.84</td>
<td>1.32</td>
<td>1.41</td>
<td>-6.85**</td>
</tr>
<tr>
<td>4</td>
<td>-.22</td>
<td>0.24</td>
<td>1.81</td>
<td>-0.14</td>
<td>-1.85</td>
</tr>
<tr>
<td>5</td>
<td>-1.36</td>
<td>-0.54</td>
<td>-0.80</td>
<td>0.33</td>
<td>-1.42</td>
</tr>
<tr>
<td>II. 1</td>
<td>.25</td>
<td>3.03**</td>
<td>0.06</td>
<td>1.05</td>
<td>-2.21*</td>
</tr>
<tr>
<td>2</td>
<td>.34</td>
<td>0.08</td>
<td>-0.23</td>
<td>0.63</td>
<td>-6.96**</td>
</tr>
<tr>
<td>3</td>
<td>-.83</td>
<td>0.59</td>
<td>-0.27</td>
<td>1.38</td>
<td>-5.51**</td>
</tr>
<tr>
<td>4</td>
<td>.76</td>
<td>0.70</td>
<td>0.08</td>
<td>0.34</td>
<td>-2.95**</td>
</tr>
<tr>
<td>5</td>
<td>-2.36*</td>
<td>0.30</td>
<td>2.78**</td>
<td>-0.34</td>
<td>-1.48</td>
</tr>
<tr>
<td>III. 1</td>
<td>-0.75</td>
<td>1.09</td>
<td>1.82</td>
<td>1.06</td>
<td>-2.02*</td>
</tr>
<tr>
<td>2</td>
<td>-0.93</td>
<td>1.25</td>
<td>0.94</td>
<td>1.59</td>
<td>-4.47**</td>
</tr>
<tr>
<td>3</td>
<td>-0.91</td>
<td>0.62</td>
<td>1.84</td>
<td>1.04</td>
<td>-4.31**</td>
</tr>
<tr>
<td>4</td>
<td>-0.01</td>
<td>-0.40</td>
<td>1.98*</td>
<td>0.26</td>
<td>-0.99</td>
</tr>
<tr>
<td>5</td>
<td>-0.27</td>
<td>0.31</td>
<td>2.01*</td>
<td>1.50</td>
<td>-1.39</td>
</tr>
</tbody>
</table>

1 Positive "t" occurs when group 1 is larger than group 0 on that particular measurement.

*Significant at 5 percent level (df = 300) = 1.968
**Significant at 1 percent level (df = 300) = 2.592
The OSPE, when compared to problem-solving skills as measured by the Problem-Solving Post-Test parts shows no significant relationship to any item. This might possibly be an indication that the group in the lower percentiles of the OSPE were able to catch up or it might indicate a "ceiling effect" of the problem-solving test. Unfortunately, making inferences by comparing the results of Table 3 to Table 1 would not be meaningful. Though the factor "College" does not appear in Tables 1 and 3, because no significance was indicated, it was a part of the regression equations. Table 3 omitted, as factors for comparison, "Objective Pre-Test Total" scores and "Problem-Solving Pre-Test Total" scores. The effect of these variables on the others does not permit a meaningful comparison between the two equations.

Between the groups, it can be seen on Table 3 that the Experimental Group did significantly better on most skills as indicated by Problem-Solving Post-Test scores than did the Control Group. Defining problems, making assumptions, and formulating hypotheses are skills significantly demonstrated in all three problems. The significance in favor of the Experimental Group in choosing the best hypothesis may be an effect of the greater emphasis of this topic in the problem-solving
television presentation. In all, the column of negative signs on the left and asterisks on the right leave little to the imagination. The fact that no significances are seen in Items I-4 and 5, II-5, and III-4 and 5 might be attributed to the nature of the conventional course. Factual information and its application to a given course of action receive a greater emphasis in the conventional course. In teaching problem-solving, the emphasis is distributed to include the thinking skills defined by parts 1, 2, and 3 of each problem.

Hypothesis Ten: There are significant differences in the attitudes of the students in each group towards the course.

The attitude scale shown in Appendix VI was structured by: 1. - Agree strongly; 2. - Agree somewhat; 3. - Agree slightly; 4. - Disagree slightly; 5. - Disagree somewhat; 6. - Disagree strongly. On Table 4 the means of the items by the difference between them are shown. For data of this kind a 10 percent level of significance may be acceptable though none appear here.

For item 2, the Experimental Group indicated at the highly significant 1 percent level a different attitude than the Control Group. The item read, "This course would have been better without television." The mean of
TABLE 4

STUDENT REACTION DATA

Item Score Means for Experimental and Control Groups with "t" Statistic For Testing the Significance of the Difference Between Groups

<table>
<thead>
<tr>
<th>Item</th>
<th>Experimental (0)</th>
<th>Control (1)</th>
<th>Both Groups</th>
<th>t</th>
<th>df = 259</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 147 Means</td>
<td>n = 114 Means</td>
<td>n = 261 Means</td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>2.946</td>
<td>2.965</td>
<td>2.954</td>
<td>+0.111</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.544</td>
<td>2.693</td>
<td>3.172</td>
<td>-3.894**</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3.143</td>
<td>3.175</td>
<td>3.157</td>
<td>+0.176</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2.694</td>
<td>2.404</td>
<td>2.567</td>
<td>-1.579</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2.721</td>
<td>2.614</td>
<td>2.674</td>
<td>-0.610</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3.741</td>
<td>3.860</td>
<td>3.793</td>
<td>+0.510</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2.980</td>
<td>3.026</td>
<td>3.000</td>
<td>+0.271</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3.286</td>
<td>3.272</td>
<td>3.280</td>
<td>-0.073</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2.129</td>
<td>2.254</td>
<td>2.184</td>
<td>+0.762</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2.673</td>
<td>2.860</td>
<td>2.755</td>
<td>+1.089</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>2.259</td>
<td>2.623</td>
<td>2.418</td>
<td>+2.222*</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>3.381</td>
<td>3.395</td>
<td>3.387</td>
<td>+0.072</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>2.837</td>
<td>2.991</td>
<td>2.904</td>
<td>+1.040</td>
<td></td>
</tr>
</tbody>
</table>

1Positive "t" occurs when group 1 is larger than group 0 on that particular measurement.

*Significant at 5 percent level (df = oo) = 1.960  
**Significant at 1 percent level (df = oo) = 2.576
3.544 for the Experimental Group indicates a position between "Agree slightly" and Disagree slightly." The Control Group, with a mean of 2.693, took a position one full step closer to agreement with the statement. This may be interpreted to mean the experimental method either made better use of television or the tele-lessons were more effective than in the conventional method.

The other significant item of the list of thirteen is number 11. It reads, "I learned to recognize assumptions in health advertising." Though both means fall in the area of agreement with the statement, the Control Group mean is larger. At the 5 percent level of significance this indicates the Control Group is further from agreement than the Experimental Group.

Since the signing of the questionnaires was voluntary, a smaller sample was available to compare "Grade" and "Sex" with attitude responses. There were no significant t-scores when either variable was related to the thirteen attitude items. However, Table 5 shows the significances (in covariance with grade and sex) of this sub-sample of those who signed their questionnaires. Item 2 again shows significantly that the Experimental Group favors television more. Item 3, "I learned a great deal about health in this course," indicates the Experimental Group felt they learned more about health than did
TABLE 5

STUDENT REACTION DATA

Item Score Means for Experimental and Control Groups with the "t" Statistic For Testing the Significance of the Difference Between Groups Considered in Covariance with Grade and Sex\(^1\)

<table>
<thead>
<tr>
<th>Item</th>
<th>Experimental (0)</th>
<th>Control (1)</th>
<th>Both Groups</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 84 Means</td>
<td>n = 64 Means</td>
<td>n = 148 Means</td>
<td>df = 144</td>
</tr>
<tr>
<td>1</td>
<td>2.750</td>
<td>2.984</td>
<td>2.851</td>
<td>+1.055</td>
</tr>
<tr>
<td>2</td>
<td>3.631</td>
<td>2.625</td>
<td>3.196</td>
<td>-3.399**</td>
</tr>
<tr>
<td>3</td>
<td>3.036</td>
<td>3.531</td>
<td>3.250</td>
<td>+2.058*</td>
</tr>
<tr>
<td>4</td>
<td>2.798</td>
<td>2.453</td>
<td>2.649</td>
<td>-1.556</td>
</tr>
<tr>
<td>5</td>
<td>2.786</td>
<td>2.828</td>
<td>2.804</td>
<td>+0.233</td>
</tr>
<tr>
<td>6</td>
<td>3.333</td>
<td>3.953</td>
<td>3.601</td>
<td>+2.076*</td>
</tr>
<tr>
<td>7</td>
<td>2.929</td>
<td>3.234</td>
<td>3.061</td>
<td>+1.476</td>
</tr>
<tr>
<td>8</td>
<td>3.155</td>
<td>3.547</td>
<td>3.324</td>
<td>+1.546</td>
</tr>
<tr>
<td>9</td>
<td>1.964</td>
<td>2.531</td>
<td>2.209</td>
<td>+2.692**</td>
</tr>
<tr>
<td>10</td>
<td>2.571</td>
<td>3.078</td>
<td>2.791</td>
<td>+2.355*</td>
</tr>
<tr>
<td>11</td>
<td>2.202</td>
<td>2.750</td>
<td>2.439</td>
<td>+2.599*</td>
</tr>
<tr>
<td>12</td>
<td>3.190</td>
<td>3.578</td>
<td>3.358</td>
<td>+1.519</td>
</tr>
<tr>
<td>13</td>
<td>2.738</td>
<td>3.203</td>
<td>2.939</td>
<td>+2.263*</td>
</tr>
</tbody>
</table>

\(^1\)Positive "t" occurs when group 1 is larger than group 0 on that particular measurement.

*Significant at 5 percent level (df = 120) = 1.980
**Significant at 1 percent level (df = 120) = 2.617
the Control. However, the mean indicates only slight agreement with the statement. Item 6, again in the area of slight agreement, shows the Experimental Group favors more time for the course than the Control Group. Item 9 indicating, "the subject matter in this course is important to me," is favored more and significantly so by the Experimental Group. This is in the "Agree somewhat" category with a mean of 1.964 compared to 2.531 with a 1 percent level of significance. Item 10, "my attitude towards health education has improved," finds the Experimental Group between "Agree somewhat" and "Agree slightly" while the Control Group takes the latter position at the 5 percent level. Item 11, "I learned to recognize assumptions in health advertising" again indicates a significant difference between groups favoring the Experiment Group at the 5 percent level of significance. Closer to only slight agreement, item 13, "I learned to draw conclusions from the health facts" shows the Control Group scored this item higher, at the 5 percent level of significance, indicating less disagreement by the Experimental Group.

Accounting for the difference in the number of significant items between the results on Table 4 and Table 5 is somewhat difficult. If one assumes that subjects who voluntarily signed their names to the
questionnaires were trying to make an impression with favorable responses, then there would be fewer significant differences. If one assumes that these same subjects are more opinionated or have more "courage of their convictions" then the difference between groups have some meaning. When the Experimental Group means of Table 4 are noted to be generally smaller (though significantly so in only two instances), the combined results of the two samples lead to the acceptance of the tenth hypothesis indicating that the Experimental Group tends to have a more favorable attitude towards the course.
CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary. The development of civilization and the present rapid rate of the increase in knowledge are direct products of man's ability to think. Living in the modern world with its tremendous growth in technology and its ideological differences requires well-developed capacities to think by more and more citizens. Educational aims have for many years included both the processes of thinking and health, though expressed in varying terms, as important objectives. In more recent years, a distinct emphasis on teaching for thinking has been noted in general education.

Health educators, as well as many other education specialists, have expressed in their literature the importance of teaching students to think in order to attain the specific goals of their fields. However, there has been an apparent lack of application of teaching techniques which do more than utilize memorization. Evidence has been accumulated in many subject areas which demonstrate that teachers believe in the importance of teaching to think but they do not
engage in activities with the techniques to promote student thinking.

Among the difficulties in promoting thinking-inducing classroom methods has been, until recently, the lack of experimental research to develop adequate and practical concepts of thinking skills and how to teach for them.

Another difficulty has been the variety of terms, definitions, and meanings imparted to thinking processes and to methods of application. Critical thinking, reflective thinking, creative thinking, and problem-solving are a few examples of terms similar in meaning yet different. There are similarities in their application but also differences.

John Dewey has greatly influenced the development of the concept of applying thought to the solution of man's problems. His treatment of reflective thinking by definition and application along with a variety of experiments in the psychology of thinking by many researchers have given considerable impetus to attempts at practical application in the educational process.

During the early decades of this century, when thinking as a process was receiving greater attention, health educators, among others, recognized the important relationship between problem-solving and the attainment
of health objectives. The literature, from time to time, registered a desire to see greater use of the problem-solving method in health classes. Adapted from Dewey, a problem is defined as a situation involving doubt, difficulty or perplexity requiring solution. Problem-solving is the process or method by which a problem is solved. This, also from Dewey, is varyingly described as (1) defining the problem, (2) forming hypotheses, (3) gathering and interpreting evidence, (4) testing hypotheses and evaluating evidence, (5) drawing a conclusion, (6) evaluating the conclusion.

One purpose of this study was, in effect, to adapt the problem-solving method to a health education course. The traditional methods of teaching health have been considered to be less adequate in the areas of promoting thinking, affecting attitudes toward health and health practices, meeting the needs of students particularly by showing them how to help themselves by solving their own problems, and changing their behavior by developing better health practices.

As an outgrowth of an earlier and stimulating project with educational television at The Ohio State University, this study was undertaken to develop a "problem-solving health education course" and to compare its results with the conventional course.
The problem-solving course was taught by a problem-solving approach to the subject of health. A problem was defined as a situation giving rise to a perplexity, uncertainty or doubt which would require solution or explanation. Problem-solving skills to be measured were: (1) ability to define a problem, (2) ability to make assumptions, (3) ability to formulate hypotheses, (4) ability to choose the best hypothesis, (5) ability to present facts in support of the hypothesis.

The conventional or traditional course was defined as that in which the emphasis is on memorization or factual information. It was assumed for this study, that teachers were, in effect, emphasizing knowledge.

The Health Education 400 course for freshmen at The Ohio State University was taught with the use of television. This medium was to be included, therefore, in the presentations of the course.

The problem of the study was defined as "comparing the problem-solving method with the conventional method in Health Education 400." Of thirty-nine sections of the course normally receiving both a televised half-hour lesson and a one-hour non-televised discussion, fourteen sections were designed a control group and fourteen sections an experimental group.
The control group received the conventional tele-lessons and discussions as already established. For the experimental group comparable tele-lessons, student's guides, teacher's guides, and other procedures were developed. In all, eight tele-lessons and ten discussion sessions with appropriate guides with the problem-solving approach incorporated were prepared. In addition, materials to assist the seven teachers of the experimental group in the problem-solving method were distributed. Eight conventional group teachers received no particularly new in-service assistance. Most teachers taught two sections or classes of approximately 50 students. Of the 1400 students a sample of 420 was drawn by systematic selection of 15 test papers from each section. (However, due to insufficient data, some subjects were rejected.)

An objective, thirty-five item, multiple-choice test was adapted and a three problem, five parts each, subjective problem-solving test was developed both to be used as a pre-test and post-test. A scale-guide for evaluating the subjective test was constructed and used. Also, a thirteen item attitude scale was devised and administered at the end of the course.

Analysis of covariance employing the "t" test of significance between means at the 5 percent level was
the statistical procedure. Computation doing multiple regressions was done on a 7090 IBM computer to test the following hypotheses:

1. There is no significant difference in knowledge achievement (factual information gained) between the two groups;

2. There is a significant difference in problem-solving achievement between the two groups;

3. Both the problem-solving group and the conventional group were equal in knowledge and problem-solving at the beginning of the course;

4. There is a significant correlation between the score on the Ohio State Psychological Examination and gain in factual information;

5. There is no significant correlation between the score on the Ohio State Psychological Examination and problem-solving achievement;

6. There is a significant correlation between the score on the Ohio State Psychological Examination and the course grade;

7. There is no significant correlation between problem-solving ability and year in college;

8. There is no significant correlation between problem-solving and sex;

9. There are significant differences in gains among specific problem-solving skills;

10. There are significant differences in the attitudes of the students in each group toward the course.

Conclusions. Apparently, before any consideration of the statistical results of the study, teachers involved
in the experimental-problem-solving group indicated through informal discussion, the experience was interesting, enlightening and satisfying. Even teachers in the control group registered interest as a consequence of dealing with the problem-solving examination. The lack of sophistication with the method and much of the resistance of the students seemed to be reduced if not overcome after several weeks. This effect was cited in another recent study in health education. While discussions indicated no teacher felt completely adequate or secure with the "new" method, there was agreement that with time and experience more evident and satisfying results would be forthcoming. This attitude prevailed while considering the restrictions of a one-credit, one-hour, required freshman course.

There was preliminary agreement, too, that one hoped for by-product was somewhat accomplished. The problem-solving tele-lessons were considered to be an improvement over the first (conventional) series of video-tapes. However, there was unanimous agreement that further improvements in television should be sought in the immediate future.

Conclusions of a more objective nature are based on the findings of ten hypotheses. The first two hypotheses are of primary interest in this study.
First, the hypothesis of no significant difference in knowledge achievement between the two groups at the end of the course was proven. Both the post-test score and the difference or gain between pre and post test showed no significant difference between groups. Supporters of the problem-solving approach have long contended this would be so and several studies agree. However, it is necessary to note that a thirty-five item multiple-choice test does not leave much room for differences. The finding that those who scored high on the pre-test gained less at the end of the quarter demonstrates a "ceiling effect" in this particular test. Nevertheless, since the test items were intended to cover a fairly wide range (within the course limits) it is noteworthy that these results were accomplished. The problem-solving approach apparently does not neglect gains in factual information. Indeed, the feeling, by proponents of the method, that this approach makes information more meaningful appears to be reinforced.

Second, a significant difference in problem-solving achievement was found. As would be expected, the teaching of and for problem-solving abilities should demonstrate identifiable gains over classes where these abilities are not objectives. An important consideration here is that under the conditions--teachers new to the method, untried
television presentations, only one hour per week for discussion classes, and students resisting unfamiliar techniques--problem-solving objectives were accomplished after all. While it can be said that students in the conventional courses are also resistive (to a required course) and had only one hour for discussions, the difficulties originating in a new approach which is usually considered to require more class time are of a greater magnitude. Actually, the significance of the difference between groups is reinforced not only by the more difficult course conditions, nor by the indication of a 1 percent level of significance, but by the fact that this level of significance prevailed for both the post-test scores and gain scores.

The results also point out that those who scored higher on the problem-solving pre-test showed less gain. While a "ceiling effect" may be a consideration, it is more likely that inadequate test instructions, poor example problem, and inexperience with teaching problem-solving are a cause. The actual test scores were much lower than the possibilities anticipated in the construction of the test. Subsequent experience with the test supports the latter theory rather than "ceiling effect." Revision of the test through improved test instructions and examples, better written problem
situations, and greater clarity of request for information in the last part could increase the range of scores and the test effectiveness. Basically, however, the experiment can be considered to have been successful and the undertaking of this study justified by its contribution to health education if only considering the first two hypotheses.

Third, the hypothesis that the control group and experimental group were equal in both knowledge and problem-solving abilities at the outset was demonstrated by lack of significant t-scores for both tests. Though the pre-test design was not a necessity, it was an indication that the sampling procedure was valid. In addition, the pre-test information increases the power of the statistical results and interpretations by being considered in covariance with post-test results.

Fourth, a significant correlation between scores on the Ohio State Psychological Examination and gain in factual information was demonstrated. As one of several factors to be considered in this study, OSPE is known as a predictor of success in college. Furthermore, it is accused of bias in favor of factual content rather than thinking ability (as are many college courses). The relation between OSPE and the Objective Pre-Test, Post-Test and difference were all high as anticipated (at the
1 percent level of significance). The testing of this hypothesis was intended as a prelude to the next.

Fifth, the practical proposition of the hypothesis was no significant relation between OSPE and problem-solving achievement. Operating on the assumption that OSPE was not a "thinking test," and that a sufficiently good problem-solving test would make this discrimination the hypothesis of no relation was tested. In effect, a relation with both the problem-solving post-test score and problem-solving gain was indicated at the 5 percent level of significance. Since specific discrimination between thinking ability and factual knowledge is difficult to achieve; since evidence indicates that the better students tend to do well in both areas; and since the OSPE has a correlation of .64 with the ACE's "Test of Critical Thinking, Form G," it is not considered disappointing that the fifth hypothesis was proven wrong.

Sixth, there is a significant correlation between scores on OSPE and the grade earned for the course. That those who score in the higher percentiles of the Ohio State Psychological Examination also earned the higher grades in Health Education 400 was demonstrated at the

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1 percent level of significance. In view of the two foregoing hypothesis, this finding was to be expected.

Seventh, identifying and evaluating a correlation between problem-solving ability and year in school was considered because a substantial number of sophomores and higher enroll in the course. Most merely failed to schedule or could not fit the course into freshman year programs. The t-scores on both the problem-solving pre-test and post-test showed tendencies but no significances for the upperclassmen to do better. They did better on pre-test objective scores and on earned grade. Since this represents both groups this is not surprising. Also, evidence in the literature indicates that problem-solving abilities do not accrue automatically or increase with age.

Eighth, there is no significant correlation between problem-solving and sex was proven to be wrong in this study. Literature elsewhere tends to defend the males ability to solve problems and occasionally accedes to equality with females in this regard. This is frequently a matter of what kinds of problems are offered. There is general agreement that the female student (at The Ohio State University) in the freshman year is superior to the male. Actual evidence of this fact appears in the evaluation of the original television experiment evaluated
by the Bureau of Educational Research and Service cited earlier in this study. Significance favoring the female was indicated for both problem-solving pre-test and post-test and gain scores in problem-solving. Pre-test significance was at the 1 percent level (including the Objective Pre-Test). Post-Test and gain significance was at the 5 percent level with no significance shown for post-objective scores. The latter due most probably to the objective test's "ceiling effect." Since high relationship with grade was also demonstrated, it is to be concluded that the females are both better students and better problem-solvers (according to the test in this study) than the males enrolled in Health Education 400.

Ninth, there are significant differences in gains among problem-solving skills. The experimental group was highly favored in this regard with an exception. High significances were evident in defining problems, making assumptions, and listing hypotheses. In choosing the best hypothesis, significance favored the problem-solvers once in three problems and none in listing facts in support of the hypothesis. However, the tendencies in the non-significant items favor the problem-solving group. Nowhere in the data did the control group show a tendency to gain more than the experimental group in problem-solving
skills. Since the test instructions in part 5 were questionable, and both groups failed to present as much information as might be expected, doubt exists to destroy the reliability of a conclusion. The factual aspect of the conventional course may well be responsible for preventing significance favoring the experimental group in part 5; giving facts to show why the hypothesis is warranted. Nevertheless, considering the evidence, teachers who claim to teach problem-solving through the conventional approach find no support in this study.

Tenth, there are significant differences in attitudes toward the course. Insofar as the questionnaire permitted, the means of the attitudes never appeared in an area of considerable disagreement and never in complete agreement. The evidence accumulated showed that the experimental group was better disposed towards television than the control group. They also felt they learned how to make assumptions more so than the control group. Other significant relationships were evidenced which indicate the experimental group was more favorably disposed toward the course than the control group. Since the significances are between groups and the means do not fall into highly favorable areas, indications are that course improvements are warranted and student reactions to this required course are evident. This study is a result, in part, of
the recognized need for course improvements. The results of this study, it is hoped, will affect favorably both the course and student reactions toward the course.

Generally, it is to be concluded that: problem-solving can be taught in health education; some problem-solving objectives can be attained in a one credit health education course; there is little or no sacrifice of knowledge or factual information gained in the use of the problem-solving method; given time students react more favorably to the problem-solving approach; teachers can learn to employ the problem-solving approach with some success at the outset; the television lessons of the problem-solving course were more favorably received by students than the conventional video-tapes used in this study.

Recommendations. As a consequence of the experience accrued in conducting this study, the following recommendations are proposed:

1. Continued efforts to improve teaching with problem-solving in health education through professional pre-service and in-service training programs should be made.

2. Construction of a reliable, easily administered, easily scored problem-solving--critical thinking health education test should be undertaken.

3. Improvement of the problem-solving test used for this study, by creating additional stems or problem-situations, re-wording questions, and
revising the example problem should be undertaken as a basis for developing an objective problem-solving test as in the previous recommendation.

4. A study should be undertaken to evaluate the relative effectiveness of problem-solving television lessons compared to the non-televised problem-solving course.

5. The problem-solving approach should be continued in the presentation of Health Education 400 at The Ohio State University.
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APPENDIXES
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APPENDIX I

Health Education 100 Television Advisory Committee

Co-Chairman: Dr. Margaret A. Mordy, Chairman,
Division of Physical Education for Women

Co-Chairman: Dr. Lewis A. Hess, Chairman,
Division for Physical Education for Men

Co-ordinator: Dr. Mary K. Beyrer, Associate Professor
of Health Education

Dr. Wesley P. Cushman, Professor of
Health Education

Dr. Delbert Oberteuffer, Professor of
Health and Physical Education

Robert Kaplan, Assistant Professor
Television Teacher
Sample of Problem-Solving Class Schedule

TELECAST VIEWING SCHEDULE FOR HEALTH EDUCATION 400 - AUTUMN 1961


Period I
September 25, 26, 27
Introduction and Orientation

Period II
October 2, 3, 4
Health Education and Problem-Solving
Assignment: Chapters 1 and 2 pp. 333-339.

Period III
October 9, 10, 11
Mental Health and Problem-Solving
Assignment: Chapters 3 and 4 (skim pp. 20-69, 85-89)

Period IV
October 16, 17, 18
Courtship, Marriage and Problem-Solving
Assignment: Chapters 5 and 6 (skim 107-112)

Period V
October 23, 24, 25
Human Reproduction and Problem-Solving
Assignment: Chapter 7 to page 163

Period VI
October 30, 31, Nov. 1
No TV: Discussion sections meet as scheduled

Period VII
Nov. 6, 7, 8
Communicable Disease and Problem-Solving
Assignment: Chapters 12 (skim 286-291, 395-7, 304-9)

Period VIII
Nov. 13, 14, 15
Degenerative Disease and Problem-Solving
Assignment: Chapter 13, (skim pp. 360-366)

Period IX
Nov. 20, 21, 22
No TV: Discussions sections meet as scheduled

Period X
Nov. 27, 28, 29
Nutritional Fitness and Problem-Solving

Period XI
Dec. 4, 5, 6
Personal and Community Health and Problem-Solving
Assignment: Chapter 11, pp. 451-456 (skim unassigned portion of Chapter 16)

Period XII
To be Scheduled.
Final Examination
UNIT II. "Student's Guide - Mental Health and Problem-Solving"

Textbook Assignment: Chapters 3 and 4 (Skim pp. 50-59-, 85-89)

I. "Wheel of Health"
   A. Health is a complex of factors
   B. Problems in mental health
   C. A problem between roommates

II. Understanding adjustment problems
   A. Causes of problem (conflict)
   B. Reactions to problem (conflict)
      1. Fight reaction
      2. Flight reaction
      3. Problem-Solving

III. Defense mechanisms
   A. Projection
   B. Rationalization
   C. Conversion

IV. Problem-Solving
   A. Hypotheses
   B. Generalize to solve similar problems
   C. Seeking help

V. Dr. John Bruedel of the Counseling and Testing Center
   A. Range of normal problems
   B. 
1. Discuss the problem of the two roommates on TV and show:
   a) How should they recognize a problem exists?
   b) How you would define their problem?
   c) What are the assumptions to be made?
   d) What possible solutions (hypotheses) can be proposed?
   e) Which is the best one? What evidence or facts support it?

2. Which defense mechanism, of those listed in your textbook retard problem-solving?

3. Can you think of problems where a flight reaction or fight reaction would be acceptable solutions?

4. Mary Q. graduated from high school in the upper third of her class. Her father, a physician, who had wanted a son, feels that Mary at least should study medicine and eventually take over his practice. She is doing poorly in her science courses but fairly well in English and history. Lately, she has been suffering from headaches and sleeping and eating poorly. Also, she has been dating rather frequently and has overslept missing some morning classes. Her advisor is concerned that she will not be admitted to medical school as a result of her performance.

   a) How might Mary recognize that a problem exist?
   b) How would you define her problem?
   c) Hypotheses - or possible solutions might, on the basis of experience be proposed here.
   d) Information, facts, data need to be collected and considered. In the case of closely related hypotheses such as the aforementioned, collecting facts might easily have been first.
   e) Select and apply best (most promising) solution (hypothesis).
   f) Evaluate results.

5. Explain how maturity is related to mental health and problem-solving.

6. Choose a mental health problem and develop it in accord with problem-solving techniques.
UNIT III. Student’s Guide - Courtship, Marriage and Problem-Solving

Textbook Assignment: Chapters 5 and 6 (Skim 107 - 112)

I. Many problems

II. Wheel of Health
   A. Intellectual Fitness and Maturity
   B. Emotional Fitness
   C. Sociological Health
   D. Physiological Health

III. Some assumptions about college dating

IV. Advice from married students
   A. Planning
   B. Finishing schooling
   C. Marriage and career
   D. Establishing independence

V. More to consider
   A. Religious backgrounds
   B. Socio-economic backgrounds
   C. Others
Suggested Problems (Unit III)

1. From the discussion on television, what seemed to be the main problem or consideration of the married couples?

2. What is the difference between a rationalized conclusion and a reasoned conclusion?

3. A textbook makes the following statement: "The values of courtship are not the same as the values of marriage. During courtship individuals tend to be on their best behavior for their prospective spouses and often wittingly, or unwittingly, conceal their true personalities and mask their flaws from each other."

   List as many possible inferences, implications or conclusions you can draw.

4. What is the inference of the television teacher's remark, "Remember that averages are somewhat treacherous!"

5. One sophomore says, "I won't marry. If I were born 50 years sooner it would be different. Women knew their places and took care of the house and children and served the needs of the man-of-the-house. Today's woman demand too much."

   a) How might he recognize that a problem exists?
   b) How would you define her problem?
   c) Hypotheses - or possible solutions might, on the basis of experience be proposed here.
   d) Information, facts, data need to be collected and considered. In the case of closely related hypotheses such as the aforementioned, collecting facts might have easily been first.
   e) Select and apply best (most promising) solution (Hypothesis)
   f) Evaluate results
UNIT VI. Student's Guide - Degenerative Disease and Problem-Solving

Textbook Assignment: Chapter 13, Skim pp. 360-66.

I. Prevention is the method of choice
   A. Degenerative Disease
   B. Misconceptions
   C. Quackery

II. Some relationships in diseases
   A. Communicable disease, mortality goes down; degenerative disease, mortality goes up

III. Cancer
    Benign
    Malignant
    Metastasis
    Carcinogens
    Seven danger signals

IV. To Smoke or Not to Smoke?
   A. Lung cancer and smokers, rural and urban
   B. Authorities take a stand
   C. Social factors
Suggested Problems (UNIT VI)

1. What are your hypotheses for the increased mortality due to degenerative disease? Communicable disease?

2. The problem is defined as "what can I do to prevent my having cancer?"
   a) Discuss the plan of action to be taken.
   b) Present the facts in evidence.

3. The problem is defined as "what can I do to prevent my having coronary heart disease?"
   a) Discuss the plan of action
   b) Present evidence

4. In discussion of 2 and 3 above, show how we must act on the best evidence we have now.
   a) Is plan of action in 2 better supported by facts than plan of action in 3?

5. Since most heart attacks are not fatal, it is said that people who have one usually live longer than those who don't. How does this explain the problem of living with heart disease?

6. From the evidence presented, what would appear to be the best solution to the problem of whether or not to smoke.

7. When the television teacher referred to three of the leading causes of death amongst 15 - 24 year olds as being psychogenic in nature, what did he infer?

8. Gary just found out that he is a diabetic who will require insulin every day. He says, "I don't want to stay in college because I won't be able to keep up physically and I'll be too tired mentally."
   a) How might Gary recognize that a problem exists?
   b) How would you define his problem?
   c) Hypotheses - or possible solutions might, on the basis of experience, be proposed here.
   d) Information, facts, data need to be collected and considered. In the case of closely related hypotheses such as the aforementioned, collecting facts might easily have been first.
   e) Select and apply best (most promising) solution (hypothesis)
   f) Evaluate results.
UNIT VII. Student's Guide - Problem-Solving in Nutrition and Fitness


I. What are the roles of exercise and diet in weight control?
A. Wheel of Health
1. Physical or organic Fitness
2. Motor Fitness
3. Emotional Fitness
4. Social Fitness

B. Benefits of Exercise

C. Obesity

D. Fallacies about exercise (false assumptions)
1. Calorie

E. Caloric expenditures

F. Physical Education - Athletics - Recreation

G. Physical effects of fatty tissue

H. Orthopedic difficulties in obesity

II. Diet: 15 calories per pound per day
A. > 2300 calories intake to maintain desired weight
   < 1750 daily caloric intake
   < 500 calories per day to lose 1 lb. per week
   1750 daily caloric intake
   500 calories per day
   1. metabolism

B. Caloric values of foods

C. Nutrition and dieting

D. Emotions and overeating

III. Dr. Ruth St. John, Endocrinologist, Student Health Service
APPENDIX II (Continued)

Suggested Problems (Unit VII)

1. List the false assumptions that are made regarding overweight.
2. What is the meaning of malnutrition?
3. How does the problem of overweight develop in later or post-college years for many people?
   How can the problem be solved or avoided?
4. In what ways does alcohol affect the problem of proper nutrition?
5. What assumptions (fallacious or untrue) are made regarding alcohol and its use in social drinking?
6. Discuss the narcotics problem. How can it be solved?
APPENDIX II (Continued)

UNIT VII  SOLVING PROBLEMS OF NUTRITION AND WEIGHT CONTROL

I. Open on physical education activities

A. What are the roles of exercise and diet in weight control?

1. At Wheel of Health
   a) physical or organic fitness, and motor fitness an obvious aspect of personal health
   b) affect one affect others

2. Benefits of exercise - Experimental studies point to:
   a) maintaining desirable weight
   b) preserving the cardiovascular system
   c) aids individuals to meet emergencies
   d) delays the aging process

3. Exercise and weight control
   a) obesity degenerative disease shorter life
      1. Moderate overweight 40% higher risk
      2. Marked overweight 70% higher risk
   b) fallacies about exercise - assumptions
      1. expends too few calories
      a) a calorie is a unit of heat a measurement
      2. exercise increases appetite
   c) athletes and hard laborers - 6000 cal/day
      1. National Research Council - 2400 to 4500 cal/day for men depending on activity
      2. 250 cal/hr walking to 1000 cal/hr wrestling
      3. animal experiments show normal wts. are 50 to 100% more active than obese animals treadmill exercises reduced weight, overweight animals eat more
      4. active vs. inactive businessman - active had lower % of body fat and less disuse atrophy associated with aging

5. Physical Education Maintaining weight, preserving cardiovascular system, meet emergencies, delay aging.
   a) Paul Dudley White, M.D. - 75 yrs. cyclist heart specialist to President Eisenhower
   b) President Kennedy and Youth Fitness Program

6. Anatomical Model
   a) fat - competes for space and nourishment
   b) increase blood vessels and work of the heart

7. Suitcase --
   a) carrying 10 lbs. - damages bones, spine and joints orthopedic problems

B. Diet and Weight Control

1. Average person needs 15 cals/pound to maintain desired weight
   a) Metabolism varies with individuals - (sum total of bodies chemical activity)

2. 150 lbs. - desired weight
   15 cals/lb.
   2250 cal/daily requirement to maintain
   a) depends also on age, metabolism and activity

3. To lose, 1 lb. = 3500 cal. - eat 500 less cal. per day
   = 3500 calories/week - or 1 lb. lost every 7 days
APPENDIX II (Continued)

Suggested Problems (Unit VII)

1. List the false assumptions that are made regarding overweight.
   1. It is inherited
   2. It is caused by glandular disturbances
   3. Exercise does not expend enough calories
   4. Exercise increases appetite too much
   5. Others

2. What is the meaning of malnutrition?
   (Mal = bad, poor, imperfect may mean too much as well as too
   little nutrition)
   a) What is the greatest nutrition problem in the U. S.?
   b) Is the other kind non-existent?

3. How does the problem of overweight develop in later or post-
   college years for many people?
   How can the problem be solved or avoided?
   1. Men give up "activity" in favor of business and retain
      eating habits
   2. Business pressures and social pressures may lead to more eating
      and drinking opportunities
   3. A gradual metabolic change takes place and caloric intake is
      not reduced in accord with requirements (1% per year after
      25 yrs.)
   4. Women are involved in food preparation and have opportunity
      to eat more
   5. Women may use pregnancy as excuse for gaining and retaining weight
   6. Others
   To avoid or solve:
   1. Maintain activity - learn and continue to engage in recreational sports
   2. Control caloric intake through proper eating habits

4. In what ways does alcohol affect the problem of proper nutrition?
   1. Has a relatively high caloric value
   2. Does not have tissue building nutrients
   3. Depresses appetite if too much is consumed
   4. Gives a false sense of good judgment and well-being
   5. Irritates the membrane of the digestive tract
   6. Others

5. What assumptions (fallacious or untrue) are made regarding alcohol
   and its use in social drinking?
   1. It is a stimulant
   2. It is a food
   3. It is addicting like a drug (not yet proven)
   4. It is a necessary aid to socialization at parties
   5. You can develop a safe tolerance to it
   6. It keeps you warm in cold weather
   7. Others

6. Discuss the narcotics problem. How can it be solved?
4. Calorie reduction need not reduce quantity of food
   a) avoid gravies and sauces, creamed and fried foods, alcoholic beverages, extra butter, cream
   b) fill up on fresh fruits, leafy vegetables and other low calories foods.
   c) appendix of test lists caloric values
      ice cream = 200+ calories
      apple pie = 500+ calories
      candy bar = 270+ calories
      doughnut = 210+ calories

5. Nutrition and dieting
   a) need proteins, carbohydrates, fats, vitamins, minerals and water
   b) avoid calories if necessary but not nutrients
   c) some foods are nutritious but also high in calories
   d) remember exercise's role in dietary problems
   e) a Varied Diet tends to be a Balanced Diet - supplements are not necessary

6. Emotional Aspects
   a) another aspect of the "Wheel of Health"
   b) film of interview between psychiatrist and obese woman

II. Dr. Ruth St. John - Endocrinologist and Associate Physician, University Student Health Service

A. The Weight Control Program
   1. psychological social aspects
   2. glands and overweight
   3. weight and family history
   4. married students - insurance
   5. seeking a practical solution to a practical problem - "How to lose weight in a College Environment"
   6. "Crash Diets" - psychological effects

B. Conclusion
A WHEEL OF HEALTH

PERSONAL HEALTH

HEREDITY AND ENVIRONMENT

PHYSIOLOGICAL HEALTH

ORGANIC FITNESS

INTELLECTUAL FITNESS

EMOTIONAL HEALTH

SOCIAL FITNESS

ECONOMIC FITNESS

HEREDITY AND ENVIRONMENT

MOTOR FITNESS

SOCIOLOGICAL HEALTH
### APPENDIX III

**Sample of conventional class schedule**

**TELECAST VIEWING SCHEDULE FOR HEALTH EDUCATION 400 - AUTUMN 1961**


<table>
<thead>
<tr>
<th>Period I</th>
<th>Introduction and Orientation</th>
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<tbody>
<tr>
<td>September 25, 26, 27</td>
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<table>
<thead>
<tr>
<th>Period II</th>
<th>The Search for Better Health</th>
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<tbody>
<tr>
<td>October 2, 3, 4</td>
<td></td>
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<tr>
<td>Assignment: Chapters 1 and 2 pp. 333-339.</td>
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<table>
<thead>
<tr>
<th>Period III</th>
<th>A Framework for Mental Health</th>
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<tbody>
<tr>
<td>October 9, 10, 11</td>
<td></td>
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<tr>
<td>Assignment: Chapters 3 and 4 (skim pp. 20-69, 85-89)</td>
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<table>
<thead>
<tr>
<th>Period IV</th>
<th>Health Factors Related to Marriage</th>
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<tbody>
<tr>
<td>October 16, 17, 18</td>
<td></td>
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<tr>
<td>Assignment: Chapters 5 and 6 (skim 107-112)</td>
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<table>
<thead>
<tr>
<th>Period V</th>
<th>Looking Forward to Parenthood</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 23, 24, 25</td>
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<tr>
<td>Assignment: Chapter 7 to page 163</td>
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<table>
<thead>
<tr>
<th>Period VI</th>
<th>No TV: Discussion sections meet as scheduled</th>
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<tr>
<td>October 30, 31, Nov. 1</td>
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<thead>
<tr>
<th>Period VII</th>
<th>Health Practices in the Control of Disease - I</th>
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<tbody>
<tr>
<td>Nov. 6, 7, 8</td>
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<tr>
<td>Assignment: Chapters 12 (skim 266-291, 395-7, 301-9)</td>
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<tr>
<th>Period VIII</th>
<th>Health Practices in the Control of Disease - II</th>
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<tbody>
<tr>
<td>Nov. 13, 14, 15</td>
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<tr>
<td>Assignment: Chapter 13, (skim pp. 360-366)</td>
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<tr>
<th>Period IX</th>
<th>No TV: Discussion sections meet as scheduled</th>
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<tr>
<td>Nov. 20, 21, 22</td>
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<tr>
<th>Period X</th>
<th>Fitness for Better Health</th>
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<tbody>
<tr>
<td>Nov. 27, 28, 29</td>
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<table>
<thead>
<tr>
<th>Period XI</th>
<th>Good Health - A Way of Life</th>
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<tbody>
<tr>
<td>Dec. 4, 5, 6</td>
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<tr>
<td>Assignment: Chapter 11, pp. 451-456. (skim unassigned portion of Chapter 16)</td>
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<th>Period XII</th>
<th>Final Examination</th>
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<tr>
<td>To Be Scheduled.</td>
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</table>
Student's Guide for "A" Framework for Mental Health
Textbook Assignment: Chapters 3 and 4 (skim pp. 50-59, 85-89)

I. Introduction: Tension and its relation to mental health

II. Understanding the person and the environment

III. Recognizing the basis of conflict and our reactions to it
   A. The reason for conflict
   B. Reactions to conflict
      1. Successful adjustment
      2. Flight reaction
      3. Fight reaction

IV. Identifying some of the common problems of college students

V. Accepting mental health (and mental illness) as a matter of degree

VI. Accepting personal responsibility for behavior

VII. Recognizing cause for behavioral differences

VIII. Learning to control behavior and relieve tension
   A. Adjustment mechanisms
   B. Emotional symptoms: anxiety, depression, excitement, withdrawal, and queer or unusual behavior.

IX. Seeking competent professional help if the problems persist
APPENDIX III (Continued)

SUGGESTED PROBLEMS

1. How can we use the problem-solving approach to meet situations such as:
   A. Getting the family to realize our weaknesses and abilities
   B. A 1.9 average at the end of Winterquarter.
   C. The question of premarital sexual relations

2. To what extent does the term adjustment imply conformity?

3. When does the college student need to seek competent help in the area of mental health?
Student's Guide for "Health Factors Related to Marriage"

Textbook Assignment: Chapters 5 and 6 (skim 107-112)

I. Marriage Today -- Its Meaning and Implications
   A. Recognizing the reasons for entering into marriage
   B. Acknowledging the changing roles of women in modern society
   C. The emerging of the democratic type of family unit

II. Successful Marriage -- Its Formula
   A. Identifying the important personal traits (i.e., maturity) which offer a constructive approach to marriage.
   B. Understanding the roles and purposes of dating experiences in our society
   C. Choosing the "right time" for marriage
      1. At what age is one mature enough for marriage?
      2. What are the chances for success and the problems of marriage while partners are still in college?
   D. Clarifying the concept of love and its relation to courtship and marriage
   E. Realizing educational, cultural and economic factors which are also involved in the successful marriage pattern.
   F. Recognizing that desirable health attitudes, practices and knowledge contribute to successful marriage and parenthood long before the marriage vows are taken.
SUGGESTED PROBLEMS

1. What is the role of love in the consideration of marriage? How does love differ from sex?

2. To what extent do family background, customs and traditions affect happiness in marriage? Why is it important that we recognize such factors?

3. Emphasis is often placed on the appraisal of our socio-psychological health factors when considering marriage; what are the physical health factors of which we should also be aware as important to preparation for marriage?
I. The chronic and degenerative diseases as compared with the infectious or communicable diseases.

II. Heart and circulatory diseases - the number one cause of death in the U.S.
   A. Facts or fables concerning heart disease
   B. The common types of heart and circulatory diseases "Blue baby"
      1. Congenital defects
      2. Rheumatic fever - which may lead to rheumatic heart disease
      3. Hypertension
      4. Arteriosclerosis and atherosclerosis
      5. Coronary occlusions
      6. Apoplexy or stroke
   C. The care and prevention of heart disease
   D. Facts concerning disease

III. Cancer - the number two cause of death in the United States today!
   A. The ominous statistics - one of every two cancer victims COULD BE SAVED
   B. The malignant cell as compared to the benign cell; the process of metastasis
   C. Common sites of cancer and its allied diseases
   D. Causes of cancer, the carcinogens; research regarding them
   E. The increase in cases of lung cancer
   F. The intelligent approach to cancel control and protection; the seven common danger signals or early symptoms
1. What are the principles of healthful living that you as a college student should begin emphasizing now to protect yourself as much as possible against heart disease and cancer?

2. There are other chronic diseases besides heart disease and cancer that are major health problems in our society today even though they are not major causes of death. Why? List and consider them.

3. Why does the field of quackery flourish in the area of the chronic diseases?

I. Total Fitness - its importance - some components

II. Nutrition and its relation to fitness
   A. The fundamentals of nutrition: the nutrients:

   - Proteins
   - Carbohydrates
   - Fats
   - Vitamins
   - Minerals
   - Water

   B. Choosing food via the four major food groups: milk group; fruit and vegetables group; meat group; bread and cereal group.

   C. The problem of weight control

III. Exercise and recreation in connection with fitness

IV. Smoking and its effect on well-being

V. Alcohol and its relation to fitness

VI. Our decisions regarding food, exercise, recreation, tobacco, alcohol and drugs - directed by our values and needs.
1. Analyze some of the common food fads and fallacies you have observed as influencing your family and friends.

2. What information should most college students have to stimulate their interest in selecting well-balanced meals?

3. How much can a person drink and be socially acceptable or safely drive a car? What are some of the social implications of the abuse of alcohol?

4. Summarize the advantages and disadvantages of smoking. What do you think should be included in a smoker's code of etiquette?
Teacher's Guide for "Fitness for Better Health"

OUTLINE OF TOPIC

I. Introduction to total fitness
   A. Automation, automobiles, television and our push-bottom conveniences have been changing our habits and activities.
      1. Physically we are in a state of comparative "dis-use."
      2. Often we use our leisure time in less active pursuits and therefore lack sufficient exercise.
   B. The concept of fitness refers to total fitness, not "exercise" alone.
      1. We have touched on the components of fitness in mental health, parenthood and disease and immunity.
      2. The food we consume plays a major role in our health and fitness; in the United States the problem is over-eating or eating unwisely.
      3. Physical education courses offer sport skills that can be continued into adulthood; recreational pursuits that "re-create" refresh and relax one are also important.
      4. Society today too frequently turns to all kinds of pills and drugs, coffee, cigarettes and alcohol as a compensation for fitness.

II. Nutrition and its relation to fitness
   A. Many factors affect our eating habits - racial background of parents, religion, economic conditions, type of home, etc.
   B. Food fads may be responsible for a great waste of money.
   C. The fundamentals of nutrition are found in the six nutrients.
      1. Proteins
         a. Body tissues are chiefly protein and thus large amounts are needed particularly in childhood for growth and throughout life for repair of tissues.
         b. Pregnant women require protein particularly for lactation.
         c. In many parts of the world the greatest food deficiency is that of protein; this is part of our world problem of overpopulation and food supply.
         d. Animal foods are our best sources.
2. Carbohydrates (sugars and starches)
   a. Our major supply of fuel or energy, the main source of which are plant foods.
   b. These can take care of current needs for energy (quick energy) and can be stored or converted into fats for a reserve fuel supply.

3. Fats
   a. Moderate amounts of fat for insulation and stored energy are desirable.
   b. Fats supply more than twice the energy of carbohydrates when oxidized or burned.

   (1) Measure value of food energy by calorie unit
   (2) The unit called a calorie means the amount of heat or energy necessary to raise one kilogram of water 1°C.
   (3) The active athlete needs a high-caloric intake in terms of energy for activity and protein for tissue repair.
   (4) The rate of metabolism may also affect our caloric intake and the rate at which fats are burned. Metabolism is the sum total of all the chemical reactions in the body.

4. Vitamins
   a. Provide material for enzymes

   (1) Enzymes are catalysts or chemical compounds which aid a chemical reaction.
   (2) Without these, proteins, carbohydrates and fats couldn't be utilized in metabolism.

   b. Vitamins without the nutrients (proteins, carbohydrates and fats) could lead to starvation; overdoses of vitamins could also be dangerous.

   c. Only small amounts of vitamins are necessary and our normal foods usually supply a sufficient number.

   d. Buying vitamin pills is a waste of money unless a doctor has found a condition where it is necessary.
5. Minerals

a. Inorganic nutrients used in moderate amounts for growth and repair of bones and teeth and in minute amounts for body function.

b. Normally found in our food. An example of the exception is iodine, which is added to table salt where it is lacking in the soil.

c. Supplements are not necessary except in certain medically determined instances.

6. Water

a. Comprises 2/3rds of our body weight; transports food and wastes and aids in regulating body temperature.

b. Get much of it from our food; some is a by-product of metabolism.

c. Most of it we consume in drinking water or beverages; generally get enough by drinking when we're thirsty.

D. Choosing food via certain food groups

1. To help us meet our needs for nutrients, two "systems" of food groups have been devised.

   a. Seven basic food groups (as per textbook)
   
   b. Four main food groups

(1) The milk group or dairy foods. (Also termed the milk-cheese group; 1 ounce cheese is equivalent to 1 cup of milk.) Recommended daily quantities as such, or in cooking:

   - 3-4 cups - children
   - 4 or more cups - teen-agers
   - 2 or more cups - adults

(2) The meat group - two or more servings (of two ounces, edible portion) daily of lean meat, fish, poultry or cheese (if not included in milk group) with dry beans, peas, nuts, peanut butter as alternates.

(3) The vegetable and fruit group - four or more servings including one rich in Vitamin C and one dark green or yellow.

(4) The bread and cereal group - four or more servings daily; these should be the enriched or whole grain breads and cereals.

2. A variety of foods selected from these groupings will help assure a balanced diet; "a varied diet tends to be a balanced diet."
3. In selecting food we tend to reflect eating habits of our parents and our home environment (farm or urban).

4. Few supplements needed if we choose foods wisely, including a variety of items from all these groups.

E. The problem of over-eating and weight control

1. Over-eating (a national problem in the U.S.) often leads to obesity.

2. Obesity is definitely not a sign of good health— in adults or children; high incidence of high blood pressure, gall bladder disease, arteriosclerosis and diabetes among overweight persons has been demonstrated. Obesity also shortens the life span.

3. Obesity is not a hereditary trait; but, the habit over-eating may be learned from one's family. Glandular defects are not a factor in overweight in any appreciable number of these individuals, either.

4. Height-weight charts are average charts and individual deviations are to be expected.

5. Major key to controlling weight is a matter of sustained discipline and restraint at the dinner table, a lifelong habit of eating moderately.

6. The crash diet which encourages the loss of much weight quickly is often an unhealthy diet. Weight lost quickly is also regained nearly as quickly. It is the gradual loss through a long-term "reorganization" of eating habits that is desirable.

7. Exercise plays a large part in weight control or maintenance, but it is overrated as the most important factor of weight reduction. An enormous amount of exercise is needed to burn up enough calories as in a pound of body fat, and the most likely result is a huge appetite. Exercise is no panacea for weight reduction, but an individual can psychologically eat more satisfactorily if he also exercises regularly.

8. Weight fluctuations may be unhealthy also.

9. A diet prescribed for you by a physician is the only healthy way to reduce.

III. Exercise and recreation in connection with fitness

A. Exercise is recommended by Paul Dudley White, M.D., as a preventive of circulatory and heart disease.

B. Generally exercise is also recommended to maintain muscle tone, aid circulation, digestion and bowel function.
C. Psychologically, exercise counteracts nervous stress and strain and enables the individual to "let off steam."

D. Dr. White further maintains that a clear mind can be maintained by alternating or accompanying mental work with exercise.

E. Regular exercise is urged for healthy people of all ages by White (a 71-year old physician, hiker, bike rider, wood-chopper) provided that sudden strenuous activity is prepared for gradually.

F. Service, skills and activities offered to university students by the Department of Physical Education, Intramurals and Athletics plus the Student Union help to control fatigue and promote fitness both during the college years and throughout life. The individual sport skills which can be learned at the university may be particularly important to our recreational and social life now and our family life after graduation.

IV. Smoking and its effect on well-being

A. The fables about smoking that we heard as children were meant to scare us away from what was considered unwholesome or unhealthy. What are the harmful effects?

B. One physician's opinion is that irritation to nose, throat, and respiratory passageways is the most common immediate harm to heavy smokers. Less common, long-term problems of asthma and obstruction of the respiratory passages may lead to and be a major aggravating factor in the over-inflation of the lungs.

C. Many doctors (according to the same physician) consider lung cancer as a consequence of smoking has been somewhat exaggerated. For every one patient who gets lung cancer which has been contributed to by heavy smoking there are probably 50 or 60, or maybe even a hundred, whose health has been impaired in other ways. So, numerically, lung cancer is not the most important harmful effect and we think that smoking contributes to the development of coronary disease and the very frequent diseases of circulation that contribute to 5 at percent of the deaths of American people.

D. Regardless of why you learned to smoke, it is a "pleasure" which it took time to acquire and which now may have become a psychological crutch.

1. It may be the tension reliever a la the two steel balls in the fingers of Captain Queeg.

2. If smoking helps to control an individual's emotional state, it may have some merit.

3. It may be an indication of a nervous phenomenon.
V. Alcohol and its relation to fitness

A. It is estimated that at least two-third of our population use alcoholic beverages to some extent.

B. The pseudo-stimulating effect of the initial drink of alcohol is caused by its depressant effect on the brain.
   1. An initial cocktail tends to relax the blood vessels, increases the readiness of the stomach to receive and digest food - whets the appetite so to speak.
   2. During ensuing drinks calories are burned, the appetite disappears and no real nutrition of the body cells takes place since alcohol is an incomplete food.
   3. Because of the depressant effect of alcohol on the brain, we lose our inhibitions, can't reason, use good logic or sound judgment. We tend to talk too much, our vision blurs and our equilibrium fails.

C. The heavy drinker or the alcoholic often suffers from malnutrition; no tissue damage from moderate drinking.

D. Many factors are involved in our behavior patterns concerning drinking - family habits, economic background, religion, national origin, etc.

E. Although not as addicting as narcotic drugs, alcohol can also become a psychological crutch.
   1. It takes the "brakes off" our inhibitory brain centers; it makes us feel good or even superior and we tend to attempt things we wouldn't ordinarily attempt.
   2. Much of the increasing rate in venereal disease among young adults may be "influenced" by alcohol.

VI. Decisions regarding food, exercise, recreation, tobacco, alcohol, drugs - directed by values and needs.

A. The sooner one decides what his own values and needs are regarding these socially acceptable patterns of behavior, the sooner one learns to enjoy them within set limits.

B. Over-eating, over-drinking, over-indulgences of any kind are not only a form of mis-used recreation and tend to be habit forming, but they are symptomatic of immaturity, emotional instability or generally poor mental health.

C. As far as fitness is concerned-your nutritional habits, your smoking and drinking habits and your exercise and recreational habits - are you developing fitness for better health?
SUGGESTED DISCUSSION TOPICS

1. List and discuss some of the common food fads and food supplement fallacies you have observed as influencing your family and friends.

2. Consider some of the reasons underlying the popular appeal of crash diets and the current "reducing salon."

3. Discuss the acceptable and desirable types of enrichment and fortification processes applied to food products today.

4. Since most people leading moderately active lives need 15 calories per pound to maintain their desirable weight, suggest that each member of the class determine (1) the number of calories needed daily and (2) the number of calories needed daily to lose or gain one pound a week (desired number of calories less or plus 500).

5. What information should most college students have to stimulate their interest in selecting well balanced meals?

6. Name some of the factors that determine the amount of nicotine that reaches the lung tissue.

7. Is there a best way to quit smoking -- a sharp break or a gradual reduction in the amount of tobacco used?

8. Why is alcohol so often mis-classified by the layman as a stimulant?

9. What are some of the factors that slow down the passage of alcohol from the stomach into the blood stream? Is the rate of oxidation also affected by specific factors? Stress the implications of these details.

10. What are some of the social implications of the abuse of alcohol?

11. What do you think should be included in a code of smoking etiquette?
SUGGESTED REFERENCES

1. Dach, Elizabeth M. Your Emotions and Overweight, 1957. Available from Division of Mental Hygiene, Ohio Dept. of Mental Hygiene and Correction, Columbus, Ohio.


7. How to Control Your Weight (1958) Metropolitan Life Insurance Company, 1 Madison Avenue, New York, N. Y.


9. Today’s Health. Series of Articles on Nutrition:
   (2) "Food for Energy," by Hazel M. Hauck, Ph.D. (November, 1957).
   (9) "Underfed or Poorly Fed?" by Grace A. Goldsmith, M.D. (June, 1958).
   (12) "How to Eat Well and Reduce Sensibly," by Helen S. Mitchell, Ph.D. (September, 1958).


1. Ability to Define a Problem

Identifying and defining a problem in a clear and precise manner enables an individual to begin to attack the problem more efficiently. This avoids the frustration of attempting to settle a difficulty without knowing what the difficulty is. It enables ideas to crystallize or fall into some sort of pattern. This skill is also important for good reading and understanding as well as personal problem-solving.

2. Ability to Select Pertinent Information for the Solution of a Problem

After definition of the problem, one needs to know what kinds of information would be most helpful. Thus, information must be adjudged on the basis of relevancy or pertinence and also of reliability so that superfluous and misleading evidence is discarded or disregarded. There is also an interaction between information and the definition of a problem as well as the intelligent solution achieved.

3. Ability to Recognize Stated and Unstated Assumptions

An assumption is a part of the argument that may be taken for granted (unstated) without any argument to justify it. If it is stated, it is simply "said" to be true, not "shown" to be true. In either case, assumptions make an important difference as to whether the argument or conclusions ought to be accepted or rejected. Critical thinking, logical thinking, and sound judgment are most apparent at this stage.

4. Ability to Formulate and Select Relevant and Promising Hypotheses

To consider as many possible solutions to a problem increases the likelihood of the best possible one being selected for the given situation. To explore mentally, think through consequences or results can eliminate both the misfortunes of poor choice and the frustrations of trial-and-error.

5. Ability to Draw Conclusions Validly and to Judge the Validity of Inferences

Correct reasoning or logical thinking enables one to draw conclusions which are truly based on the evidence and naturally follow from it. Good information is useless if the wrong conclusions are drawn from it. A valid conclusion follows the evidence. To infer something or accept something which is inferred but is not validly related to the information, may be due to personal bias rather than objective thinking. Drawing valid conclusions and judging the validity of arguments or presentations which we read or hear, are critical skills in problem solving.

*Adapted from Dressel and Mayhew, General Education. pp. 179-181.
With permission of the publishers.
Some Hints for Promoting Problem-Solving

1. Children and adolescents need to be encouraged to present their own problems, not admonished to think clearly.

2. Success in problem-solving, as in much other behavior, depends largely on the child's motivation. The child must feel that the task is important to him, that is related to some of his other interests and activities. The problem must be his.

3. Problem solving as a phase of thinking can be taught, at least in part, because it involves factors which are susceptible to control and learning through experience.

4. Many children have an active curiosity and an urge to overcome difficulties, both of which attitudes give them a good start as problem-solvers, particularly in puzzle situations. The teacher and parent must be aware of the level of difficulty at which the problem can be presented. The individual's and the groups level of aspiration gives clues to the complexity of problems which may be successfully presented.

5. Parents and teachers must avoid providing ready-made solutions to children's problems. Time and patience are not always inexhaustible but they are certainly desirable where an adult and a child face a problem together.

6. The development of meanings in the problem area is usually a first step toward the solution of problems.

7. Parents and teachers may help the child by calling his attention to any material in the stimulus situation which he does not perceive and to the objective which is to be attained.

8. Pupils can be encouraged to modify an objective as it becomes clearer to them through experience.

9. Parents and teachers can assist pupils in using inductive-deductive method in cases where definitions, rules, and other generalizations are to be learned.

10. Children and adolescents can be encouraged to raise questions, check sources, and otherwise test the relevancy and worth of ideas suggested. Evaluation is a continuous process in problem-solving.

11. Children need opportunities for observation, for using their memory, and time for recollection. A group of adolescents cannot come to an instant conclusion about the virtues of Universal Military Training.

12. Parents and teachers can help children to face, not avoid, basic personal problems by guiding them in their early search for solutions.

13. Older children can be taught to recognize some of the common errors of logic, such as the use of inaccurate analogy or the neglect of negative instances.

14. Inability to solve problems in any particular field may be caused by difficulties with specific techniques. Faulty reading of a problem in social studies or errors in computation in arithmetic may affect solutions unfavorably. Children need to be helped in finding specific causes for their errors.

15. The scientific method may be generalized and verbalized with older children to provide them with a possible series of steps for solving problems and for checking the validity of conclusions.

16. Testing solutions in action provides one of the best antidotes to extreme verbalization in problem solving.
A Graphical Representation of Problem-Solving

As Used by a Group*

Naming the Problem

What are the Assumptions concerning it?

What are your own experiences with it?

Discussing the Problem

What are the outstanding attitudes about it?

What are the facts concerning it?

WAYS OF UNCOVERING ATTITUDES
1. Reading
2. Seeing motion pictures
3. Understanding one's self
4. Understanding others

WAYS OF DISCOVERING FACTS
1. Reading
2. Seeing motion pictures
3. Field trips
4. Inviting speakers
5. Interviewing

Proposing Solutions to the Problem

Acting in Terms of the Solutions

(After Farley and Overton, School Review, Vol. 59 (1951), pp. 403-409.)

Suggestions to Teachers

1. Always practice reflective teaching; teaching which builds with a problem and progressively builds up to culminate in an answer.

2. Keep clearly in mind that a problem represents a mental perplexity - things just don't "add up" - problem-solvers need to know just what their problem is; just what is causing the difficulty.

3. See in the first place that the students do already know a few things, that is, have a fund of ideas relevant to the general area of subject matter under consideration; and that they realize the possibility of drawing upon old ideas intact or to suggest new ideas.


5. Do some card-stacking. Adroitly throw various possibilities into the ring.

6. Be slow to frown upon wrong answers.

7. Always keep the field open for surprises to yourself. Even "dumb ones" may come up with astoundingly fruitful creations if only given a chance.

8. Finally - if certain ideas needing consideration are not forthcoming - suggest them yourself.
   a. Subject all ideas to tests of problem-solving
   b. Separate each idea from person who proposed it to minimize personal involvement and enhance objectivity
   c. Make sure some of teachers own proposals are among the rejects to remove status - value from own proposals.

To Summarize Steps of Scientific - Reflective Method --

1. A problem arises because available data seem to be out of harmony with one another in light of current interpretations of generalizations;

2. Alternative interpretations are sought, new ones are invented if necessary and all are taken into consideration (typically called hypotheses);

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3. On the basis of each hypothesis, which serves as a generalization, concrete facts are deduced, some of which may already be known whereas others require experimental origination because they are not already known or may not previously have existed;

4. If one of the hypotheses is found to harmonize all known facts and to predict with accuracy unknown facts - the criteria of adequacy and harmony in the interpretation of available or obtainable data - the conclusion is that it has been found to be an acceptable hypothesis. If no considered hypothesis is found to satisfy the criterion, the conclusion is that the problem is not yet solved.
APPENDIX IV (Continued)

Basic Abilities in Thinking Effectively*

1. Recognizes and defines problems, identifies issues.
2. Formulates, extends and verifies feasible hypotheses.
3. Collects, selects, or selectively recalls relevant data, differentiates between reliable and unreliable sources, between factual and non-factual sources.
4. Recognizes reliable experiments.
5. Draws reasonable inferences regarding cause and effect, logical implication, valid generalization, reliable prediction, and accurate description.
6. Recognizes and evaluates implicit assumptions, uses postulational arguments logically, recognizes relevant value systems and uses them reasonably.
7. Recognizes errors and fallacies.
8. Comes to decisions or conclusions, tests them, applies them to pertinent situations.
9. Applies semantic principles to language employed.

Attitudes Favorable to Thinking

1. Intellectual curiosity 6. Conviction of cause-and-effect relationships
2. Intellectual honesty 7. Disposition to be systematic
3. Objectivity 8. Flexibility
4. Intelligent skepticism 9. Persistence
5. Open-mindedness 10. Decisiveness

Attitudes Valuable in Group Thinking

1. Respect for another's views
2. Candor and expectancy of candor
3. Careful listening (tendency to)

Attitudes Unfavorable to Effective Thinking

1. Lack of intellectual curiosity
2. Intellectual dishonesty
3. Bias or prejudice for or against (anything)
4. Primitive credulity
5. Harmful incredulity; the closed mind
6. Disregard for cause-and-effect relationships
7. Unsystematic procedure, tolerance of confusion (tendency to)
8. Dogmatism and rigidity; inflexibility
9. Lack of persistence
10. Indecisiveness

Problem-Solving in Health Education

Definitions - Supplement

Deductive reasoning - the process of reasoning, thinking, or inferring from the general to the particular, from principles to facts.

Inductive reasoning - the process of reasoning from the particular to the general, from facts to principles or generalizations.

Analysis - a separating or breaking up of a whole into its parts so as to find the nature, proportion, function, relationship, etc.

Synthesis - the putting together of parts or elements so as to form a whole.

Interpolation - to supply intermediate terms in a series of terms; to infer a value, quantity, etc. within a known range.

Extrapolation - to estimate or infer a value, quantity, etc. beyond the known range.

Analogy - the process of reasoning by comparisons.
APPENDIX IV (Continued)

Some References: For Teaching Problem Solving


HEALTH EDUCATION PROBLEM SOLVING EXAMINATION

The questions in the enclosed booklet are designed to test, in part, your ability to solve health problems and do critical thinking in health education. Your subjective answers are to be brief and explicit, not lengthy essays. However, list as many answers as possible. (See the example problem on page 2.) Be sure you write legibly in the spaces provided.

Before proceeding to the example problem and the test questions, you will need to know the following definitions and terminology. Read them first, then read the example problem before you begin the test.

Problem - a situation involving doubt; a condition or situation where a perplexity or dilemma blocks an attempt to reach a goal.

Assumption - a supposition; anything taken for granted; anything treated as true without examination.

Hypotheses - proposed or tentative solutions for the purpose of testing as a solution.

Warranted - justifiable or reasonable; in accord with the facts or evidence.

(Read the example problem on the next page)
EXAMPLE PROBLEM

Ronald, a university student, writes in his health class, "In most of my classes, I sit towards the rear of the room. Few professors seem to speak loudly enough to be heard and I miss a good deal of their lectures. They must have awfully weak voices since the rooms are not large. My hearing must be O'K because I never have earaches."

1. Define the problem.
   *(possible answer)* The problem is for Ronald to find out if he has a hearing deficiency.

2. What assumptions are made?
   *(some possible answers)*
   a) Lectures are missed because professors have weak voices.
   b) Earaches are related to poor hearing.
   c) Ronald's hearing must be O'K.
   d) One should be able to hear in the back of the room.
   e) Ronald is really trying to hear the lectures.

3. Propose as many hypotheses or possible solutions as you can.
   *(some possible answers)*
   a) Ronald should move to the front of the room.
   b) Ronald should use a hearing aid.
   c) Ronald's visiting a doctor and following his advice will solve his problem.
   d) If Ronald has the wax removed from his ear, then he will hear better and his problem will be solved.
   e) He should try paying closer attention to the lectures.

4. Choose the best hypothesis. Give evidence to show why it is warranted and the others are not.
   *(some possible answers)*
   a) May help but does not go to the cause of problem.
   b) is not warranted until further scientific evidence is gathered to support it.
   c) Is best because hearing problems are usually organic thus medical diagnosis and treatment are necessary; the measurement of hearing acuity requires technical knowledge and apparatus.
   d) same as b; ear wax is not always responsible for reduced hearing.
   e) is not warranted without further evidence of Ronald's behavior during lectures.
Read the following paragraph:

Frank was talking to his classmates between classes; "I have read that there is a definite relationship between cancer and smoking. This worries me from time to time but, nevertheless, I haven't quit. I feel sort of leary about getting a chest x-ray because of what it might show."

1. Define the problem.

2. What assumptions are made?
3. Propose as many possible solutions or hypotheses as you can.

4. Choose the best hypothesis. Give evidence to show why it is warranted and the others are not.
Read the following paragraph:

Barbara, a college freshman says, "My problem is one of overweight and activity. It concerns the amount of time that I am busy in class and studying, and the amount of time for activity. While in high school, I was active and didn't have too much fat. Now I weigh 129 pounds."

1. Define the problem.

2. What assumptions are made?
3. Propose as many hypotheses or possible solutions as you can.

4. Choose the best hypothesis. Give evidence to show why it is warranted and the others are not.
Read the following paragraph:

In a dormitory bull-session, Bruce was saying, "It doesn't seem to be something you can measure. But I'll bet when a fellow falls in love with the right girl, he'll just know it. You're bound to meet the one meant for you if you search hard enough."

1. Define the problem.

2. What assumptions are made?
3. Propose as many hypotheses or possible solutions as you can.

4. Choose the best hypothesis. Give evidence to show why it is warranted and the others are not.
HEALTH EDUCATION 400 EXAMINATION

DO NOT MARK ON THIS TEST IN ANY WAY

Directions for Marking Answers

You are to decide for each question or statement the best answer among the choices listed. Then you are to record your answer on the Answer Sheet. The sample question and answer will show exactly how to proceed.

Sample question:

The normal oral temperature of the human body is:

1. 68
2. 98.6
3. 96.8
4. 72

Answer as it should be indicated on the Answer Sheet

1. 1 2 3 4 5
   ||| |||| |
   |||||

Because the second choice (2 - 98.6) is correct, the space under the 2 is filled with heavy mark on the answer sheet.
APPENDIX V

Scale-Guide For Grading Problem-Solving

In Health Education 400

DEFINE: (9 credits for best answer; 6 credits for good answer; 3 for weak; 0 for none)

9 The problem is for Frank to find out if there is a relationship between his smoking and his chances of getting cancer.
9 The problem is for Frank to determine if smoking will give him cancer.
6 The problem is for Frank to find the truth about whether or not smoking causes cancer.
6 Is there a relationship between smoking and cancer?
6 The problem is whether or not Frank should give up smoking.
3 The problem is for Frank to find out if he has cancer.
3 The problem is for Frank to overcome his fear.

ASSUMPTIONS: (1 credit for each assumption)

1. Frank smokes.
2. Smoking causes cancer.
3. Chest x-ray tells whether or not a patient has cancer.
4. Frank is afraid to learn he might have cancer.
5. Frank is afraid to face reality.
6. Giving up smoking prevents cancer.
7. Frank wants to find out if he has cancer or not.
8. Frank enjoys smoking.
9. Frank is not familiar with the 7 danger signals of cancer.
10. Frank wants to know more about cancer.
11. The article Frank read is true.
12. If he has cancer it is due to smoking.
13. Chest x-ray is normal procedure; not harmful.
14. Frank would stop smoking if x-rays showed signs of cancer.
15. If one quits smoking, chances of having cancer are reduced.
16. Frank doesn't want to quit smoking.
17. Frank has never learned about cancer in school.
HYPOTHESES (1 credit for each hypothesis)

A. Frank should study about cancer and its relationship with smoking, more thoroughly.
B. Frank should see a doctor, have a check-up and discuss his problem.
C. Frank should have a chest x-ray and stop smoking.
D. Frank should stop smoking.
E. Frank should have a chest x-ray.
F. Frank should cut down on smoking.
G. Frank should take a health education course.
H. Frank should consult a psychologist about his fears.
I. Frank should smoke filtered cigarettes.
J. Frank should talk to patients who have lung cancer.
K. Frank should survey smokers and non-smokers.
L. Frank should consider himself normal and go along as he is.

BEST HYPOTHESIS - GIVE EVIDENCE (6 credits for best hypothesis; 1 for good hypothesis; 2 for weak; 0 for none - plus 1 credit for each fact in evidence)

6+ 1. A or B - Assuming Frank wants to know about cancer and accumulating evidence will alleviate fears and solve problems, B would be considered if time were a factor (but not money).

4+ 2. C - having x-ray might give a sense of security, and stopping smoking might prevent cancer. Seems unlikely with our educational reinforcement of some kind.

2+ 3. D - though indicated, Frank might carry fear he already has cancer.

2+ 4. E - does not solve problem by itself.

2+ 5. F - " " " " ""

2+ 6. G - ranks along with A & B

4+ 7. H - might be an indirect but eventually successful way to solve problem.

0- 8. I - no solution in sight

2+ 9. J - partial solution possible

2+ 10. K - " " ""

0- 11. L - no solution

+1 for each acceptable item of "fact"
APPENDIX V (Continued)

DEFINE:

9 The problem is for Barbara to establish how much she ought to weigh and how to maintain proper weight.
9 The problem is for Barbara to determine if she is actually overweight and what cause might be, or if she is unduly concerned.
9 The problem is for Barbara to establish what overweight means and if it applies to her.
6 The problem is for Barbara to determine if she only thinks she is overweight due to inactivity.
6 The problem is for Barbara to determine the relationship between overweight and activity.

ASSUMPTIONS:

1. Barbara is overweight at 129 lbs.
2. Barbara was not overweight in high school.
3. Barbara spends more time studying in college than in high school.
4. Barbara gets less activity in college than in high school.
5. Barbara hasn't enough time for both studying and activity.
6. Barbara hasn't checked the Height and Weight Charts.
7. Barbara has to spend her time studying.
8. Barbara does not want to be overweight.
9. Barbara has been trying not to gain weight.
10. There is a relationship between inactivity and overweight.
11. Inactivity causes overweight.
12. Activity reduces weight.
13. There is no activity involved in class and studying.
14. Activity kept Barbara's weight down in high school.
15. High school was easier for Barbara then in college.
16. Barbara's adjustment to college routine is normal.
17. Barbara's eating habits are the same as in high school.
18. Barbara has not grown since high school.
19. Barbara is carrying too many courses in college.
20. Scales used are accurate.
21. Has matured and should not "grow" anymore.
22. Barbara is in good health.
HYPOTHESES

A. Barbara should find out how much she should weigh.
B. Barbara should study nutrition and causes of overweight.
C. Barbara should find out if she overeats.
D. Barbara should consult a physician and follow his recommendations.
E. Barbara should adjust her schedule to allow time for exercise and activities.
F. Barbara should cut down her calorie intake and exercise.
G. Barbara should cut down her calorie intake.
H. Barbara should learn how to study.
I. Barbara should reduce her class schedule.
J. Barbara should consult a doctor about emotions, and their relation to overweight.
K. Barbara should consult a physician about the glandular causes of overweight.
L. Barbara should go on a diet.
M. Barbara should try reducing pills.
N. Barbara should quit school.
O. Barbara should change her curriculum.
P. Barbara should stop worrying and enjoy herself.
Q. Barbara should check the scales.

BEST HYPOTHESES - GIVE EVIDENCE

6+ 1. A - may show weight is normal and no problem exists
6+ 2. B - knowledge may help to resolve concern, indicate ways to maintain
4+ 3. C - may indicate immediate cause of problem and solution
4+ 4. D - if problem is serious medical advice is warranted.
2+ 5. E - a solution in part, but indicated
4+ 6. F - the solution if problem is real
2+ 7. G - partial solution
2+ 8. H - possible help - not necessarily indicated
2+ 9. I - " " " " "
2+ 10. J - " " " " "
2+ 11. K - " " " " "
2+ 12. L - but consult doctor
0 13. M - " " "
0 14. N - not necessarily
0 15. O - " "
0 16. P - " "
2+ 17. Q - if considered in assumptions

(+1 for each acceptable item of "fact")
APPENDIX V: (Continued)

DEFINE:

9. The problem is how to recognize being in love and how to meet someone to love.
9. The problem is for Bruce to learn to be more realistic about love and finding one's mate.
3. Bruce's problem is to learn how to recognize being in love.
3. Bruce's problem is how to tell when he has met the right person to love.
3. Bruce's problem is how to find the right person to love.
3. Bruce's problem is to determine what love is.

ASSUMPTIONS

1. There is only one person meant for you.
2. You can't measure love.
3. You must search hard to find the one you love.
4. Something unexplainable tells you when you are in love.
5. One falls in love.
6. Something unexplainable will tell you when you meet the right girl (boy).
7. If you search hard enough you will find the right girl (boy).
8. You will have no doubt about love when it comes.
9. There are certain girls meant for certain boys.
10. Love is not possible except with the certain girl (boy).
11. Bruce is looking for the right girl.
12. Bruce has not yet found the right girl.
13. Bruce isn't in love now.
14. Bruce wants to fall in love.
15. Bruce lives in a dormitory.
16. Bruce believes in predestination.
17. The bull-session is about girls (love, marriage, etc.)
18. Bruce has never taken a marriage course.
19. Bruce has never discussed this with "older" or more learned people.
HYPOTHESES

A. Bruce should take a course in Courtship and Marriage.
B. Bruce should read books by authorities on Love and Marriage.
C. Bruce should attend lectures, and discussions on Love and Marriage in churches, YMCA's, etc.
D. Bruce should take a course in Health Education.
E. Bruce should consult marriage counselors; ministers; psychologists; teachers; parents; engaged couples and married couples.
F. Bruce should date a variety of girls and image each of them as a potential mate.
G. Bruce should learn the purposes of dating, courtship and marriage.
H. Bruce should establish a set of standards as a checklist for what he expects in a mate.
I. Bruce should meet girls as friends instead of considering them as mates.

BEST HYPOTHESIS - GIVE EVIDENCE

6+ 1. A, B, C, D - a planned course of study might help Bruce attain a more realistic attitude about love and marriage
4+ 2. E - possibly in lieu of or in conjunction with A, B, C, or D
2+ 3. F, G, H - concurrent with A - E for "Practical" experience and development
2+ 4. I - warranted if one assumes Bruce has little dating and social experience

(1+ for each acceptable item of "fact")
In order to improve this course for future students, we would appreciate your honest, sincere and thoughtful responses to the following items.

Check off one response for each item according to the following scale:

1 - Agree strongly  
2 - Agree somewhat  
3 - Agree slightly  
4 - Disagree slightly  
5 - Disagree somewhat  
6 - Disagree strongly

<table>
<thead>
<tr>
<th>Number</th>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This course was enjoyable.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>This course would have been better without television.</td>
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<tr>
<td>3</td>
<td>I have learned a great deal about health in this course</td>
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<td></td>
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<tr>
<td>4</td>
<td>The classroom teacher and the television teacher worked well together.</td>
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<tr>
<td>5</td>
<td>The course is presented in a meaningful and practical manner.</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>This course should be given more time.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I learned how to apply health knowledge to solving health problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>I will probably use much of what I learned quite soon.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>The subject matter in this course is important to me.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10</td>
<td>My attitude towards health education has improved.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11</td>
<td>I learned to recognize assumptions in health advertising.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
12. This course held my attention.  

13. I learned to draw conclusions from the health facts.  

14. List a single FAVORABLE or UNFAVORABLE factor or characteristic (i.e., too talkative, jolly, incoherent, -- use your own terms) about each of the following:

<table>
<thead>
<tr>
<th>FAVORABLE</th>
<th>UNFAVORABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV Teacher</td>
<td></td>
</tr>
<tr>
<td>His presentation</td>
<td></td>
</tr>
<tr>
<td>Classroom Teacher</td>
<td></td>
</tr>
<tr>
<td>His presentation</td>
<td></td>
</tr>
</tbody>
</table>

15. Briefly fill in one of the following:

1. I enjoyed this course because --

2. I have no particular feeling about this course because --

3. I disliked this course because --

16. One thing I liked best about the course was --

17. One thing I disliked most about the course was --

18. If you do not mind, in order to compare your responses to the grade you earned (this paper has no effect on grades) print your name ____________________________.
### APPENDIX VII

#### TABLE 6

**PRE AND POST TEST**

Means for Problem-Solving Test Parts

**Pre-Test: Problem 1**

<table>
<thead>
<tr>
<th>Part</th>
<th>Groups</th>
<th>N</th>
<th>X</th>
<th>Groups</th>
<th>N</th>
<th>X</th>
<th>Groups</th>
<th>N</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td>Experimental</td>
<td></td>
<td></td>
<td>Merged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part 1</td>
<td></td>
<td>134</td>
<td>1.746</td>
<td>194</td>
<td>1.856</td>
<td>328</td>
<td>1.811</td>
<td></td>
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<tr>
<td>Part 2</td>
<td></td>
<td>134</td>
<td>2.851</td>
<td>194</td>
<td>2.902</td>
<td>328</td>
<td>2.861</td>
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<tr>
<td>Part 3</td>
<td></td>
<td>134</td>
<td>2.918</td>
<td>194</td>
<td>3.196</td>
<td>328</td>
<td>3.082</td>
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<td></td>
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<tr>
<td>Part 4</td>
<td></td>
<td>134</td>
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<td>Part 5</td>
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<td>194</td>
<td>.701</td>
<td>328</td>
<td>.692</td>
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<td></td>
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### TABLE 6 (Cont'd)

Pre-Test: Problem 2

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<th>Part</th>
<th>Control</th>
<th>Experimental</th>
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<tbody>
<tr>
<td>1</td>
<td>131</td>
<td>191</td>
<td>328</td>
</tr>
<tr>
<td>X</td>
<td>0.619</td>
<td>1.046</td>
<td>.884</td>
</tr>
<tr>
<td>2</td>
<td>131</td>
<td>191</td>
<td>328</td>
</tr>
<tr>
<td>X</td>
<td>2.918</td>
<td>3.284</td>
<td>3.134</td>
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<tr>
<td>3</td>
<td>131</td>
<td>191</td>
<td>328</td>
</tr>
<tr>
<td>X</td>
<td>2.925</td>
<td>2.974</td>
<td>2.954</td>
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<tr>
<td>4</td>
<td>131</td>
<td>191</td>
<td>328</td>
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### TABLE 6 (Cont'd)

**Post-Test: Problem 1**

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TABLE 6 (Cont'd)
Post-Test: Problem 2
TABLE 6 (Cont'd)
Post-Test: Problem 3

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### TABLE 7

**Means for Pre and Post Test Scores and Difference Between Pre and Post Test Scores**

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### TABLE 8
**Means for the Ohio State Psychological Examination, Age of Groups, and Grade for Course**

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Born in Brooklyn, New York, on February 24, 1925, I, Robert Kaplan, later attended the public schools of this city. Having returned to New York University after World War II, the Bachelor of Science degree was granted me in 1948. I received the Master of Arts from the same institution in the summer of 1949. From September 1948 to the present I have been teaching in the Department of Physical Education of The Ohio State University in both Health and Physical Education. In 1958, I was admitted to candidacy for the Doctor of Philosophy degree at the same institution.