

ASSESSMENT OF THE HEALTH KNOWLEDGE  
of  
TENTH GRADERS IN THE PORTSMOUTH, VIRGINIA,  
PUBLIC SCHOOL SYSTEM

by

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A greater emphasis is being placed on health educators for prevention of health problems (Kime, Schladdt, & Tristh, 1973, p.5). According to C.A. Hoffman, past president of the American Medical Association, health education will provide the next major advance in the health of people. He believed that people must be taught that life style is one of the most important factors in their health (Kime, et al., 1973, p.5). One of the most important phases of teaching about healthy lifestyles is to disseminate sound information to increase the health knowledge of people. Perhaps the most appropriate starting point for this dissemination is in the school system.

There appears to be an increasing concern on the part of schools to teach sound health information so that the students will have increased options for making sound decisions about their health, which will hopefully result in healthy lifestyles. The question which arises is why is the development of health information or knowledge an essential component for healthy behavior?

According to Bloom (1956), the development of knowledge is an essential component of all cognitive behaviors and can be justified in several ways. "Perhaps the most common justification is that with the increase in knowledge or information there is a development of one's acquaintance with reality" (p.32). As an individual learns more, his perception of the world around him increases.

Bloom (1956) justifies the importance of knowledge because it is considered basic for all other educational outcomes. Educational activities, such as problem solving, are based upon knowledge: "The intellectual abilities represented in the taxonomy assume knowledge as a prerequisite" (Bloom, 1956, p.33). In addition:

all of the affective classifications make use of or are based upon knowledge. Thus, it is generally held that interests are developed as the result of an increase in information; likewise attitudes and appreciations are regarded as having some base in knowledge or information. (Bloom, 1956, p.33)

Foster (1968) said the following about health education and its effect on behavior:

Health is a dynamic quality; it is not an end in itself, but it becomes the means through which the student can accomplish his goals. It allows him to live a happy constructive life in which he is able to contribute to society. The total health activity must be well planned, organized, and developed before it will influence his behavior pattern; thus, it must relate to his requirements. Health education consists, therefore, of teaching directed towards experiences which result in doing. Pupils must have health knowledge presented in such a stimulating and effective manner that they will want to use it. (p.11)

The type of program Foster describes should be an exemplar of every school health education program. It appears that the school is in

a strategic position to increase one's options for sound decisions leading to healthy lifestyles. Therefore, the dissemination of health information from kindergarten to high school is essential to increase one's health knowledge.

### Purpose

This investigation will assess the current health knowledge of a random sample of tenth grade students in the Portsmouth, Virginia Public School System (PPSS) who were completing their health education course. The Seffrin Health Cognition Test will be used as the means of measurement. The two research questions which were examined were:

1. What is the overall health knowledge of the sampled students in Portsmouth and how does this group compare with Seffrin's norms for high school students who had completed or were completing their high school health course?

2. How do males and females in Portsmouth differ in health knowledge?

The results of this investigation should facilitate the planning of future health curricula through identifying areas of weakness in ten conceptual areas and five cognitive levels, as measured by the Seffrin Health Cognition Test. This study will also extend the norms for the Seffrin Health Cognition Test to males and females.

### Definition of Terms

In order to clarify terms used in this study, the following definitions were chosen:

Health education refers to "a process with intellectual, psychological and social dimensions relating to activities that increase the abilities of people to make informed decisions affecting their personal, family, and community well-being" (Ross & Mico, 1980, p.312).

Health knowledge refers to "those behaviors and test situations which emphasize the remembering, either by recognition or recall, of ideas, materials, or phenomena" (Bloom, 1956, p.62). In this study, health knowledge was measured by the Seffrin Health Cognition Test.

The Seffrin Health Cognition Test (SHCT) was constructed "for the purpose of measuring the extent of cognition achieved by high school pupils who have completed or are (sic) completing their high school health science course" (Seffin, 1982, p.1). The test measured ten conceptual areas and five cognitive levels. These were identified under the instrumentation section of chapter two.

### Assumptions

To use the SHCT, it was assumed that:

1. Students would respond in an honest manner.
2. Four kinds of cognitive behavior were appropriate for high school testing. They were: (a) First level-- knowledge of facts or

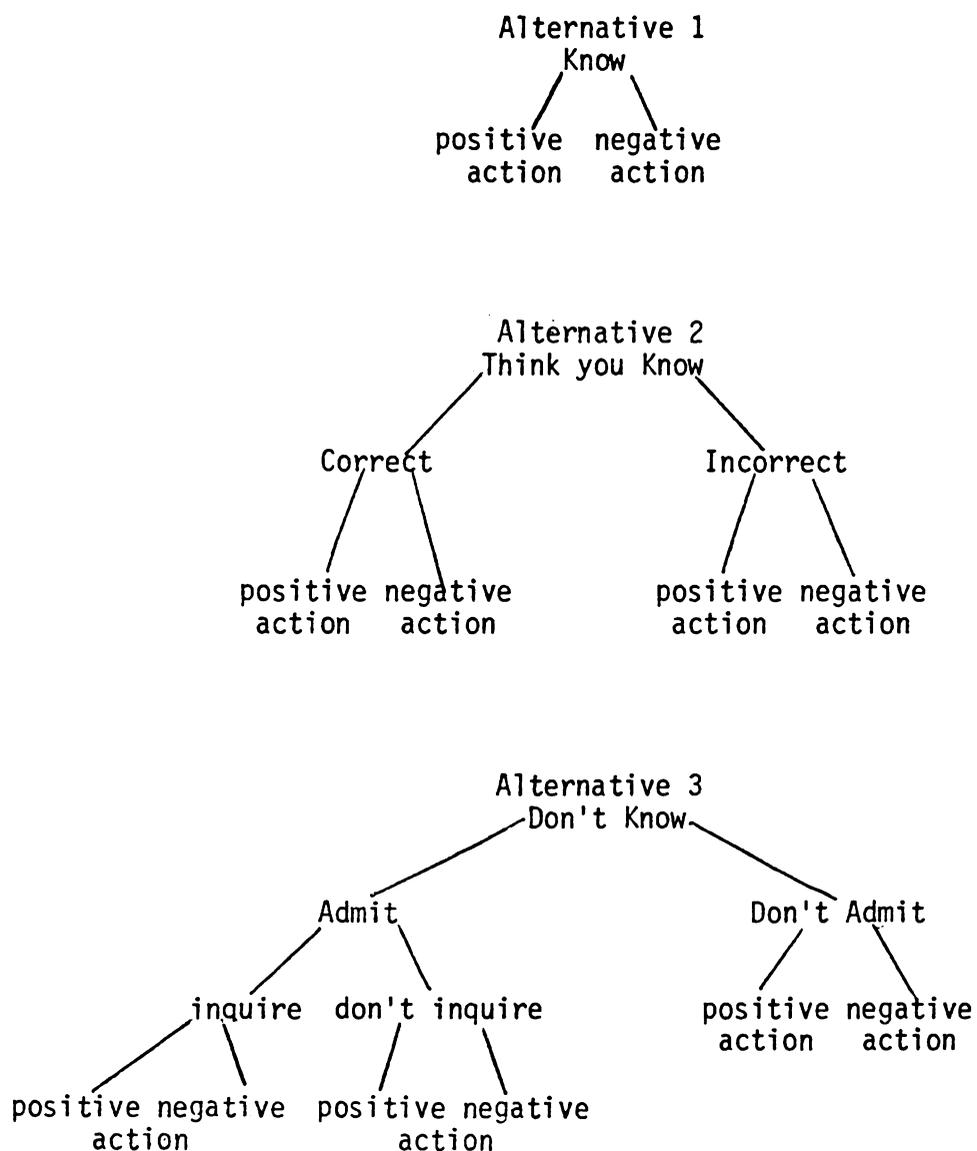
recall of information; (b) Second level-- comprehension of facts enabling one to choose the correct answer; (c) The third and fourth levels included the application and analysis of several facts and principles, and the ability to apply them to a new situation. (Seffrin & Veenker, 1972, p.43)

### Significance of the study

One of the goals of health education is to provide information that can positively influence health behavior (Kime, et al., 1973, p.271). One of the questions which arises is what type of philosophy should one advocate regarding the relationship of knowledge and how it affects behavior. One philosophy states that the acquisition of facts will bring about a desired behavioral outcome. Another philosophy is that modification of attitudes and/or behaviors is the best indicator of success (Kime, et al., 1973, p.271).

"In dealing with health behavior from the perspective of knowledge and how it affects behavior, we are dealing with a multifaceted problem" (Galli, 1978, p.177). Galli (1978) describes three alternatives included in the dimension of knowledge (Figure 1). In the First Alternative the individual knows the course of action that should be taken to avoid a certain health problem. Individuals will either behave in a manner which is in accordance with the facts or they will behave without regard for the facts. Alternative Two describes those who think they know the correct information. If the individual's knowledge is correct this individual may use the

Figure 1. Flow chart for the relationship between knowledge and behavior.



Note. From Foundations and Principles of Health Education (p.178)

by N. Galli, 1978, New York: John Wiley and Sons.

information or disregard it. The same choices are open if the information is incorrect. Individuals may make a correct decision by chance, but it is more likely that they will make an error. Not knowing the correct information describes Alternative Three. In this situation, the individual can admit lack of knowledge and then either inquire into the correct facts or remain ignorant. If the individual does not admit the lack of knowledge; he may take positive action, but he may also take negative action. This model indicates that although people are aware of the correct health information, they may or may not take positive action (Galli, 1978, p.178).

Knowledge is an expected outcome of any educational program (Kreuter & Christenson, 1981, p.51). The term education literally means "to lead out" (Galli, 1978, p.146). "Health education, then, is the process whereby the individual, in cooperation with the instructor, is provided an opportunity to apply new knowledge and act in healthful ways" (Galli, 1978, p.146).

Evaluation of knowledge has been an integral part of the educational system. Oberteuffer, et al. (1972), identified the following purposes of evaluation:

1. To determine present health knowledge, beliefs, and practices as a basis for developing instructional objectives.
2. To identify and diagnose sources of learning difficulties.
3. To assess the effectiveness of teaching materials and strategies.
4. To appraise the total health curriculum.

5. To provide continuing information about student achievement as a basis for motivation or grading.

6. To ensure the relevance of evaluation procedures employed to the specific course objectives.

7. To serve as a basis for constructive revision or modification of all aspects of the curriculum. (p.164)

Included as a part of evaluation is measurement. "Measurement is descriptive only-- a means of quantifying some amount of information or status" (Oberteuffer, et al., 1972, p.164). The results are then used to make an evaluation. Measuring knowledge is one method of evaluating specific objectives. Standardized tests are often used to measure how much learning has taken place, and are usually designed for maximum validity and reliability. The results of such a knowledge test can be utilized by the teacher for evaluation of teaching effectiveness. The scores will aid in answering questions such as: 1) Were the objectives achieved? 2) Were the goals realistic? and 3) Were the scores at the desired level? The answers to these and other questions should be used when evaluating lesson plans and curriculum guides (Oberteuffer, et al., 1972, p.813).

Unlike other areas of education, health education objectives are often very difficult to measure. Measuring health behaviors is plagued with problems of direct observation and the reliability of self report (Oberteuffer, et al., 1972, p.166). It has been stated that "it is inappropriate to establish immediate health behavior change as the absolute criterion for success in school health education" (Kreuter

& Christenson, 1981, p.46). If health education did have behavior change as its primary goal, the only means for success would be to control the children as well as the school environment (Kreuter & Christenson, 1981, p.46).

"Health knowledge is that aspect of health instruction that the teacher can be most effective in evaluating" (Oberteuffer, et al., 1972, p.168). The importance of knowledge should not be underestimated, for innovative curriculums have been shown to have a positive effect on the attitudes and practices of school children (Redican, Olsen, & Mathis, 1979, p.340). Although, it has been shown that knowledge alone does not insure that an individual will choose healthy behaviors, neither can it be denied that the acquisition of knowledge is the basis of rational decision making and subsequent behaviors.

### Summary

The purpose of this study was to measure the current health knowledge of a random sample of tenth grade students in the PPSS, using the Seffrin Health Cognition Test.

Blooms's taxonomies of educational objectives are separated into three domains; yet it is understood that they are all interdependent. They are treated separately for the purpose of focus. The cognitive domain must receive the same emphasis as the affective and psychomotor domains. Although attitudes and behavior are important results of health education programs, they are based upon cognitive abilities.

## Review of Literature

### Taxonomy of Educational Objectives

The taxonomy of educational objectives was devised "to facilitate communication... between persons concerned with educational research and curriculum development" (Bloom, 1956, p.10). Achievement testers and educational research workers are primarily concerned with the changes produced in students behavior "as a result of educational experiences" (Bloom, 1956, p. 12). Bloom (1956) believes that unlike teaching techniques and test materials, student behaviors can be represented by a small number of classes. The same classes of behavior can be observed in different grade levels, in different schools, and in different content areas (p. 12).

The taxonomy is a classification system for the intended behaviors of students, not the instructional methods or materials used by the teacher. Bloom (1956) defined intended behaviors as "the ways in which individuals are to act, think, or feel as the result of participating in some unit of instruction" (p.12). He also recognized the fact that the students' actual behavior on completion of the unit may differ from the intended behavior described in the objectives.

The taxonomy contains six major classes:

- 1) Knowledge
- 2) Comprehension
- 3) Application
- 4) Analysis
- 5) Synthesis
- 6) Evaluation

The classes are in hierarchical order; that is, "the objectives in one class are likely to make use of and be built on the behaviors found in the preceding classes" (Bloom, 1956, p. 18).

The first classification of cognitive behavior is knowledge. Knowledge are "those behaviors and test situations which emphasize the remembering, either by recognition or recall, of ideas, materials, or phenomena" (Bloom, 1956, p. 62). In the learning situation the student stores certain pieces of information and when tested is expected to recall that information. The use of judgement comes into play because the problems are stated in a form different from the original learning situation.

The arrangement of the knowledge objectives are from specific behaviors to complex, abstract behaviors. The knowledge category is different from the others in that the major process is remembering, while remembering is only part of the "more complex process of relating, judging and reorganizing" (Bloom, 1956, p. 62). When testing knowledge you are asking the student to give a correct response to a question that should be in a format not too different from the way it was presented. This area can be tested efficiently, economically, and can cover a large body of knowledge with only a few problems (Bloom, 1956, p. 78).

Bloom (1956) states that "probably the largest general class of intellectual abilities and skills emphasized in schools and colleges are those which involve comprehension" (p. 89). Students are presented an idea, must know what is being discussed, and must then make use of the material contained in the idea. Bloom (1956) uses the term comprehension to include all the objectives, behaviors, and responses which the student exhibits as an understanding of the idea being presented (p. 89).

Three types of comprehensive behaviors are identified in the taxonomy: 1) translation, 2) interpretation, and 3) extrapolation. When testing translation objectives, recall may be used when the student is asked to explain a formal definition. In some instances, students "translate" a question in a distorted manner, only to find that they answer the question incorrectly. The teacher should be certain that all essay questions are appropriately worded (Bloom, 1956, p. 90).

Essay exercises are often used when testing students interpretive abilities. They may be asked to interpret a political cartoon with respect to political campaigns. Objective questions may also be used. When using objective questions, students should thoroughly understand the procedures for answering the questions (Bloom, 1956, p. 90).

When testing for extrapolative ability, it is often effective to use the essay exercises previously mentioned. The student must go beyond the information given and present new ideas. The extrapolation may go beyond the original time dimensions, the original topic, and may relate to more than the original sample (Bloom, 1956, p. 90).

The next category in the classification of cognitive behaviors is application. Most of what is taught in school is intended to be applied to real life situations. Therefore, the effectiveness of a program is dependent upon how well students "carry over into situations applications which the students never faced in the learning process" (Bloom, 1956, p. 122). This is one of the biggest problems

faced by educators. Research has shown that the ability to comprehend a fact will not necessarily mean that it will be correctly applied. By teaching concepts, generalizations, and good problem solving methods, the student will be better equipped to apply the data learned in the class (Bloom, 1956, p. 122).

The fourth category that Bloom (1956) has identified is that of analysis. It is broken-down into the following categories: 1) analysis of elements, 2) analysis of relationships, and 3) analysis of organizational principles. Bloom (1956) stated that "analysis emphasizes the breakdown of the material into its constituent parts and detection of the relationships of the parts and of the way they are organized" (p.144). Analysis exercises may be used to provide a fuller comprehension of material presented. In the testing situation, the ability to analyze is dependent upon familiarity with the material (Bloom, 1956, p. 149).

Synthesis is the fifth area classified by Bloom (1956, p. 162) . It is defined "as the putting together of elements and parts so as to form a whole. This process ... constitutes a pattern... not clearly there before" (Bloom, 1956, p.162). Synthesis is broken down into the following categories: 1) production of a unique communication, 2) production of a plan or proposed set of operation, and 3) derivation of a set of abstract relations. This category allows for creative behavior, but within the constraints of the particular problem. This type of problem produces a product that "is more than the materials he began to work with" (Bloom, 1956, p. 162). Activities that emphasize synthesizing provide a greater range of experiences than those concerned with the

accumulation of ideas (Bloom, 1956, p.162).

A major problem associated with exercises in synthesis is evaluation. Often the examiner has only the opinions of judges. If the examiner develops a check-list or rating scale, evaluation may be facilitated (Bloom, 1956, p.174).

The last classification is evaluation. It is defined as:

The making of judgements about the value, for some purpose, of ideas, works, solutions, methods, material, etc. It involves the use of criteria as well as standards for appraising the extent to which particulars are accurate, effective, economical or satisfying (Bloom, 1956, p.185).

Most of our evaluations are done quickly without careful thought to the idea or activity being judged. A judgement is made with specific criteria established (p.186).

The Taxonomy of Educational Objectives was designed to be a useful tool for educators. It should be an aid in developing new curricula, instructional techniques, and testing techniques.

#### Studies of Health Education and relationship to knowledge

There have been two national studies of health education and its relationship to knowledge. The first was the School Health Education Study (SHES) which was initiated in 1960. SHES was comprised of three phases. Phase One consisted of a nationwide survey of over 840,000 public school children and their administrators. It was "an attempt to assess the level and quality of school health

education programs" (Galli, 1980, p.148). It was reported that the following topics had been neglected at the elementary school level and that they needed more emphasis: a) alcohol education, b) community health programs, c) consumer health education, d) environmental hazards, e) health careers, f) international health activities, g) nutrition and weight control, h) sex education, family life, parenthood, and child care; i) smoking, and k) venereal disease (Cornacchia & Staton, 1979, p.144). The average sixth grader was able to correctly complete just over 50 percent of the test questions. The areas of weakness for ninth graders were: a) consumer health, b) habit forming substances, c) fatigue, sleep, and rest; d) defense against disease, e) mental health, f) dental health, and g) safety and first aid.

Phase Two was the development of basic health concepts. Ten concepts were devised to be representative of the total body of health knowledge. Each concept is further supported by subconcepts which are then broken down to include the physical, mental-emotional, and social components. The investigators also identified present and future health problems.

In Phase Three, the investigators recommended the need to "keep abreast of the current research in the field of health" (Galli, 1980, p.148). Recommendations based on findings from the study were meant to be used as guidelines for local school systems in evaluating their own programs (Sliepcevich, 1964, p.13). Unfortunately, "many health educators found it to difficult to understand and apply in the

classroom situation" (Russell, 1975).

The second study was the School Health Curriculum Project (SHCP), initiated in 1974. It was begun as an effort to make elementary school children aware of the dangers of smoking. "Each unit follows the same format: introduction including motivation, awareness, appreciation, structure and function, disorders and diseases, prevention and culmination" (Stephenson, 1981, p.18). Included in the SHCP are six categories of educational objectives: a) knowledge, b) comprehension, c) application, d) analysis, e) synthesis, and f) evaluation (Cook, 1973).

The SHCP was noted for its extensive teacher preparation. Teachers participate in a two-week training session where they learn the objectives, methods, and materials of the unit. The school principal and nurse are also involved. In the two weeks this "team" of school personnel all participate in the experiments and activities which the students will participate. Members of the training staff visit the schools throughout the year to help with problems and evaluate the success of the program (Galli, 1980, p.165).

In 1979, Redican, Olsen, and Mathis compared the SHCP series and the A.J. Nystrom Company's "Being Healthy" series. The similarities were as follows: a) both are used in the elementary schools, b) core areas are similar, c) both are multi-media programs, and d) both courses take ten weeks to complete. The differences between the two were: a) SHCP utilizes more materials than the Nystrom series, b) there

is no inservice teacher training for the Nystrom series, and c) the SHCP costs more than the Nystrom series. Three different Midwest elementary schools were involved in the study. Two different sixth grade classes were used from each of the schools. In School 1, the experimental group received the SHCP unit and the control group received regular instruction. The experimental group in School 2 received the Nystrom series and the control group received regular instruction. In School 3, one group received the SHCP unit and the other group the Nystrom unit. All of the students involved were administered the AAHPER Cooperative Health Education Test, Preliminary Form 4, as both a pre- and posttest.

No significant differences were found between any of the pretest scores. The posttest scores revealed the following significant differences:

- School 1- The significant difference was in favor of the experimental group receiving the SHCP unit.
- School 2- The significant difference was in favor of the experimental group receiving the Nystrom unit.
- School 3- The group receiving the SHCP unit score significantly higher than the group receiving the Nystrom series.  
(Redican, et al., 1979, p.341)

The differences in the two units were possibly due to the greater number of activities in the SHCP unit. The control groups were also found to have significant gains in the pre- and posttest scores. Their units were text-book oriented along with teacher lectures. Redican, et al, (1979) concluded that "health education can be effective in increasing the health knowledge of elementary school students" (p.342).

In 1978, the Kentucky Health Systems Agency--West suggested that

their health education programs be updated. A task force was developed to evaluate school health programs. It was determined that Western Kentucky seniors' health knowledge was below average for the Kilander-Leach Test norms. The Kilander-Leach Health Knowledge Test contains 100 multiple choice questions. The test covers nine health areas. It has a reliability coefficient of .83 for high school seniors (Sollander, 1979, p.22). The students who reported the school as their major source of health information averaged higher than those naming other sources. The researchers also found that "the majority of health education teachers remain poorly trained in health" (Higgins, Price, & Dunn, 1982, p.165).

Perry, Killen, Telch, Slinkard, and Panaker (1980) investigated the effects of a special smoking program on tenth-grade students. The control group, which consisted of a total of 394 students, received traditional smoking lectures concerning the long term effects. The experimental group, which consisted of 477 students, received four sessions that "focused on social pressures influencing the adoption of the smoking habit and the immediate physiological effects of smoking" (p,722). Various learning activities were incorporated into the sessions. The pre- and posttests consisted of carbon monoxide samples, knowledge-attitude questionnaires, and self reports of smoking incidence. The investigators found significant differences between the groups on each of these measures. The experimental group showed significant reductions in the incidence of smoking, whereas no significant improvement was found for the control group. The

The experimental group was more knowledgeable than the control group. Though, their attitudes did not significantly differ. The investigation concluded that focusing on immediate problems associated with smoking had a much greater effect than only focusing on long term rehabilitations (Perry, et al., 1980, p. 724).

Studies have shown that health education can be effective in increasing the health knowledge of students, with the school being the prime place for the dissemination of that information. A goal of school health educators should be to "increase the competencies of individuals to make decisions about personal behaviors that will influence their health" (Kolbe, 1982, p. 145). The Surgeon General's Report (1979) recognized that:

One of the fears associated with health education, especially government-sponsored efforts, is that it interferes with individual freedom by attempting to modify individual lifestyles. Actually, the goal of health education is just the opposite-- to guarantee the individual's freedom of choice regarding his own health by giving him the reliable information he needs to make decision about how he wants to live. (p. 436)

In order to achieve this goal, health education curricula must be comprehensive. The Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association (1974) urged that federal legislation give support to a comprehensive program. That program should

should combine all of the areas that are considered health problems (p.130).

Kreuter (1977) stated that "if proponents of school health education cannot respond with clear supportive evidence, the programs as we know them may suffer a fatal blow" (p.2). An individual's health status reflects the competencies of health education; "educational experiences should provide the skills to be a competent, self-directed, and appropriate user of health services" (Nader, 1978, p. 2).

Adolescents' needs are very complex and their behavior is often motivated by one or more desires. "New experiences and widening horizons are valuable in modifying behaviors. Students must be shown that they may have more to gain by modifying their behavior than by retaining old habits" (Foster, 1968, p. 18). Here education is important. By developing new and innovative health curricula, educators will see positive effects on health knowledge, attitudes and practices.

## Methodology

### Population and Sample

The population for this study was all tenth-grade students in the Portsmouth, Virginia, Public School System (PPSS). There are a total of forty-two tenth-grade health education classes in the Portsmouth Public School Division. A random sample of eight male and eight female classes was chosen. The sample was chosen in the following manner: 1) Each of the forty-two classes was described on a two by four inch slip of paper. The description included: teacher's name, class period, school, and sex of the class. 2) The slips were divided by sex and were placed in two separate bags. 3) Eight slips were drawn from each of the male and female bags. This number was agreed upon by the investigator and Dr. Walter Galliford, Assistant Superintendent of the PPSS, so as not to place too great of a burden on the participating teachers.

The tenth-grade class was chosen because it was the last year that health education was available for the students in the PPSS. The investigator chose the PPSS because she had attended grades 1-12 there and was familiar with the system. Other than classroom tests, there had been no city-wide assessment of the health knowledge of the tenth-grade students. Upon discussing this project with Dr. Walter Galliford, it was determined that the results of such a project would be useful for the teachers in their future planning.

The socioeconomic status of the families with children in the

Portsmouth School Division is primarily middle class. The median family income is \$20,119 per year. Table 1 shows the ethnic breakdown for each school.

### Protection of Human Rights

The research proposal was submitted to the Human Subjects Committee of the Division of Health, Physical Education, and Recreation, College of Education, Virginia Polytechnic Institute and State University, for Committee approval. Other steps which were taken to maintain confidentiality of both the students and their schools were:

1. The names of the students were omitted from the answer sheets.
2. The names of the schools were not identified in this paper.

### The Instrument

The instrument used for this study was the Seffrin Health Cognition Test<sup>1</sup>. This test was the result of a study that was conducted with the purpose of developing an instrument that could be used to assess health knowledge of high school students who were completing their last health course.

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<sup>1</sup>A copy of the Seffrin Health Cognition Test may be obtained from Dr. John R. Seffrin, Chairman Health and Safety Education, Indiana Univeristy, HPER Building, Bloomington, Indiana, 45405.

Table 1

Percentage of Whites, Blacks, and Others in the Portsmouth Public  
School System

<u>School</u>	<u>White</u>	<u>Black</u>	<u>Other</u>
School 1	72	25	1
School 2	32	67	1
School 3	28	71	1
School 4	47	52	1
School 5	22	76	1
Total for all schools	37	62	1

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Note. This data was supplied by the Portsmouth School Board.  
The figures are rounded and may not total 100%.

The first step in the development of the instrument "was to establish a basis for assuring curricular validity in measuring the expected instructional outcomes among high school students" (Seffrin, et al., 1982, p.43). This was accomplished by examining professional journals, high school textbooks, recommendations about health education curriculums, and interviewing authoritative professionals. The ten concepts of the School Health Education Study were also examined. They provided a "logical framework for the organization of the content" (Seffrin, et al., 1972, p.43). The following are the ten concepts which the questions were based on:

1. Growth and development influences and is influenced by the structure and functioning of the individual.
2. Growing and developing follows a predictable sequence, yet, it is unique for each individual.
3. Protection and promotion of health is an individual, community, and international responsibility.
4. The potential for hazards and accidents exists, whatever the environment.
5. The family serves to perpetuate man and to fulfill certain health needs.
6. Personal health practices are affected by a complexity of forces, often conflicting.
7. There are reciprocal relationships involving man, disease, and environment.
8. Use of substances that modify mood and behavior arises from a variety of motivations.
9. Food selection and eating patterns are determined by physical, social, mental, economic, and cultural factors.
10. Utilization of health information, products, and services is guided by values and perceptions.

The second step involved determining what type of questions would be used. The four areas of cognitive behavior which were selected for testing are (a) knowledge, (b) comprehension,

(c) application, and (d) analysis. Fifty percent of the questions were in the knowledge category. The comprehension category was assigned one third of the remaining items while the other items were application or analysis questions.

The last step was the construction of the test questions. There were 120 questions developed. Two preliminary forms of sixty items each were then prepared. A purposive sample of 1,264 high school students was chosen for the initial testing. This sample included students from urban, rural, and inner city schools. "Forms A and B were distributed alternately throughout each group of pupils tested" (Seffrin, et al., 1972, p.45). An item analysis was conducted to determine which questions would make up the final test form. During the initial testing, the investigators found that the students had more than enough time during the fifty-minute class period to answer all of the questions. As a result, one question was added to each of the conceptual areas (see Table 2).

The final test form was administered to 1,082 students. This was another purposive sample of rural, urban, and inner city high school students. The scores ranged from a low of 9 to a high of 63, with a mean of 33.42 and a standard deviation of 10.47.

"The Kuder Richardson formula 20 was used to compute the test reliability which was found to be .8728" (Seffrin, et al., 1982, p.45). In this study, alpha coefficients of reliability

Table 2

Items Assigned to Each Conceptual Area and Educational Objective  
on the Test Form

Concept 1

K 4, 14, 26  
C 45, 46  
A 56  
Z 59

Concept 2

K 2, 7, 18  
C 33, 47, 52  
A 62  
Z

Concept 3

K 9, 10, 19  
C 39, 41  
A 68, 69  
Z

Concept 4

K 24, 25, 28  
C 38, 42, 44  
A 70  
Z

Concept 5

K 1, 6, 21  
C 43, 50, 55  
A  
Z 57

Concept 6

K 11, 13, 20  
C 37, 40, 51  
A 60  
Z

Concept 7

K 3, 12, 15  
C 53, 43  
A 64, 65  
Z

Concept 8

K 16, 17, 23  
C 31, 35, 49  
A 61  
Z

Concept 9

K 5, 8, 22  
C 34, 36  
A 63, 66  
Z

Concept 10

K 27, 29, 30  
C 32, 48  
A 58, 67  
Z

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Note. K - Knowledge, C - Comprehension, A - Application, Z - Analysis

were determined for the combined scores, conceptual component scores, and the cognitive level scores for the Portsmouth students (see Table 3). The coefficient of reliability for the entire test was .886. This indicated that the test was relatively reliable in measuring health knowledge of this group. The alpha scores of the ten different concepts ranged from a low of .327 to a high of .542. The coefficients for the cognitive levels were somewhat higher, ranging from .338 on analysis to .772 on comprehension. The coefficients, for the concepts, were very low and indicated that they should not be separated into specific scales. The knowledge, comprehension, and application levels do have marginal reliability coefficients and the data should be interpreted with caution when these scales are used.

Table 3

Alpha Coefficients of Reliability for the Total Scale, the Conceptual Component Subscales, and the Cognitive Level Subscales of the Seffrin Health Cognition Test: Tenth Graders in Portsmouth, Virginia, 1983 (N= 376)

Scale	Number of items	Alpha
<u>Conceptual Components</u>		
Concept 1	7	.490
Concept 2	7	.423
Concept 3	7	.458
Concept 4	7	.375
Concept 5	7	.490
Concept 6	7	.484
Concept 7	7	.542
Concept 8	7	.327
Concept 9	7	.395
Concept 10	7	.403
<u>Cognitive Level</u>		
Knowledge	30	.721
Comprehension	25	.772
Application	13	.753
Analysis	2	.338
Total	70	.886

### Data Collection

Upon approval of the Human Subjects Committee, the principals of the schools were initially contacted by a letter briefly describing the project. The details of participation were discussed in person or over the phone. The principals then discussed the project with the teachers involved. The investigator brought the test directions, questionnaires, and answer sheets to the teacher at an agreed time. The directions were discussed and any questions were answered. The teachers administered the test at their convenience. Students were given the choice to participate. Fifty minutes were allotted for the reading of the directions and the completion of the test. The students were instructed to use only a number two pencil. They were to fill in each circle on the answer sheet completely and to make no stray marks. They were told not to write on the questionnaires. Upon completion of the test, the teacher collected both the questionnaires and the answer sheets. They were returned to the investigator the next day. The investigator then examined each op-scan, checking for stray marks and improperly filled circles. Once all the schools were tested, the data were processed by the Virginia Tech Learning Resources Center.

## Findings

The purpose of this investigation was to assess the current health knowledge of a random sample of tenth grade students in the Portsmouth, Virginia, Public School System who were completing their health education course.

The first research question examined was: What is the overall health knowledge of students in Portsmouth, and how does this group compare with Seffrin's norming group of high school students who had completed or were completing their high school health course?

The following is a rank ordering of the ten concepts. They are ranked from the highest to the lowest mean score for the combined group of Portsmouth Students (Table 4).

1. Use of substances that modify mood and behavior arises from a variety of motivations.
2. Personal health practices are affected by a complexity of forces, often conflicting.
3. Growing and developing follows a predictable sequence, yet is unique for each individual.
4. The potential for hazards and accidents exists, whatever the environment.
5. Food selection and eating patterns are determined by physical, social, mental, economic, and cultural factors.
6. Protection and promotion of health is an individual, community, and international responsibility.

Table 4

Means, Standard Deviations, and t-statistics for Portsmouth Males and Females on the Conceptual Areas of the Seffrin Health Cognition Test

Conceptual Area	Overall	Males (n=171)		Females (n=205)		t	p
	<u>M</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
1. Structure and functioning influences	2.25	2.520	1.702	2.151	1.492	2.24	.027
2. Growth sequence	2.99	2.877	1.595	3.068	1.598	-1.16	.248
3. Responsibility of health	2.87	3.152	1.725	2.785	1.585	2.15	.034
4. Accident prevention	2.93	3.064	1.550	2.552	1.270	3.66	.000
5. Reciprocal relationships	2.72	2.731	1.666	2.892	1.438	-1.00	.320
6. Family life	2.64	2.479	1.689	2.736	1.414	-1.158	.115
7. Personal health	3.02	3.117	1.735	3.102	1.696	0.08	.935
8. Health information	2.80	2.888	1.382	2.912	1.369	-0.16	.870
9. Substance abuse	3.45	3.438	1.609	3.404	1.623	0.20	.840
10. Nutrition	2.91	3.000	1.677	3.165	1.425	-1.02	.308
Overall	28.98	29.269	12.066	28.741	9.958	0.46	.648

7. Utilization of health information, products, and services is guided by values and perceptions.

8. There are reciprocal relationships involving man, disease, and environment.

9. The family serves to perpetuate man and to fulfill certain needs.

10. Growth and development influences and is influenced by the structure and functioning of the individual.

Seffrin's group consisted of 1,082 students. They had a mean score of 33.42 and a standard deviation of 10.47. The Portsmouth group consisted of 376 students and they had a mean score of 28.98 and a standard deviation of 10.94. A t-test value of -6.854 was calculated with the difference ( $p < .001$ ) being in favor of Seffrin's group (see Table 5). While the range of scores was similar for both groups (4 to 62 for Portsmouth and 9 to 63 for Seffrin's sample), a comparison of percentile ranks for the Portsmouth and Seffrin groups revealed that Seffrin's norming group did better throughout the range of scores.

The second question examined was: How do the Portsmouth males and females differ in health knowledge? The male scores ranged from a low of 4 to a high of 62. The female scores ranged from a low of 9 to a high of 57 (see Table 6). In comparing percentile ranks, the sampled females outscored males up to a raw score of 27 points. Males outscored females at all levels above 26 points (see Table 6). These differences, however, were

Table 5

Raw Scores, Cumulative Frequencies, Percentile Ranks, T-Scores, Means, and Standard Deviations for Portsmouth's Students and Seffrin's Norming Group on the Seffrin Health Cognition Test

Portsmouth				Seffrin		
Raw Score	Cumulative Frequency	%-ile Rank	T Score	Raw Score	%-ile Rank	T Score
70				70		
.				.		
.				.		
63				63	100	78.24
62	376	99.87	80	62	100	77.28
61				61		
60				60	100	75.37
59				59		
58				58	100	73.46
57	375	99.60	76.50	57	99	72.51
56	374	99.07	73.53	56	98	71.55
55	371	98.40	71.45	55	98	70.60
54				54	97	69.64
53	369	97.87	70.28	53	96	68.69
52	367	97.34	69.33	52	95	67.74
51	365	96.81	68.50	51	94	66.78
50	363	96.28	67.84	50	93	65.83
49	361	95.74	67.21	49	91	64.87
48	359	95.08	66.53	48	90	63.92
47	356	93.88	65.45	47	89	62.96
46	350	92.29	64.25	46	87	62.01
45	344	90.82	63.30	45	85	61.05
44	339	88.96	62.24	44	83	60.10
43				43	81	59.14
42	330	87.63	61.57	42	79	58.19
41	329	85.90	60.76	41	77	57.23
40	317	83.24	59.64	40	74	56.28
39	309	80.05	58.44	39	72	55.32
38	293	76.86	57.34	38	69	54.37
37	285	75.00	56.75	37	66	53.42
36	279	73.01	56.13	36	62	52.46
35	270	71.01	55.40	35	59	51.51
34	264	68.48	54.81	34	55	50.55
33	251	65.69	54.04	33	52	49.60

Table 5 (continued)

Raw Scores, Cumulative Frequencies, Percentile Ranks, T-Scores, Means, and Standard Deviations for Portsmouth's Students and Seffrin's Norming Group on the Seffrin Health Cognition Test

Portsmouth				Seffrin		
Raw Score	Cumulative Frequency	%-ile Rank	T Score	Raw Score	%-ile Rank	T Score
32	243	62.90	53.29	32	48	48.64
31	230	59.57	52.42	31	46	47.69
30	218	57.05	51.78	30	41	46.73
29	211	54.12	51.04	29	38	45.78
28	196	50.66	50.17	28	34	44.82
27	185	46.68	49.17	27	31	43.87
26	166	42.82	48.19	26	28	42.91
25	156	40.03	47.47	25	24	41.96
24	145	37.10	46.71	24	21	41.00
23	134	33.91	45.85	23	18	40.05
22	121	30.45	44.89	22	15	39.10
21	108	27.52	44.03	21	13	38.14
20	99	24.47	43.09	20	10	37.19
19	85	20.08	41.61	19	8	36.23
18	66	16.09	40.09	18	6	35.28
17	55	13.43	38.94	17	5	34.32
16	46	11.04	37.76	16	4	33.36
15	37	8.51	36.29	15	2	32.41
14	27	6.25	34.66	14		
13	20	4.79	33.34	13	1	31.46
12	16	3.72	32.16	12	1	29.55
11	12	2.66	30.67	11	1	28.59
10	8	1.86	29.16	10	1	27.64
9	6	1.06	26.97	9	1	26.68
8	2	0.40	23.50	8		
7				7		
6				6		
5				5		
4	1	0.13	20.00	4		

Mean	28.98	Mean	33.42
SD	10.94	SD	10.47
n =	376	n =	1,082
t(1456) = -6.854, p .001			

Table 6

Raw Scores, Percentile Ranks, and T-Scores for Portsmouth Males  
and Females on the Seffrin Health Cognition Test

Raw Score	Males			Females		
	Cumulative Frequency	%-ile Rank	T Score	Cumulative Frequency	%-ile Rank	T Score
62	171	99.71	77.60			
.						
.						
57				205	99.76	78.20
56	170	98.83	72.67	204	99.27	74.40
55	168	97.66	69.88			
54						
53	166	96.78	68.50	203	98.78	72.50
52	165	96.20	67.74	202	98.29	71.18
51	164	95.61	67.07	201	97.80	70.14
50	163	95.03	66.48	200	97.32	69.30
49	162	94.44	65.93	199	96.83	68.56
48	161	93.86	65.43	198	96.10	67.63
47	160	92.11	64.13	196	95.37	66.82
46	155	89.77	62.68	195	94.39	65.88
45	152	88.01	61.76	192	93.17	64.88
44	149	85.38	60.53	190	91.95	64.02
43						
42	143	83.33	59.67			
41	142	82.16	59.21	187	89.02	62.27
40	139	80.12	58.46	178	85.85	60.74
39	135	76.61	57.26	174	82.93	59.52
38	127	73.10	56.16	166	80.00	58.42
37	123	70.76	55.47	162	78.54	57.91
36	119	68.71	54.88	160	76.59	57.26
35				154	73.66	56.33
34	116	65.79	54.07	148	70.73	55.46
33	109	62.57	53.21	142	68.29	54.76
32	105	59.65	52.44	138	65.61	54.02
31	99	57.31	51.84	131	61.46	52.91
30	97	56.14	51.55	121	57.80	51.97
29	95	53.51	50.88	116	54.63	51.16
28	88	49.71	50.07	108	51.46	50.37
27	82	45.91	48.97	103	47.32	49.33
26	75	43.57	48.38	91	42.20	48.03

Table 6 (continued)

Raw Scores, Percentile Ranks, and T-Scores for Portsmouth Males  
and Females on the Seffrin Health Cognition Test

Raw Score	Males			Females		
	Cumulative Frequency	%-ile Rank	T Score	Cumulative Frequency	%-ile Rank	T Score
25	74	42.11	48.01	82	38.29	47.02
24	70	40.06	47.48	75	34.63	46.05
23	67	37.13	46.72	67	31.22	45.10
22	60	33.92	45.85	61	27.56	44.04
21	56	31.58	45.21	52	24.15	42.98
20	52	28.36	44.28	47	21.22	42.01
19	45	23.39	42.74	40	17.32	40.58
18	35	19.01	41.22	31	13.66	39.04
17	30	15.79	39.97	25	11.46	37.97
16	24	12.57	38.53	22	9.76	37.05
15	19	9.94	37.15	18	7.32	35.48
14	15	7.89	35.87	12	4.88	33.43
13	12	6.43	34.80	8	3.41	31.76
12	10	5.26	33.80	6	2.44	30.30
11	8	3.80	32.20	4	1.71	28.82
10				3	0.98	26.67
9	5	2.05	29.50	1	0.24	21.80
8	2	0.88	26.10			
7						
6						
5						
4	1	0.29	22.40			

insignificant, for the overall t-test between males and females (see Table 7) indicated that the difference between the sampled means of the two groups has a high probability of occurring by chance,  $[t(374) = .46; p = .648]$ .

In addition to examining the total raw score differences between males and females, differences in the conceptual (see Table 4) and cognitive (see Table 7) areas were examined. In the conceptual areas, males outscored the females on concepts 1, 3, and 4. Males and females did not differ on the remaining concepts (2, 5, 6, 7, 8, 9, and 10) or on the cognitive levels. This is not surprising in view of the large amount of error in the measurements.

### Summary

The analysis of data indicated that there was a significant difference between the Portsmouth students and Seffrin's group. The difference was in favor of Seffrin's group. The study also extended the original norms to include the differences between males and females. They differed on concepts 1, 3, and 4. They did not differ on the total score; on concepts 2, 5, 6, 7, 8, 9, and 10; or on the cognitive levels. In addition, alpha coefficients of reliability were determined for the different concepts and cognitive levels, as well as the overall test. The overall test was determined to be a reliable measure of health knowledge. With the exception of analysis, the cognitive scales have marginal reliability. The conceptual scales have very low reliability.

Table 7

Means Standard Deviations, and t-statistics for Portsmouth Males and Females on the Cognitive Levels of the Seffrin Health Cognition Test

Cognitive Level	Males (n=171)		Females (n=205)		<u>t</u>	<u>p</u>
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Knowledge	14.169	4.923	13.663	4.427	1.05	.300
Comprehension	9.532	5.133	9.243	3.974	0.60	.549
Application	4.964	3.350	5.156	2.757	-0.60	.551
Analysis	0.602	0.731	0.678	0.717	-1.01	.314
Total	29.269	12.066	28.741	9.958	0.46	.648

## Discussion

The purpose of this study was to assess the current health knowledge of a random sample of tenth graders in the PPSS who were completing their health education course.

The first question examined the overall health knowledge of the sampled students in Portsmouth and compared them with Seffrin's norming group. A significant difference in favor of Seffrin's group was reported. As the purpose of this study was to assess only the level of health knowledge, the exact causes of the differences can not be determined without further study.

This study expanded the original study to include data on the cognitive levels and conceptual areas. The conceptual area with the highest mean score dealt with the use of substances that modify mood and behavior. This high mean score was probably due to the fact that the PPSS spends a great deal of time in the area of drug education.

The concepts ranked fourth and fifth concern accident prevention and nutrition. The area of nutrition was a large part of the curriculum. The area of accident prevention was covered in the tenth grade as the students took a semester of Standard First Aid and Safety. The investigator expected the score in this area to be higher as the students had just completed this course.

The conceptual areas with the lowest mean scores were concerned with growth and structure of the human body and sex education. At

this time, there is very little emphasis on the growth and structure of the body in the health curriculum in the PPSS. Topics concerning sex education and family relationships were not a part of the current curriculum. The low mean scores in these, as well as other conceptual areas, indicated that there was a need for the curriculum to be reviewed and revised. These scores were not an indication of the quality of the instruction. They were indicators of the areas of weakness in the curriculum. This investigation did not determine the probable causes of the scores.

The level of reliability was important when analyzing the test. A reliability coefficient indicated the amount of error in measurement. Alpha coefficients of reliability were calculated for each of the ten concepts and the cognitive levels. The test received an overall alpha score of .886. This indicated that the test was highly reliable, yet; when broken down into the different cognitive and conceptual areas, the question of their reliability was raised. Further study would be necessary to determine why the areas with low coefficients of reliability had such scores.

In addition, this investigation expanded the original norms to include the data on the differences between males and females. The males outscored the females at all levels above 26 points. The probability level of .648 indicated that this difference was insignificant and had a high probability of occurring by chance.

The data provided insight into the areas of weakness for the

students of the PPSS. These scores provided teachers with a starting point for the revision of the present curriculum. Although this investigation provided insight into the areas of weakness of the students of the PPSS, further study was needed to provide an accurate analysis of the students' health knowledge.

### Recommendations

The investigator recognized that while knowledge gain is an important objective of health education, evaluation should not be limited to knowledge alone. The assessment of needs, attitudes, and behaviors will provide a more complete analysis of the present curriculum.

The following recommendations are based on the preceding data, the investigator's knowledge gained through graduate school, and professional journals:

1. In addition to health knowledge needs, attitudes, and behaviors should be assessed. Evaluations should start in the first grade and be done yearly.
2. The present curriculum and textbooks should be reviewed and updated.
3. Teachers should be asked the following questions:
  - a. How often are lecture notes updated?
  - b. How often are refresher courses taken?
  - c. Is there a need for special in-service training programs for health education teachers?

d. Are outside resources-- such as doctors, college professors, etc.-- being utilized?

e. Are your evaluation techniques valid and reliable?

f. What type of learning experiences will be most beneficial for the students of the PPSS?

4. How does the health curriculum of Portsmouth compare with other comprehensive curriculums?

5. Though the data collected was a rough indication, the areas that should be emphasized for revision are the areas of:

a. Growth and development of the human body.

b. Sex education including topics concerning family life.

c. Safety and accident prevention.

Many factors must be considered when revising a curriculum. If a thorough analysis is done, the framework will be laid for examining the strengths and weaknesses of the curriculum.

### Summary

The results of this study indicated that the tenth grade students of the PPSS have many weaknesses in the area of health education. The results did not indicate what is the nature of the weaknesses, but indicated that there is a need for further study and revision of the present curriculum. This study also provided additional data for the Seffrin Health Cognition Test.

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