This dissertation has been microfilmed exactly as received

TINNIN, Helen Lou, 1923—
THE DEVELOPMENT, STANDARDIZATION, AND PILOT TESTING OF AN AUTO-INSTRUCTIONAL PROGRAM IN HEALTH EDUCATION ON THE TOPIC OF CIGARETTE SMOKING.

The Ohio State University, Ph.D., 1964
Health Sciences, public health

University Microfilms, Inc., Ann Arbor, Michigan
Copyright by
Helen Lou Tinnin
1965
THE DEVELOPMENT, STANDARDIZATION, AND PILOT TESTING OF
AN AUTO-INSTRUCTIONAL PROGRAM IN HEALTH EDUCATION ON
THE TOPIC OF CIGARETTE SMOKING

DISSERTATION

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

By

Helen Lou Tinnin, A.B., M.P.H.

* * * * * *

The Ohio State University
1964

Approved by

[Signature]
Adviser
Department of Physical Education
Research in the public schools usually necessitates the cooperation of many people and this study was no exception. Foremost appreciation goes to Dr. Raymond Drage, Superintendent of the Stark County Schools, who permitted a choice of the school districts in the system to be approached about the research project. Acknowledgment goes to Paul F. Pfeiffer, Executive Head of the Perry Local School District, where the research was done. A special expression of gratitude is extended to Frank Mulvaney, Principal of the Edison Junior High School, who allowed the investigator the freedom to plan the study without hindrance within the framework of the school day, and who did everything possible to make the school situation conducive to the research. In addition, appreciation goes to Paul Steiner, Assistant Principal, and Nancy Kerr, Guidance Counselor; both assisted in many ways.

Many members of the Stark County Department of Education offered suggestions and were available for consultation whenever the need arose, and to each member of the staff of this department the writer is indebted. A special note of thanks is extended to John Crail, Director of Guidance and
Pupil Personnel, who volunteered help on so many occasions during the progress of the study.

Personnel from each of the voluntary health agencies, the Stark County Tuberculosis and Health Association, the Stark County Cancer Society, and the Stark County Heart Association, all contributed both time and materials for use in this study. Special appreciation and recognition is deserved by L. L. Taylor, Executive Director of the Tuberculosis and Health Association, who, because of a particular interest in education about smoking and health, encouraged the undertaking of this study, allowed the use of duplicating facilities in his office, and otherwise encouraged the completion of the study. Gratitude is extended to Brent DeVore, Public Relations Director and to Dorothy LaPore, Health Education Secretary, of the Tuberculosis and Health Association, who assisted in countless ways.

A very special "thank you" is reserved for the student participants. The many seventh-grade students who gave freely of their time and worked diligently to help in the development of the programed instruction units deserve to be listed individually. Unfortunately, this is an impossibility because of the large number of students involved.
<table>
<thead>
<tr>
<th>Designation of the Research and the Pilot</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>56</td>
</tr>
<tr>
<td>V. PRE-PROGRAM FACT FINDING ABOUT THE POPULATION</td>
<td>58</td>
</tr>
<tr>
<td>Small Group Discussions as a Means of Determining Interests and Needs of Seventh Graders</td>
<td>58</td>
</tr>
<tr>
<td>Parent Interviews</td>
<td>61</td>
</tr>
<tr>
<td>Local Voluntary and Official Health Agencies as Resources</td>
<td>61</td>
</tr>
<tr>
<td>Interviews with Teachers, Supervisors, Counselors and Social Administrators</td>
<td>62</td>
</tr>
<tr>
<td>Categories of Educational Need Defined</td>
<td>63</td>
</tr>
<tr>
<td>Summary and Conclusions</td>
<td>64</td>
</tr>
<tr>
<td>VI. PLANNING THE PROCEDURES FOR CONSTRUCTION OF THE AUTO-INSTRUCTIONAL PROGRAM</td>
<td>65</td>
</tr>
<tr>
<td>Selection of the Programing Technique</td>
<td>65</td>
</tr>
<tr>
<td>Selection of Consultants</td>
<td>66</td>
</tr>
<tr>
<td>Selection of the Program Content</td>
<td>69</td>
</tr>
<tr>
<td>Consideration of Fear Arousal Communications</td>
<td>71</td>
</tr>
<tr>
<td>Selection of the Program Objectives in Behavioral Terms</td>
<td>76</td>
</tr>
<tr>
<td>General Philosophy</td>
<td>77</td>
</tr>
<tr>
<td>Special Areas of Attention in Writing a Program</td>
<td>78</td>
</tr>
<tr>
<td>Summary</td>
<td>83</td>
</tr>
<tr>
<td>VII. RESEARCH AND DEVELOPMENTAL TESTING ON THE PROGRAM UNITS</td>
<td>85</td>
</tr>
<tr>
<td>The First Draft of a Unit</td>
<td>85</td>
</tr>
<tr>
<td>Individual Testing with Students</td>
<td>86</td>
</tr>
<tr>
<td>Psychological Consultation</td>
<td>90</td>
</tr>
<tr>
<td>Procedures for Testing Written Responses</td>
<td>91</td>
</tr>
<tr>
<td>Developing the Criterion or Performance Test</td>
<td>95</td>
</tr>
<tr>
<td>Program Revisions and Retests</td>
<td>99</td>
</tr>
<tr>
<td>The Completed Program on Smoking and Health</td>
<td>105</td>
</tr>
<tr>
<td>Summary</td>
<td>106</td>
</tr>
</tbody>
</table>
VIII. PILOT TEST OF THE PROGRAM UNITS ............ 107

Procedure for the Pilot Test .................... 107
Characteristics of the Test Group ............. 112
Analysis of Performance on the Criterion Test
  of Each Program Unit ....................... 113
Error Analysis .................................. 121
Time Analysis .................................. 125
Summary and Discussion of Validation Results. 126
Limitations ................................... 130

IX. RECOMMENDATIONS ............................. 134

BIBLIOGRAPHY .................................... 139
APPENDIX I ...................................... 150
APPENDIX II ..................................... 152
APPENDIX III .................................... 154
APPENDIX IV .................................... 258
APPENDIX V ..................................... 274
AUTOBIOGRAPHY .................................. 287
**TABLES**

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Summary of cm/cp Gains, by Unit of Program</td>
<td>115</td>
</tr>
<tr>
<td>2.</td>
<td>Means and Standard Deviations of cm/cp, by Unit of Program</td>
<td>116</td>
</tr>
<tr>
<td>3.</td>
<td>Readability Predictions of Units</td>
<td>151</td>
</tr>
<tr>
<td>5.</td>
<td>Regression Coefficients, in Analysis of Covariance of cm/cp and Sex, Continuous I.Q., and Time</td>
<td>276</td>
</tr>
<tr>
<td>6.</td>
<td>Statistics for Tests of Hypotheses in the Analysis of Covariance of cm/cp and Sex, Grouped I.Q.'s, and Time</td>
<td>277</td>
</tr>
<tr>
<td>7.</td>
<td>Regression Coefficients in Analysis of Covariance of cm/cp and Sex, Grouped I.Q.'s, and Time</td>
<td>278</td>
</tr>
<tr>
<td>8.</td>
<td>Errors Occurring on More Than One Frame of a Unit</td>
<td>279</td>
</tr>
<tr>
<td>9.</td>
<td>Error Rates for Pilot Group on Each Program Unit</td>
<td>283</td>
</tr>
<tr>
<td>10.</td>
<td>Statistics for Tests of Hypotheses in the Analysis of Covariance of cm/cp and the Rate of Correct Terminal Frames and Rate of Correct Frames</td>
<td>284</td>
</tr>
<tr>
<td>11.</td>
<td>Regression Coefficients in Analysis of Covariance of cm/cp and the Rate of Correct Terminal Frames and the Rate of Correct Frames</td>
<td>285</td>
</tr>
<tr>
<td>12.</td>
<td>Time Analysis of Units</td>
<td>286</td>
</tr>
</tbody>
</table>
INTRODUCTION

That cigarette smoking is a potentially deleterious practice to the future health of the smoker is a widely held view. Prevention of smoking behavior, at least until a level of maturity is achieved to assess the full impact of the consequences, is being accepted more and more as a responsibility of the schools. Psychologists and educators have recognized that, for the most part, adoption of the practice of cigarette smoking occurs during, or prior to, adolescence, and that educational exposures are most effective if they precede the adoption of the practice. Education about smoking and health appears to have a gradual but positive impact on rate reduction of cigarette smoking by school children provided the educational treatment occurs early enough. The major problem at present is the lack of suitable materials available for use in education and for educational experimentation in the grades preceding high school.

It was the purpose of this study to approach the problem of preventive education about smoking and health by developing new materials to be used in educating the early
adolescent child. For this purpose, an auto-instructional program on the topic of cigarette smoking was developed, standardized, and pilot tested. Since the ultimate concern of health education is to give the individual the necessary background for use in making decisions which contribute to a positive state of health, the auto-instructional program units completed during this study were developed with the point of view of serving this function in regard to decisions about the practice of cigarette smoking.
CHAPTER I

SMOKING AND HEALTH

Detrimental Aspects of Smoking to Health

Epidemiological evidence of the health hazards of smoking have been accumulating over a period of years, but it has only been in the past ten years that the scientific journals have recorded an overwhelming number of studies which have convincingly related evidence that points to a causative relationship between cigarette smoking and certain diseases. A result of the many scientific reports was that claims of the dangers of smoking reached the general public, and some smokers reacted with brief, but significant abstinence from cigarettes, as was reflected by declines in cigarette sales. This, in turn, led components of the tobacco industry to become alarmed. The phrase "more research is needed" was the most frequent reply of cigarette company representatives to press interviews.

The American Cancer Society took early leadership in answering the claims for needed research. This voluntary health agency sponsored several large statistical studies
which brought the evidence of the incompatibility of cigarette smoking and health into even sharper focus. One such early study of 187,783 men showed that when age was taken into consideration, the over-all death rate was 68 per cent higher for cigarette smokers than for non-smokers.\(^1\) A later analysis of other aspects of the same study concluded that an extremely high association existed between cigarette smoking and some diseases, such as lung cancer; and that a high association existed for a number of other diseases, among them coronary artery disease.\(^2\)

Another major statistical study was sponsored by the Public Health Service. Conducted by Harold Dorn, it involved a study of 200,000 policy holders of U. S. government life insurance. This study confirmed the earlier findings of increased mortality for cigarette smokers from cancer and other diseases. Dorn expressed the increased mortality of


cigarette smokers in terms of excess mortality which he found to be 58 per cent greater for smokers than for non-smokers.\(^3\)

In 1957, Dr. Leroy E. Burney, the Surgeon General of the United States, made the statement: "The Public Health Service feels the weight of the evidence is increasingly pointing in one direction: that excessive cigarette smoking is one of the causative factors in lung cancer."\(^4\) This statement was later restated by Dr. Burney in a special article for the A.M.A. in which he also reviewed some of the pertinent studies linking cigarette smoking and mortality. He concluded in this article: "It is a statutory responsibility of the Public Health Service to inform members of the medical profession and the public on all matters relating to important public health issues. The relationship between smoking and lung cancers constitutes such an issue and falls within this responsibility of the Public Health Service."\(^5\)

---


For those who still doubted the relationship between smoking and disease, the British report in 1962 offered ample evidence to weaken skepticism. 6 This report brought together, for the first time, a summary of the findings of 216 separate studies on smoking and health, most of which indicted the cigarette as it relates to health. The report recommended several actions by the British government, including education, especially of school children. 7

Meantime, our leading voluntary health agencies were concerned with the lack of official action on the part of our own government. In mid-1961 the presidents of the American Cancer Society, the American Public Health Association, the American Heart Association and the National Tuberculosis and Health Association jointly signed a letter to the President of the United States, requesting that he set up a commission to study the problem of smoking and health. 8 Approximately six months later, in January 1962, representatives of these organizations met with the Surgeon General of the United

7 Ibid., p. 53.
States and proposed that an advisory committee of experts be appointed to study the available knowledge about smoking and health, and that recommendations be made to him. A committee was appointed.

Two years later the report was released. It stated: "Cigarette smoking is causally related to lung cancer in men; the magnitude of the effect of cigarette smoking far outweighs all other factors. The data for women, though less extensive, points in the same direction."\(^9\) In addition, it stated that there was a relationship between cigarette smoking and bronchitis and emphysema,\(^10\) and an association between cigarette smoking and heart disease.\(^11\) The committee concluded: "Cigarette smoking is a health hazard of sufficient importance in the United States to warrant appropriate remedial action."\(^12\)

**The Problem of Smoking Among School Children**

By 1959, some investigators felt that no more evidence was needed for turning their efforts to prevention of smoking

---

behavior. A study was undertaken that year to determine the smoking habits of high school children, a necessary procedure for defining the problem of adolescent smoking. The American Cancer Society took the leadership in this endeavor, and under the direction of Daniel Horn, a major study was conducted to determine the smoking practices of high school students in Portland, Oregon. The data were collected on anonymous questionnaires, and revealed that cigarette smoking existed in every grade surveyed. The rate of regular smokers among boys increased progressively from a low of 14.5 per cent for freshmen to a high of 35.4 per cent for seniors. Girls revealed somewhat lower rates, but these increased progressively from a low of 4.6 per cent for freshmen to a high of 26.2 per cent for seniors.

Another survey of the smoking habits of school children was made by Salber, in Newton, Massachusetts. She surveyed grades seven through twelve by using questionnaires.

---


14 Ibid., p. 1501.

on which students identified themselves. Results at the high school level were similar to those in Oregon, except for a somewhat higher rate among the Massachusetts students. In addition, Salber's study revealed that some school children were smoking as early as the seventh grade. Sallak, using anonymous questionnaires for data collection, surveyed grades seven through twelve in Erie County, New York. He found the same trends as did Salber. Smoking was not uncommon in the seventh grade, and the rate of smoking increased progressively with each grade level.

These three studies were published in nationally distributed publications, and were probably responsible, initially, for bringing the problem of teen-age smoking to the attention of educators. Those who had been reluctant to admit that there was a problem were faced with the growing evidence reported from these widely different parts of the country. The question was beginning to shift from "do they smoke?" to "they are smoking, what do we do next?"

16 Ibid., p. 793.
17 Ibid., p. 794.
The Effects of Education About Smoking and Health

Few attempts to measure the impact of specific educational exposures about smoking and health have been reported in the literature. In part, this may be due to lack of different kinds of materials with which to experiment. It may also be due to the reluctance of some educators to accept responsibility for any part of the education of the school child about smoking and health.

Probably the most widely known experimental study was conducted by Horn. He used several different approaches to educate about smoking and health, and was able to demonstrate that smoking habits of high school students were modified by using a logical appeal to the intelligence of the student.

In one report of this study, Horn recommended that new materials be prepared and emphasis be placed on new information. He based this recommendation on results following the exposure of five experimental groups to pamphlets, flyers and posters using different appeals in the presentation of the materials. The factual appeal was the most successful. The recruitment rate of smokers was 13 per cent in the control

---

group compared to 7.7 per cent in the experimental group receiving the factual appeal, or the remote appeal, as it was called in the study. This represented a reduction by two-fifths of the recruitment rate of smokers among the experimental group as compared to the control group.

In an educational experiment in Maine, experimental and control groups totaling twenty-six in number were established to determine the results of specific educational treatments. Beckerman described the plan of the experimental design as being based on the Oregon study. He writes: "Using the Portland, Oregon study as a guide, the educational approach was adult in type, presenting the material in a straight-from-the-shoulder attitude." The educational exposure consisted of films and pamphlets. At the end of one year, attitudes were altered, but behaviors were no different in the control group than in the experimental group. In a later survey, however, the experimental group did show significant changes in behavior, especially in the youngest group of students.

---

20 Ibid., p. 64.
In the first report on the Maine study, Beckerman comments on a problem that still plagues educators. He states that a major difficulty encountered in the Maine study was the scarcity of educational materials on smoking and health.  

In a preliminary account of a study originating at Yale, Bergen and Olesen report that their data indicate that "health information is not unimportant as a reason that adolescents give for giving up smoking or not smoking at all." Among the 450 ninth and eleventh grade students in this study, fear of the health dangers was cited by both boys and girls as the leading reason for never smoking.

**Summary and Conclusions**

It seems apparent that cigarette smoking is a health hazard. The genesis of smoking in many, if not the majority of cases, occurs during the adolescent years. There seems to be little doubt that smoking behavior begins by some children at least as early as the seventh grade. There are

---

23 Beckerman, p. 63.


indications that education about the harmful effects of
smoking can contribute to a reduction of the recruitment
rates of new smokers among school children, and possibly to
an increase in the number of ex-smokers. There is a dearth
of educational material for use in educating about smoking
and health, especially materials suitable for use with
younger adolescents. It was because of these things that an
exploration of the potentials of programmed instruction was
first approached.
CHAPTER II

EXPLORATION OF AUTO-INSTRUCTION

Definition of Auto-Instruction

Auto-instruction, or programed instruction as it is more often called, is the kind of learning experience in which a "program" takes the place of a tutor for the student, and leads him through a set of specified behaviors which are sequenced so that it is more probable that he will behave in a given desired way in the future.¹

Terms Specific to Auto-Instruction

As in many fields, there are some terms which are peculiar to programed instruction. A few of these terms need to be defined in order to understand the material that is to follow. For the present purpose, the definitions given by Skinner and Holland will be used:

A program is a set of materials on a given subject. It consists of a number of sets of frames.


...Frame always refers to the material presented at
any one moment. An item is the material in a frame. A panel is a chart, graph, or passage of text accessible during work on a set.

For a more comprehensive background of terms, a glossary is recommended.

Variable Uses for Auto-Instruction

How auto-instruction can best be utilized depends upon the situation for which it is being considered. Certainly, it does not supplant the teacher; nor is a program replacement for a group discussion, an oral report or a book review. There are several ways in which auto-instruction is used in the classroom. It is used to carry the major burden of the instruction. It is used as an adjunct to other instruction. It is used on a voluntary basis for enrichment. It is used as remedial material for students in need of extra help.

---


Types of Auto-Instruction

Skinner programs

The Skinner type of program is called the linear, extrinsic, fixed sequence or fixed line kind of program. The terms are used interchangeably in the literature.

Skinner, a Harvard psychologist, experimenting with laboratory animals, worked with a theory of learning called the reinforcement theory. He proposed that the same principles could be applied to human learning; human behavior could be shaped by application of these principles just as behavior of lower animals could be shaped. An individual changes his behavior, or learns, as a result of the knowledge of consequences of his actions. This is the "law of effect." Things which happen to strengthen the chance of an act being repeated are called reinforcements. They serve as motivation for further repetition of the act.

Applications of the laboratory findings were used in developing materials for use in the classroom. By using the

6Ibid., p. 100.
basic principles developed in the laboratory, a program of instruction, later published for general use, was developed and successfully used by Skinner and Holland in teaching.

In using this kind of instruction, Skinner reports that learning is more effective when students write their responses. He calls these constructed responses, and they are considered an integral part of the learning process. Skinner emphasizes not only the value of the student making the response, but of his knowing that it is the correct response. Recall by the student is considered important, as opposed to mere recognition of materials.

To develop a Skinner type program, content is analyzed into the raw materials for the program, and then broken into parts. These are arranged in sequence. Komoski aptly calls the order of these arrangements "psychological sequencing," which he says implies a change in behavior by the learner. He points out that a program does not show a

---


student how to do something; it makes the doing of it an integrated part of what he "knows."^10

Learning results from a program because the learner responds to each step before he goes on to the next step. He may solve a problem, answer a question, label a diagram, disagree with a statement, or perform some other activity. In any case, he is actively involved with the process. The steps he is asked to take are so gradual that he generally responds correctly to each succeeding step. Errors prevent the occurrence of a correct response, so they are contra-indicated, if reinforcement is to occur. The time interval between behavior and reinforcement is important. Immediate reinforcement of the intended behavior is recommended.11

A linear program moves a learner from one level of attainment to a higher level of attainment. New associative connections are formed as the student gradually moves from simple to the more complex behavior. Stolurow describes the linear program as a program that "gives a little information at a time, then takes it back."^12

Crowder programs

The Crowder type of program is called the intrinsic, non-linear or branching method. To date, Crowder and his group at the commercial concern, U.S. Industries, have been the major proponent of this method of programing. The intrinsic method of programing does not propose a particular theory of learning. Supporters of this type of programing readily admit that they do not know how learning occurs. As stated by Crowder: "The intrinsic programer does not pretend to know in detail how the student learns, but is interested in whether he learns." ¹³

The frames in intrinsic programs are several paragraphs or more in length. They are followed by two or more multiple-choice questions. The answer chosen by the student directs him to some other part of the program. When the learner selects the correct answer, he is given more advanced information. The wrong answer branches him into remedial frames. The remedial frames usually interpret the error as having some meaning regarding the learner's needs. This interpretation is given to the learner along with additional information after which the learner is returned.

to another point in the program. Intrinsic programs are geared to recognition of materials rather than recall of materials.

Intrinsic programs have been used in the form of "scrambled books" under the commercial name of TutorTexts. Much of the intrinsic material has been designed for use in a mechanical device called the AutoTutor which sells commercially for over a thousand dollars, as advertised by U.S. Industries.

Several different techniques of branching for intrinsic programs have been described by Crowder who uses such terms as the "simple sequence," "wash-back program," "wash-ahead program," and "complex wash-back program" to delineate different series of events that are used in branching programs.

---


15 Information supplied by an advertisement by U.S. Industries, Inc., Educational Science Division, 250 Park Ave., New York, 17, N.Y.

Other types of programs

Pressey programs

Pressey's self-scoring multiple choice apparatus was one of the forerunners of current auto-instruction, and should be mentioned, although it was primarily a testing device. The device has been called the "grandfather" of present teaching machines. In 1926 Pressey, a professor of psychology at The Ohio State University, described the use of the apparatus. The machine had a roller which held questions which appeared in a small window on the roller. There were four answers from which to choose. Each possible answer was represented by a key. The student punched the key of his choice to answer each question. As the student worked through the test, the machine tabulated the number of correct responses, and the student had immediate knowledge of test results. The device could also be used for teaching when arranged so that the student could not move to the next question until he selected the proper key.  


18 Ibid., p. 37.
comments in regard to the idea not being widely accepted at the time, "Pressey’s machines succumbed in part to cultural inertia; the world of education was not ready for them. But they also had limitations which probably contributed to their failure."\(^{19}\)

Conversational Chaining

Conversational Chaining is a variation of the constructed response program, and was developed by Barlow. Instead of giving the answer to one frame, just prior to presentation of the next frame, the answer is incorporated into the next frame, printed in capital letters so that it stands out as the answer to the previous frame. For example:

Chicago is WEST of Washington. Air Masses moving to Chicago from the shaded part of the map would reach Chicago before Washington. This is because air masses usually move from _________ to _________.

(Answer is given in caps in next frame.)

A snow storm _________ from the WEST to the EAST would usually hit Chicago before New York.

\(^{19}\) Skinner, "Teaching Machines," p. 139.

This is because the air mass which caused the
snow storm moved from west to east.
(Answer is given in caps in next frames.)

Ruleg

Ruleg programming is a variation of the constructed
type of program, but embodies the principle of stating a rule
and giving an example. Every item involves the student in
completing a rule or an example or a combination. This
variation of programming was developed by Homme and Glaser
who were especially concerned with programming science text-
books. They point out that the psychological status of
rules and examples is quite sound. Rules and examples may
function as powerful prompts which elicit correct responses.

Mathetics

Mathetics types of programs involve a system of
classifying items. The system was developed by Gilbert who

---

21 William J. Trattipoe, Theresa G. Trattipoe, and
Clifford P. Hahn, "The Effectiveness of Three Programed-
Learning Frame Styles," The Journal of Programed Instruction,
II, No. 1 (Spring, 1963), p. 36.

22 Lloyd E. Homme and Robert Glaser, "Problems in
Programming Verbal Learning Sequences," Teaching Machines
and Programmed Learning, edited by A. A. Lumsdaine and
Robert Glaser (Washington: National Education Association

23 Ibid., p. 489.
listed eleven classifications of types of program frames or items according to their function. Gilbert suggested ways to use these classifications in program construction. A recent report on the use of this system indicates that materials are presented in a lesson called an "exercise model." There are different levels of difficulty which determine the amount of material that is given in a lesson. This varies from less than a page to several pages. Responses are multiple choice, and some branching is used. For example, the mathetics approach to an investigation of food borne diseases begins with a list of seven procedures to be followed in an epidemiological investigation of food poisoning. These procedures are followed by a page of information about Salmonella organisms and the conditions under which they multiply in foods. The reader is given a list of foods with the characteristics of each food and asked to check

---


those that fit the conditions under which Salmonella organisms grow. Answers are then checked in another part of the book, and the student goes to the next exercise.  

Auto-Instruction and Student Learning

Teaching machines and learning

Some programs are in the form of books and others require the use of a machine for presentation to the student. The merits of the machine are still under discussion. There is evidence that the teaching machine offers no advantages over programmed texts in instruction.  

An interim report of the Joint Committee on Programed Instruction and Teaching Machines has this to say about the machine:

In any case, it should be emphasized that so-called teaching machines, in themselves, do not teach. Rather, the teaching depends on the program of instructional materials that may be presented by the machine.

---

26 John Akerman, and Thomas F. Gilbert, Routine Epidemiological Investigation of Food Borne Disease (Atlanta: Communicable Disease Center, Training Branch).


Programs of instruction and learning

A summary of the research findings in regard to learning from programed instruction made by Stolurow recounts an impressive array of studies which divulge that learning occurs with programed instruction under a variety of conditions, and for widely diverse people ranging from mental retardates to university graduate students. Programed instruction has been used successfully to teach an assortment of subject matter and a variety of behaviors. Learning with programs has occurred with use of programed books, programed cards, and 29 with programs in machines. Schramm sums it up succinctly: "Therefore, it seems reasonable at this time to lay aside the question of whether students learn from programed instruction. They do." 30

Availability of Programs

To date, auto-instructional material has been more widely used by the armed forces and by industry than by the schools. This is due, partly, to the expense involved in the preparation of programs. However, the number of available

29 Stolurow, pp. 103-144.
30 Schramm, p. 50.
programs to schools has been increasing rapidly. In 1962 the number officially listed\textsuperscript{31} was 122, and in the last available report, 352 programs were listed.\textsuperscript{32} There are no programs in health education listed. A few programs in the related health sciences have emerged, such as a program of education for physicians about diabetes\textsuperscript{33} and a program for patient education on diabetes.\textsuperscript{34} These are available only for use in the AutoTutor Mark II, a somewhat limiting factor because of the cost of the machine. Of the other two related programs listed, one deals with medical terminology\textsuperscript{35} and the other with medical physiology,\textsuperscript{36} written for lay education rather than medical education.

At the level of education in the professions of the health sciences, medicine, dentistry and nursing are experimenting with the use of programs for different phases of

\textsuperscript{33}Ibid., p. 483.
\textsuperscript{34}Ibid., p. 489.
\textsuperscript{35}Ibid., p. 485.
\textsuperscript{36}Ibid., p. 486.
professional education. None of these programs have been dispensed for general use, or even for inspection by interested parties.

A commercial concern, Basic Systems, has developed a few programs that could be used in some phases of college health education, if they were available for general use. At this time, they are chiefly available for use by the pharmaceutical industry. Basic Systems has developed other programs for industrial concerns which distribute them privately. Such a program is available to physicians and others on request from Pfizer Laboratories.

Points at Issue about Programed Instruction

The field of programed instruction is not without controversy and question. Often both sides of a question can be documented from the research literature. Contrary findings by competent researchers indicate that there are significant variables or components of known variables that have


not yet been isolated. These need to be delineated and research designs refined in order to study them. The major questions about programed instruction can be classified into three broad areas involving: teaching methods, individual differences, and the place of programed instruction in the total curriculum.

**Teaching methods**

In the category of teaching methods one area of research has centered about the question of active participation. Skinner advocates writing responses while Pressey and Crowder recommend selection of correct answers to meet the active requirement. Coulson and Silberman in studying these two approaches to programing reported no significant differences on criterion tests between subjects making the constructed response and those making the multiple choice response. On the other hand, Fry, teaching the Spanish vocabulary reported that if recall was the criterion for learning, the constructed response was superior to the

---

selected response. The suggestion has been made that the kind of terminal behavior which is sought may be related to the response mode used.

An important question about programed instruction is whether a covert response is adequate or whether an overt response is necessary. A recent review of the literature points out conflicting findings. Some investigators have reported no differences in learning when the student simply reads the material, while others have reported superior learning from written responses. Hartman and his group criticize the studies that have been done in the past on the basis of the small number of subjects or the short programs used, or both. To test the question of overt and covert responses on a larger group and with a longer program, a 3500 frame programed text covering the basic Machines Operation course at I.B.M. was used with 493 subjects. The constructed response was compared with merely reading the material. No significant


difference was found in the mean achievement of the two groups.

Tobias and Weiner found no differences in achievement in writing an answer, thinking an answer, or just reading the completed statement of an answer when testing immediate recall or delayed recall in six weeks. These investigators point out that their findings confirm some studies and disagree with others. They suggest a major limitation of studies to date has been the use of short programs. They conclude that a more definitive study using longer programs is indicated and point out:

It appears questionable whether studies using programs of 90 or even 177 frames constitute an adequate test of differences between response modes since instructional programs in general use have many more frames than that.

It has been reported that overt responses resulted in better post-test performance than covert responses on

---

43 Ibid., p. 347.
materials having high information value, but not on materials having low information value when the information level was measured by the number of alternatives from which a decision was to be made. This study was done with seventh and eighth grade students, but it did not involve a classroom learning situation. However, it does denote that the factors involved in the overt-covert question may be quite complex and identity of the components involved may not be a simple matter.

**Individual differences**

During the early period of programed instruction individual differences were given scant attention by linear programers. Programed instruction was viewed somewhat as an equalizer of individuals. Eventually the problems of individual differences became apparent. Crowder proclaims the branching of intrinsic programs to be the answer to this problem, however, individual differences do not appear to be a matter that can be answered quite so unequivocally. How well programed instruction can handle individual differences and how it can cope with them is still not determined.

---

46

The problem of boredom appears to be one of the most frequently mentioned individual problems. Gotkin comments that students often complain that programing is a boring way to learn. He points out that similar reactions are elicited by other things to which the student is forced to respond and which he is unable to "tune out." However, boredom may mean that the student is spending too much time to learn too little, or the student may lack the skill to learn from the program. Shimabukuro comments that fast learners may not be challenged by small steps. Equally unchallenging are too many cues or cues that are vanished too gradually.

Krumboltz raises the question of whether programed instruction may be more acceptable to certain personalities or types of people. He cites a study in which boys learned better in the first grade with programed instruction than girls, and girls learned better than boys with conventional instruction given by female teachers. This opens new

---


questions about programmed instruction and individual differences.

One attempt to handle individual differences with linear materials was made by Campbell. Using self-instructional materials on set theory in mathematics classes in grades seven through twelve, if subjects responded correctly to fifteen basic steps, they were allowed to bypass eighty-five per cent of the material. A long linear form with no bypassing was given to students missing the basic steps. Testing the next day revealed the amount learned corresponded closely to the number of pages studied, and bypassing was no more efficient than the long linear method.

It has been suggested that programs may need to be fitted to the learner. The style of one program teacher may appeal to one student more than to another and the program can perhaps be matched to individual learning styles. Gotkin and Goldstein write:

It is time to give up the notion—often attributed to Skinner, but not shared by him—that any single sequence is the optimal sequence for all learners.

---


50 Vincent N. Campbell, "Bypassing as a Way of Adapting Self Instruction Programs to Individual Differences," Journal of Educational Psychology, LIV, No. 6 (December, 1963), p. 337.
Otherwise, programed instruction will fall far short of its promise as an innovation.  

Whether or not the speed at which students work can be paced without deterring learning has been another area of concern. External pacing was compared to self-pacing of college students doing programed algebra materials in one study. The rate of presentation was not found to be a critical factor on achievement measures; the capacity of the individual to perform over different rates of presentation was observed to have considerable range. It was concluded that externally paced and self-paced studies were equally effective. This confirms earlier studies that external pacing does not impede learning, but as Frye points out, such studies do not reveal whether or not group pacing affects the rate of learning. He studied this variable in regard to pacing and concluded that only when there was a wide discrepancy in abilities within a


group was the rate of learning retarded by forcing learners to progress at the rate of the group.

Another approach to studying the learner as he works with programed instruction was a study of the effect of pairs of students working on college algebra. The paired students wrote their answers on separate answer sheets then checked the answer to the frame. If both students were correct, they moved on to the next frame. If either of them missed the frame, they read it over and discussed the material until they were satisfied both understood it. The achievement of students working in pairs was compared with that of students doing individual study. Individual and paired students were equivalent on the unit test, mid-course and end of course tests. Students working on an individual basis complained of the monotonous routine while the paired students did not, suggesting that the interaction of the pairs served as a substitute for a teacher relationship. The major recommendation of students in the paired group was that they be paired on the basis of equal ability.

---


Programed instruction and the curriculum

A critical issue today is the place of programed instruction in the curriculum. Krumboltz sums this up:

The goal is to find that combination of material and procedures which enable each individual to attain the most important objectives for himself and his society.\(^55\)

Programed instruction cannot be all things to all people. It cannot be assumed to be the most effective technique for all situations. Coulson recommends that the optimum combination of teaching methods be identified for educational situations. He suggests that one of the most important aspects of programing is to match the task and the student characteristics. He concludes that future research needs to determine the optimum combination of programed instruction with other instruction.\(^56\)

One research study which experimented with the use of programed instruction in the curriculum was done in Denver using fifth and six grade children. The program was used in teaching Spanish. It was found to be more effective if used by the teacher than if used by a proctor. In addition to the

---

\(^55\) John D. Krumboltz, p. 49.

achievement of children, the researchers were interested in teacher attitudes toward programed instruction and how these might influence or be influenced by the use of programed instruction. When the teacher was interested in programed instruction and used it, the interest in Spanish among the high ability students increased. I.Q. was a predictor of achievement in both teacher taught and program taught Spanish. The researchers concluded that although their study was extensive, involving eighty schools, the results were more provocative than definite, and other large scale studies are needed to explore the place of programed instruction in the curriculum.\(^{57}\)

One of the most experienced researchers in the field of programed instruction, Pressey, urges that programed materials be used adjunctively with other materials. Textbook chapters can be analyzed for weaknesses and auto-instruction can be added where it is needed. He suggests one of the basic difficulties with programed instruction to be the unwarranted application of animal learning theory to meaningful human learning.\(^{58}\)

---


\(^{58}\) Sidney L. Pressey, "A Puncture of the Huge "Programing" Boom?" Teachers College Record, LXV, No. 5 (February, 1964), pp. 413-418.
Comments on the points at issue about programed instruction

There are still many unanswered questions about auto-instructional methodology. Program variables involving response modes, methods of eliciting responses, adaptation of programs to the individual, pacing of students and other issues will continue to be investigated as will other areas dealing with both methods of teaching and individual differences as they relate to programed instruction.

The most important question now facing educators appears to be the place of programed instruction in the curriculum. It is more than just another aid for the teacher. Programed instruction incorporates a number of characteristics that distinguish it from supplementary devices such as films and television. It is the systematic application of principles derived from psychological research that most distinguishes programed instruction. Yet, research with programed instruction has challenged the very theories of learning which prompted its development and has revealed the inadequacies of these theories. There is ample evidence


that programed instruction works, and this is why educators are interested in fitting it into the educational pattern. How it works is still an unanswered question. The characteristics of an effective program can not be specified in advance by psychologists or educators. Only tests with the learner can reveal whether a program teaches what it purports to teach.

Stolurow comments that the psychologist and the educator took separate and widely diverging paths following the onset of behaviorism in the twenties. Psychologists have been dealing largely with the micro aspects of behavior while educators have been concerned with the macro aspects. The joint interest in programing is bringing these two groups together again as they approach the many ramifications of the problem of human learning.

**Purpose of this Study**

The health hazards of cigarette smoking have been recognized. The problem of adoption of the practice by adolescents has also been noted, as has the need for effective educational materials for this group. Programed instruction would appear to offer an effective means of education about

---

smoking and health. The major purpose of the study is to
develop, standardize and pilot test an auto-instructional
program in health education on the topic of cigarette
smoking.

Summary and Conclusions

Auto-instruction appears to be both an efficient and
an effective method of education, regardless of whether
linear, branching or some other variation is used as the pro-
gram type. Programs for use and experimentation in health
education are absent from the educational scene, although
they would seem to offer excellent potential instruction.
The advantages and disadvantages of using auto-instructional
materials in health education cannot be explored until pro-
gramed material with which to experiment is developed. With
the current need of new educational materials to be used in
education about cigarette smoking and health, this topic
appears to be one for which development of programed ma-
terials is indicated. It is the purpose of this study to
develop these materials.
CHAPTER III

PSYCHO-SOCIAL AND CULTURAL CONSIDERATIONS

It is recognized that psycho-social and cultural elements may influence the acceptance or rejection of educational materials, and that failure to consider these aspects of education can be barriers to communicating health information. For this reason, those social, psychological, and cultural factors that have been studied about cigarette smokers, and that may have some relation to the acceptance or rejection of the educational materials to be prepared were carefully considered.

Social Class as a Consideration

Salber found differences in social class between smokers and non-smokers among high school students. She used Warner's classification of social class, but combined the lowest three classes of the seven because of the small number of students represented by these in her sample. She reported a relationship between smoking and social class
which was independent of parental practice. The rates of smoking increased with descending social class.\textsuperscript{1}

Horn did a gross measure of social class on the basis of the educational level of the parents of the smoker. He found that there was an inverse relationship between smoking practices and education of parents, but these differences disappeared by the senior year of high school. Horn concluded that, while the lower educational level of parent, usually denoting the lower social class, is related to the earlier adoption of the practice, it apparently does not influence whether or not smoking is taken up during the high school years.\textsuperscript{2}

An earlier and a very comprehensive study done by Haenzel for the Public Health Service took random samples from all geographical locations in the United States of people over eighteen years of age. This study found some evidence of ordering by social class.\textsuperscript{3} Haenzel reported that


\textsuperscript{2}Horn, "Cigarette Smoking Among High School Students," p. 1505.

professional workers smoked less than nonfarm laborers; however, the ordering by social class seemed to be less exact when smokers of over a pack per day were considered.  

McArthur reported that among a group of Harvard graduates studied, smokers came from the more privileged classes while non-smokers came from the lower social classes.  

There does not therefore, seem to be agreement on the relationship of smoking to social class. One problem may be the measure by which social class is determined. The relationship between teen-age smoking and social class appears to be extremely complex and needs to be more clearly delineated before conclusions are drawn as to its implications.

**Cultural Factors as a Consideration**

There are no known studies of specific cultural groups per se in regard to smoking practices. Haenzel considered the factor of race, within which different ethnic groups would represent cultural variations. He found the

---

differences between whites and nonwhites to be trivial for nonsmokers. An excess of heavy smokers was found among whites. Since the differential occurs only among heavy smokers, this may be explained by the economic differential. Since race and ethnic background also often represent cultural background, this study would indicate that cultural variables, at least by gross measures, may not be significant. As with social class, this is extremely complex, and needs more study before statements can be made with any degree of certainty.

**Personality as a Consideration**

Several studies have considered different aspects of personality as it relates to smoking or non-smoking behavior. Eysenck and his group in England did a study of extroversion, rigidity and neuroticism. They reported smokers to be more extroverted than non-smokers.

Heath did a follow-up study on a group of Harvard graduates. Initial information had been recorded about the

---

6 Haenzel, p. 36.
7 Ibid., pp. 37-38.
smoking practices of these men when they were undergraduate students. Stability, aims or purposes and professional pursuits of the group members were studied. Non-smokers, as a group, were found to be more stable, to have greater dependability, to have good direction and aims of life, but to be somewhat bland and colorless. He reported smokers to be energetic, searching for aims and purposes, and to be less stable, but more interesting.  

Schubert analyzed the Minnesota Multiphasic Personality Inventory (MMPI) given during orientation week to a group of college students. He found some statistically significant differences between smokers and non-smokers, but there was a great deal of overlap between the two groups on all scales in the study.  

McArthur and his group worked with the same group of Harvard graduates as did Heath. Among other things, they

studied the religious and moral orientation of the smokers and non-smokers in the group. The conclusion:

Non-smokers tend to be lower-middle class in origin, upward mobile, earnest young men, bred in a work morality that is conducive to Inner Direction. ...Smokers are (in our data) likely to come from more privileged backgrounds....\footnote{12} McArthur, p. 274.

Thomas did a combined psychological and medical study of his subjects who were medical students. He reported no differences in most Rorschach variables between smokers and non-smokers, but found differences in parental medical histories, and suggested the differences between smokers and non-smokers may be of genetic origin. \footnote{13} C. B. Thomas, "Characteristics of Smokers Compared to Non-Smokers in a Population of Healthy Young Adults Including Observations on Family History, Blood Pressure, Heart Rate, Body Weight, Cholesterol, and Certain Psychological Traits," \textit{Annals of Internal Medicine}, LIII (October, 1960), pp. 697-718.
cigarette smokers married more often, were hospitalized more often, and moved more often. The emotional status of smokers was reported to be significantly different from that of the non-smokers. Excessive smokers tended to be "neurotic."\textsuperscript{14}

Salber points out that studies to date have been conducted mainly on college students or adults and that no common thread is to be found except perhaps the greater need of social interaction by the smoker. To explain the relationship of smoking and personality in the adolescent, she studied 304 senior students in high school, both boys and girls, and used the Minnesota Counseling Inventory to measure personality. The only real difference she found between smokers and non-smokers was the poorer adjustment that smokers made in family relationships and with authority in general.

Studies to date indicate that there may be differences between smokers and non-smokers in regard to


personality variables and related factors, but no "smoker's personality" emerges. Data are conflicting in some cases, but it must be remembered that studies were done under widely different circumstances, varied scales for measurement were used, and usually very select groups were studied. The conclusions made by Matarazzo and Saslow, following an extensive review of the literature, are well founded. They report that no single variable is to be found exclusively in the group that smokes and not in the group that does not smoke.

At this time, there do not appear to be any particular personality variables that can be isolated and considered when selecting a population for study. For this reason, this factor is not considered in selecting the population to be used in this study.

**Parental Smoking Practices as a Consideration**

One association that seems to be consistent is that between parental smoking and the smoking habits of their children.

---

While such relationships have been interpreted by many to be "causal," this may or may not be the case. Since the strong association does exist, it is a consideration that cannot be ignored.

**Summary and Conclusions**

Smoking behavior cannot be defined, at this time, in terms of specific social, psychological or cultural components of an individual's background. It does appear to be related, in some way, to parental behavior in regard to the practice. This may reflect a number of components not yet isolated which are socially, culturally, psychologically, or perhaps genetically based.

No clear-cut demographic description of the cigarette smoker has emerged. On the basis of information that is available, the selection of a school district containing a relatively homogeneous group of children, such as might be

---


19 Sallak, p. 10.
found in a predominantly "middle class" suburban area, would appear to be sufficiently limiting to lessen social and cultural variations that are present. More specificity does not appear to be indicated for purposes of classroom education about smoking and health.
CHAPTER IV

POPULATION SELECTION

Selection of a population for this study involved two major tasks. One, the grade level to be used needed to be defined. Two, a relatively homogeneous population had to be located which contained this grade level. Fortunately, data were available which made both tasks possible.

Grade Level Selection

By the time high school is reached, smoking among students usually has a prevalence rate worthy of serious concern. This makes education about smoking and health highly desirable prior to entrance into high school.

Since the population for this study was to be drawn from Stark County, Ohio, it was of interest to know whether children in this county were similar to those in other parts of the country in respect to smoking practices. If they revealed smoking practices similar to those found by Salber

\[\text{Salber, } "\text{Smoking Habits of High School Students in Newton, Massachusetts," p. 970.}\]
and Sallak,\(^2\) a relatively low rate of cigarette smoking would be found among children in seventh grade, and this grade would seem to be a suitable grade level for preventive education about smoking and health.

A survey conducted by the Tri-Agency Health Education Council in October, 1963 of school children in grades seven through twelve, revealed that the rate of smoking of seventh grade children in Stark County was not significantly different from that found in other areas by other investigators.\(^3\) Some seventh graders did smoke, but, for the most part, they had not yet adopted the practice. By eighth grade the pattern had changed considerably.

Since the majority of seventh-grade children in Stark County did not smoke, this grade level was considered to be a suitable target grade for presentation of educational materials oriented toward primary prevention of the smoking practice. On this basis, seventh grade was selected as the grade level with which to work on the development of programed instruction on smoking and health.

\(^2\)Sallak, p. 9.

\(^3\)Tri-Agency Health Education Council, "Smoking Practices of School Children in Stark County, Ohio, 1963-1964 School Year," A Report to the Superintendent of Schools of Stark County. (Mimeographed.)
Selection of a School District

A request was made of school personnel to suggest school districts containing a preponderance of "middle class, college oriented" children. The areas suggested were then analyzed on the basis of census tract data 4 to determine some of the characteristics of families in the different school populations, and to seek one with a population as homogeneous as possible.

Consideration was given to the type and cost of housing in the district, the median family income, the median education, as well as to occupation of residents. A suburban school district containing a junior high school was chosen for the study group. Most of the housing in the census tracts represented in this school district were in good repair and were single family dwellings. Median education of residents was above the median for the county as a whole with over half of the population having above a high school education. Income, number of rooms per person, cost of housing were all above the median for the county. The

majority of the population were professional, managers or clerical with only a small proportion of skilled craftsmen and a negligible number of household workers and laborers.

The majority of residents in the selected area were white, protestant, and could be categorized as "middle class" ranging from lower middle in a small proportion of cases to upper middle. The vast majority being either "middle-middle" or "upper middle," considering education, occupation, and housing as reported in census data. Subjective comments of school personnel characterized it as a stable, established, "middle-class" suburban community where some of the more privileged residents of the county live, but not the wealthiest.

**Designation of the Research and the Pilot Groups**

Two kinds of groups were needed for this study. One was to be used in research and development of the program, and the other for the pilot test of the completed program. Since both groups were to be drawn from the same school population, the two groups needed to be differentiated early in the study.

There were fourteen seventh-grade classes within the population. All of them were available for use during study hall periods. One group of eighteen students was a remedial
section. The students in this group were not used for any part of the study. The rest of the classes contained twenty-five to thirty-five students with a wide range of I.Q.'s, as measured by the California Test of Mental Maturity which had been given to each student in the early weeks of the school year, and just prior to the start of this study. I.Q.'s within any one class were distributed throughout the range of low to high so that no class had a preponderance of any one ability level.

Two classes, totaling approximately fifty students, were defined as the pilot group and were reserved for the pilot test. These two groups met at eight a.m. and nine a.m. respectively. The balance of the students were defined as the research group and were designated for different phases of research and development of the program.

Summary

The population selected for use in the development and pilot testing of the program about smoking and health was the seventh grade of a suburban junior high school with a relatively homogeneous "middle class" population, as revealed by census tract data. The seventh grade was chosen
as a suitable grade level for this study on the basis of local and nationally published data. The selected seventh grade population was divided into a pilot and a research group for purposes of this study.
CHAPTER V

PRE-PROGRAM FACT FINDING ABOUT THE POPULATION

Small Group Discussions as a Means of Determining Interests and Needs of Seventh Graders

From the onset, the development of the program about cigarette smoking was considered to be "student oriented." The student always represented the point around which the procedures of development were pivoted. For this reason, investigation began with student opinion as a guide to establish the categories which needed to be covered in the program about smoking and health.

Considerable time was spent probing in depth to find what students knew about smoking and health, how they felt about it, and what their interests were about it. Different techniques were used to derive this information. The personal interview was tried first, but students did not respond too well to this approach. Many of them were reticent about expressing their ideas and appeared to feel somewhat intimidated by a stranger in their midst.

The most successful communications were established using small group discussions. Within such groups students
appeared to lose their timidity, and supported by one another, they quickly gained sufficient boldness and self-confidence to express their views. Rapport was rapidly established by the investigator after two or at the most three meetings with a group. Meetings occurred during study halls, which met daily, Monday through Thursday.

Size of the discussion groups varied from seven to ten students, and a variety of different kinds of groups were established for short periods of time. Some groups contained only girls, others only boys, and some were mixed groups. There were some groups picked according to I.Q. of the participants with I.Q.'s above 110 separated from those below.

The groups were unstructured and the atmosphere was permissive. Discussions were not initiated about smoking until rapport appeared to be established with the group. Students were given no particular directions during the inquiry on smoking except that the investigator was interested in their opinions about smoking. They were asked to "help" the investigator to think about things that might be important to seventh graders on this subject.

All of the groups were productive of useful ideas. No special differences were noted in productiveness of different kinds of groups. Boys appeared to be more open
in expressing their opinions, and to be less self-conscious about expressing their ideas. Girls tended to look to the investigator for clues of approval or disapproval before expressing opinions. Great care was taken on the part of the investigator not to express opinions.

By the time these small group discussions had progressed through three or four meetings, a great deal of useful information began to emerge. Not only was there enlightenment about the interests and needs of seventh-graders about smoking and health, but students began to name specific seventh-grade smokers and to express their views about the personalities involved. Smokers proved willing to talk about the practice, and while these comprised a small number of students, they contributed some interesting points of view.

In working with these small groups, it soon became apparent that students knew little about the health hazards of smoking and that a number of misconceptions existed among students. Some of the students made statements like "it's not good for you," "you get cancer," but none of them seemed to know what this meant or why it might happen. Some had more insight than others, but for the most part, these children were not aware of the magnitude of the dangers, nor the importance that the decision to smoke or not smoke might have for them.
Parent Interviews

Mothers in this school district were active in P.T.A. The president of the group, a nurse by profession, was very cooperative and organized groups to discuss the interests and views of parents about education concerning smoking and health. The major insight that came from parent groups was that there was fear, on the part of some, that education in this area might cause children to become critical of their parents and teachers who smoked. This was a relevant area for attention in development of the program, for children had already been critical of the adults who told them not to smoke, but who smoked themselves.

Local Voluntary and Official Health Agencies as Resources

The major official health agency in the area was the Stark County Health Department. It provided nursing service to the schools. The Health Officer was interviewed, and he referred all questions to the Director of Nurses. Both the Director of Nurses and the District Nurse who served the school were interviewed to determine their judgment on the educational needs of seventh-graders in this district in regard to smoking and health.
Major education about smoking and health has been provided in the community by the Stark County Tuberculosis and Health Association and the Stark County Cancer Society. About a year ago these two agencies joined with the Stark County Heart Association to approach the problem of education about smoking and health on an inter-agency basis. A formal organization was set up by the three groups called the Tri-Agency Health Education Council (TAHEC). The efforts of TAHEC were entirely devoted to education in the schools and in the community about smoking and health. A wealth of information was available through TAHEC and through the sponsoring agencies at the local level.

**Interviews with Teachers, Supervisors, Counselors and School Administrators**

Those already familiar with the population of seventh-graders, teachers, counselors, administrators and supervisors were interviewed to determine their perspectives, and to seek understanding of their perceptions of what seventh-graders were doing and thinking about smoking and health. It was also of interest to know what instruction was being given or would be given to this group in the ensuing months, and how, and in what context it was being presented. Since the school
used in this study had no health instruction at any grade level, any instruction was correlated with other subjects.

The interviews revealed some interesting information about school policy in regard to smoking among students. Any student caught with a cigarette in his possession was suspended from the school. This regulation was in keeping with a ruling initiated by the school board of the district during the previous year. Few problems had occurred in this respect among seventh graders, but the eighth, and even more so the ninth grade, had offenders. This tends to reinforce the conclusion that the seventh grade was suitable for preventive education.

**Categories of Educational Need Defined**

From the pre-program fact finding, a general picture began to emerge of areas that needed attention on the topic of smoking and health. From this background, a rough draft of the areas to be covered could be made. With particular attention to student opinion, the following categories emerged as those in need of attention for education of seventh grade students about smoking and health:

1. Beginning smokers

2. Advertising as a way of persuasion as well as a way of dissemination of information
3. Curiosity about and experimentation with smoking
4. Social and peer group pressures to smoke
5. "Addictive" aspects of smoking
6. Effects of nicotine and other components in cigarettes
7. How lungs work and how smoke affects them
8. Diseases associated with smoking
9. Adult behavior and smoking

Summary and Conclusions

Valuable background information for this study was collected from small group discussions with seventh grade students. These discussions proved to be an effective way to determine the perceived needs, interests and problems of students about smoking and health. Parents, teachers, counselors, administrators, and school supervisors also contributed useful information, and voluntary and official health agencies proved to be helpful community resources in the fact-finding phase of this program. Nine major categories emerged during the fact-finding phase of this study which were considered necessary for inclusion in the program to be developed.
CHAPTER VI

PLANNING THE PROCEDURES FOR CONSTRUCTION OF
THE AUTO-INSTRUCTIONAL PROGRAM

Chapter IV includes a description of the population selected for the study as well as the distinction within the population of two main groups, the research study group and the pilot study group. Chapter V describes the procedures used for collecting background information about the population, including categories of educational need about smoking and health. With this accomplished, plans for the development of the programed instruction could be made.

Selection of the Programming Technique

The Skinner type of program was chosen as the type to be used as a model for developing the program on smoking and health. It seemed desirable for students to be able to recall rather than simply to recognize materials. Research has also indicated that constructed responses, as used in the Skinner type of program, may produce learning that is retained for longer periods and which has relative permanence.
as compared with that achieved through response modes where the terminal behavior is sought through multiple choice responses.  

There is no reason to adhere rigidly to linear pro­graming, and at times variations may be indicated because of the kind of learning which is desired. Komoski, of the Center for Programed Instruction, comments on programing techniques: "...we submit that 'the subject matter should write the program.' As a result, we don't have a set technique."^2

In keeping with flexibility of technique, there were times when other than linear responses were used. However, this program was approached, from the standpoint of a linear program, and constructed overt responses were used followed by immediate feedback of the correct answer.

Selection of Consultants

It seemed vital that the program be read with attention to the different, but important range of views offered by the orientation of several professions. Prior to starting construction of the program, consultants were sought

^1Feldhusen, p. 266.

who were considered competent judges in their professional fields.

**Language arts consultant**

Since the materials were to be communicated to seventh-grade students, it was felt desirable to consult a language arts teacher about communications with this grade level of student. While the final criterion was understanding by the student, it was felt that teacher suggestions could improve the likelihood of communications, especially in regard to words that might need to be defined, deleted or reworded in the program. For this purpose, a seventh-grade language arts teacher was chosen in the school where research and development of the program was to take place. The teacher was very interested, both as a teacher, and as a smoker, in the development of the programmed instruction, and agreed to read the program units as they were developed and to comment on areas where potential communications problems existed.

**Psychological consultants**

It was considered advisable to obtain psychological consultation for critical appraisal of the program as a

---

3 The writer is indebted to Cynthia Lappin, Edison Junior High School, Canton, Ohio.
learning instrument. While psychologists are the first to concur that the final criterion of learning is what happens with the child, the psychologist offers an excellent resource person for opinions on such things as methods and types of prompting and cuing of frames, questions on testing, error rates, and sequencing of items. Some psychologists are skilled at reading critically in respect to both the theoretical and practical aspects of programed instruction. Since programing involves a special interest, and background knowledge on the part of a psychologist, it was felt that the psychologist chosen for consultation for this program should be one skilled in programing as a mode of learning, and if possible, currently working with programed instruction.

This kind of consultation was found at a private research foundation which worked closely with the university. The Director of the Psychological Sciences Group at the institute was sympathetic to the program development. He agreed to allow a Research Psychologist from his group to act as a consultant on the program. This group was actively

---

4 The writer is indebted to William Hitt, Ph.D. and Ronald Cress, Psychological Sciences Group, Battelle Memorial Institute, Columbus, Ohio.
engaged in programing and research about programed instruction.

Medical consultant

Some of the content about cigarette smoking involved information of a medical nature. It was considered important for a physician with knowledge of this topic to check the program for accuracy of the medical concepts that were covered. For this purpose, a request was made of a Professor of Medicine at The Ohio State University, who was also Director of the Tuberculosis Hospital, to read the program for medical accuracy. He had a special interest in smoking and health, frequently gave medical lectures concerning it, and was very well informed about it. He readily agreed to read the program and to make suggestions for changes on the basis of medical accuracy.

Selection of the Program Content

In selecting the content to be covered by the auto-instructional program on smoking and health, textbooks were first consulted in regard to the categories defined in the pre-program fact-finding phase noted in Chapter V,

5 The writer is indebted to Robert Browning, M.D., Director, Ohio Tuberculosis Hospital, The Ohio State University, Columbus, Ohio.
Categories of Educational Need Defined. Textbooks were no help in determining content for the program. Their coverage of the topic was minimal, and seldom involved more than a page or two if they covered the topic to that extent. Little of their material related to the areas that had been defined.

The best resources for recommendation of content were teachers and counselors, and, to a limited extent, supervisors. Excellent materials were obtained from the voluntary health agencies, especially the Tuberculosis and Health Association, which was the major local resource used by teachers in obtaining material for developing units on this topic. Guidance counselors were particularly helpful in suggestions for content to be covered on the social and peer group aspects of smoking. Science teachers, who did the majority of teaching about smoking and health, had some very good suggestions.

A number of people were interviewed in the endeavor to define the content to be covered. Prior to these interviews, the teacher, counselor or supervisor was told of the categories that had been defined in the fact-finding phase, and it was on the basis of covering the categories defined, that suggestions were requested.
From these interviews, and with the use of pamphlets, booklets, and similar materials, plus basic references on smoking and health, general content was formulated and put in outline form.

Consideration of Fear Arousal Communications

Prior to writing the program, a necessary consideration was how to handle communications about smoking and health that might arouse fear. This has not been an area of wide research in health education. Probably the most well known and the most often cited research on this topic is the work of Janis and Feshbach. Working with communications about the consequences to be expected if certain dental hygiene practices were not followed, they reported the high fear approach to decrease the acceptance of the recommendations for the desired dental hygiene.

In a recent and very extensive study of some of the questions in this area of communications, Snider points out in respect to the Janis and Feshbach study that, since fear

---

6 For a list of the basic references which were of most value, see the bibliography, Selected References on Smoking and Health.

arousal and fear reduction were not considered separately, it may be that what they were measuring was the relationship of the "resultant fear" to the recommendation. This may be a significant point. The work of Snider was done with the intent of distinguishing such differences if they existed. Since he did his work specifically on communications about smoking and health, his findings were carefully considered.

He tested several different kinds of messages on students in grades ranging from seventh to twelfth. Messages about smoking contained one or more of three independent variables; high threat (it can happen to you) or low threat (it is not likely to happen to you); high probability of occurrence (your chances are about one out of five of getting cancer) or low probability of occurrence (your chances are about one out of a thousand of getting cancer); and high defense (there is a great deal to do to avoid getting lung cancer if smoking is stopped) or low defense (there is no control, even if smoking is stopped). He found that students receiving mostly the high threat and high

---

8Marvin Snider, "The Relationship Between Fear Arousal and Attitude Change," Children's Service, Massachusetts General Hospital and Department of Pediatrics, Harvard Medical School (received December, 1963), p. 56. (Ditto.)
occurrence communications expressed significantly higher level of worry than those receiving the high threat and low occurrence communications. Both of these groups expressed more worry than the groups receiving low threat communications. He also found that although worry was aroused as a result of the threat information and occurrence information, defense information was an effective means of reducing the arousal of worry.

Future plans not to smoke or to reduce smoking were found among those groups exposed to high threat. Both smokers and non-smokers tended to have increased worry over the high threat, high occurrence information. Snider suggests that subjects will have a greater tolerance to defense avoidance responses as reported by Janis and Feshbach, if there is more at stake than just a disease, such as might occur from poor dental hygiene. If the stake is life, as in the case of cancer, possibly the impact of the message will be different.

---

9 Ibid., p. 19.
10 Ibid., p. 23.
11 Ibid., p. 39.
12 Ibid., p. 45.
13 Ibid., p. 51.
In working with seventh-graders in Stark County, it was often their expressed opinion that the teacher ought to "scare kids up" with the information about smoking. Some movies designed for education about the dangers of smoking such as One in Twenty Thousand, a movie widely distributed by the Women's Christian Temperance Union, takes this approach. Although it appears to the investigator to be a questionable approach, in discussing this issue with teachers, it was found that a surprising number of teachers felt that in giving information about the dangers of smoking that we have been "soft pedaling" fear too much. This appears to be an unresolved question at this time. However, the findings of Snider's study tend to support these opinions.

There does not appear to be a clear-cut answer to what induces fear and how much fear should be induced with the written word. The dynamics of communications, especially of the written word, is not a simple matter, and we need to look to the behavioral scientists for more research to determine answers in this area.

The facts about the health hazards of smoking are relatively fearful, no matter how they are presented, especially to the non-smoker who does not yet have reasons for rationalizing about their veracity. They can, however,
be maximized or minimized with different communications in regard to threat perceived. In writing this programed instruction, attempts were made to maintain an attitude somewhere in the middle, avoiding overemphasis, but not minimizing the dangers of the practice. Recognizing that each individual receives and interprets information in the light of his own experiences and environment, this may not always have been achieved. Before development of the programed instruction began, plans were made to pay particular attention to how children seemed to perceive the different sections of the program from the standpoint of fear arousal. Since there is no simple known way by which the degree of fear of a communication can be measured, this matter had to be judged by observation of reactions of individuals and groups of children as the study progressed.

One item that bears mentioning is the "worry" that some children expressed over their parents smoking. Particular attention seemed to be indicated to the opinions of these children. It seemed possible that these children might perceive information differently from children with non-smoking parents. This was not noted, however, as the program progressed.
In approaching the development of the program about smoking and health, it was considered best to emphasize the value of refraining from starting the practice. This, in effect, was thought to offer a way of fear reduction following information about a health danger that might arouse fear.

**Selection of the Program Objectives in Behavioral Terms**

Points of difference are often raised among researchers in the field of programed instruction, but there is one point that seems to go unchallenged: the educational objectives of a program need to be defined in behavioral terms, in writing, before the program is started.

An interesting and readable treatise on this topic is a short programed book by Mager. He describes the importance of being explicit in the statement of objectives, and emphasizes that objectives should clearly communicate the writer's intent. He challenges the use of what he calls "loaded" words like to know, to understand and to appreciate, and notes that these words are not explicit, and have many interpretations. Mager suggests that such words as to write, to construct, to solve have fewer possible misinterpretations.


He stresses that objectives should state specifically the evidence or the criterion of success that is acceptable to demonstrate the performance of the objective. If any special conditions exist in regard to the performance, these should be stressed.

A behavioral objective is sometimes stated in the form of a performance question or a criterion question. Student ability to perform on such a question gives a basis for an operational analysis of whether the program met the objective. The "behavioral specifications," as objectives are sometimes called when stated in question form, was the method selected for the statement of the behavioral expectations of the program for seventh graders on smoking and health. The content outline was used to develop performance questions which the student was expected to answer. This aspect of the program development will be mentioned subsequently, as it is more fully considered when the criterion test is described.

General Philosophy
The orientation of the investigator was toward guiding students to discovery of relationships for themselves.

\[16\] Ibid., p. 44.
At every phase of the program development, this was a primary consideration. Efforts were made to avoid the "rote" approach to program development.

**Special Areas of Attention in Writing a Program**

Two important elements of programing have already been treated in detail earlier: Statement of program objectives and selection of program content. There are other components of programing that are important. The considerations that follow were developed from so many different sources that it is not possible to give credit to their origin. They became part of the writer's repertory before the design of this program was started. Credit is due to the psychological consultants who reinforced many of these ideas during the discussions on programing during the developmental stages of the program. A number of basic references were consulted prior to the first stages of this program. In both academic and industrial settings, many people were interviewed about program construction. The information and insight from these various sources was the background for the development of the

---

17 For a list of basic references on programed instruction, see Selected References on Programed Instruction in the bibliography.
guidelines that were used in planning this program. These were sometimes changed and shaped by the ideas, opinions and suggestions of the seventh graders who were used in the program development.

Assumptions about the learners

It was deemed important to know the assumptions to make about the seventh grade learners in regard to the level of information already possessed about the areas to be programed. This was determined during the fact-finding phase, and was the basis for selection of the areas for programing. The information known about any one of the areas to be covered was never zero for all students, however, in all cases, there were some students who appeared to have a knowledge level near zero on any one topic selected. In some areas nearly all of the students appeared to have very low levels of prior knowledge. The small group discussions with students made it possible to know quite a lot about the students' repertory about smoking and health.

Although the children in seventh grade are not "new born" in respect to familiarity with cigarettes, their knowledge about the hazards of the practice of smoking appeared to be such that little more could be assumed about the learner than that he knew what cigarettes were, he knew
lots of people smoked them, including teenagers and some seventh graders, and most likely he had experimented with them himself.

**Personalized writing**

In every case possible, the program was written in personalized form in second person. This was considered advisable for two reasons. One, it seemed more likely that the child would interpret the communication as something that could happen to him, if written in terms such as "your lungs" or "your health." Two, the personal form of writing generally holds the interest of the student to a greater degree. When the second person was not advisable, or could not be used, sometimes materials could be written in terms of what happens to "us." In some cases materials had to be written in impersonal terms.

**Readability level of the writing**

Readability levels were carefully considered and were analyzed using the suggestions of Dale and Chall.\(^\text{18}\) In addition, two other resources were used in checking words that

---

were questionable. One was a book giving the words familiar
to children at different grade levels and showing the percent-
age of children familiar with the word at each level. The
other was the word book used in the language arts classes of
the seventh grade in the school where the research was done.

Frames

Only one idea or concept was placed in a frame, except
when materials were being reviewed. Structure of frames was
kept as simple as possible and constant attention was paid to
the vocabulary, as noted. Ambiguity was avoided, and if any
doubts existed about a frame, efforts were made to clarify
the information. Each frame was stated clearly in terms
considered familiar to the student. On the other hand,
efforts were made to refrain from an approach that was too
elementary and that might make the student feel the material
to be too unsophisticated.

---


**Cuing of items**

Efforts were made to supply enough cues to insure the correct response but to avoid over-prompting. Copy frames were avoided. Both formal and thematic prompting techniques were utilized. First and last letter cues were used sparingly, although there were times when such cues were necessary.

**Responses**

Responses were kept simple, and those required were considered relevant to the material being presented. Key words and phrases were chosen for responses, whenever possible. Attempts were made to see that responses to frames were always concerned with significant parts of the frame. Responses were placed at the end of frames, rather than in forward or middle positions. Frames were avoided that could be answered on the basis of construction or grammatical structure. The number of responses required in any one frame was kept to a minimum, usually one or two. Review frames were an exception; they often required several answers, as did criterion frames which sometimes called for responses of several sentences.
Progression from simple to complex concepts

Attempts were made to break difficult concepts into simple parts, and to build the new concepts into the students' repertory by starting with easy materials within his repertory and working up to the more complex ideas of the concept. Beginning at a point familiar to the student, and progressing to a new and formerly unknown point was the major approach. The student was given adequate practice to learn and use a new concept and adequate review of a new concept. These things would seem to increase the likelihood of retention of the newly learned material.

Use of examples

Whenever possible, examples were used which would demonstrate the concepts that were to be learned. These could be meaningful only if they drew upon materials that were familiar to the student from his past experience. Efforts were made to give as many meaningful examples as possible.

Summary

The Skinner or linear type program was chosen as a model for developing the program on smoking and health because it was considered more important for students to
recall information rather than to simply recognize it. Plans were made to use three types of consultants: a language arts teacher of seventh grade students, a group of psychologists who were skilled in programing, and a physician knowledgeable about the area. Using the defined categories of educational need of students in seventh grade, the content of the program was outlined with the help and recommendations of guidance counselors, teachers, supervisors and health agencies concerned with education about smoking and health. The effects of fear arousal communications were considered. It was decided to neither minimize the hazards of smoking nor to exaggerate them, and to offer as a way of fear reduction the frequent suggestions of abstinence from the practice of smoking.

The behavioral objectives of the program were defined in the form of performance questions. The orientation of the program writer was that of discovery of relationships by students rather than the "rote" approach. Writing was planned in the personalized form of the second person. Reading level and vocabulary were important considerations. The repertory of students, cuing of frames, frame construction, frame responses and ordering of frames in sequence were, among other things, considered in planning the program construction.
CHAPTER VII

RESEARCH AND DEVELOPMENTAL TESTING ON THE PROGRAM UNITS

Much important work of programing was completed during the phases devoted to fact-finding and program planning. During these phases, the population was selected, the needs of the population defined, the content selected and the considerations for writing the program were described. With these things done, the process of repeated analysis and synthesis involved in program construction could begin.

The First Draft of a Unit

The first topic chosen for programing was the cigarette advertiser. This was a topic of interest to seventh graders, and one about which they knew something, but they had not developed an awareness in regard to such things as the advertiser's motives and methods of persuasion.

With the use of the tentative performance questions devised as objectives for this topic, concepts were analyzed, ordered into a tentative sequence, and construction of the first frames began. The points described in Chapter VI about
writing frames were observed. The frames were written on five by eight cards, one frame to a card. The answer was written on the back of the card. With this completed, the unit of the program was ready for the first trial with a student.

**Individual Testing with Students**

During this phase of program development and testing, the testing is called developmental testing, and does not lend itself to statistical analysis.\(^1\) In fact, a great deal of the work done during the development of a program is empirical and is based upon student responses and the interpretation of these responses by the investigator.

The first students used in the individual testing phase of the program were drawn from among those who had participated in the small group discussions during the fact-finding phase. At the last of the small group meetings, students were asked if any of them wanted to participate later in some research on an individual basis. Almost everyone volunteered and seemed enthusiastic about the idea.

The procedure used during the individual testing was for the student to read each frame aloud from the card,

---

choosing the correct answer for any blanks that appeared in the frame. The student was closely observed, and if he appeared hesitant or puzzled, attempts were made to determine the source of his reluctance. If a particular frame caused trouble for a student, this was noted on the reverse side of the card so that it could be checked during subsequent tests with other students. The student was told immediately whether or not his answer was correct, and incorrect answers were discussed to try to determine their cause. If a student hesitated over a word, efforts were made to ascertain whether the word was unknown to him. Students were encouraged to ask questions and to comment on things which they either did not understand or did not think other seventh graders would understand.

Frames were revised on the basis of these individual tests. Some frames had to be expanded into several frames, others needed to be deleted. Some frames had to be completely rewritten, and some frames needed to be rearranged. The use of the card system made it very simple to make such revisions. It was also easy to experiment with different sequential order to determine the sequence that appeared to be best for learning.
A great deal of dependence was placed upon student opinion in revising frames. It was always kept in mind that this was a student centered, student oriented program. Throughout the program, it was student opinion that was the final consideration on any question even though student opinion was not always in congruence with that of the adults who taught them. When students first started working on the program, they were hesitant to make suggestions, but as they continued working and began to see their ideas put to use, they not only were excellent critics, but some of them had imaginative and interesting suggestions which were most helpful.

The first unit was tested on a number of different kinds of students to explore whether any obvious factors needed to be considered in selecting students for the individual testing phase. Some students did appear to be more adaptable to the individual work than others. This may have been due to personality differences, or perhaps to the interpersonal reaction with the investigator. No known factor seemed to account for this, such as sex, I.Q., or previous

---

2 References to I.Q. in this study refer to Measurements by the California Test of Mental Maturity.
exposure to small group discussions. Since students had to read aloud, it was possible that this might be the factor; however, it did not appear to be. Some of the students who seemed to work best were poor at reading aloud. Being more highly motivated, the students who particularly liked the individual testing were more productive, and, for this reason, were used with greater frequency for this phase of program construction.

The students used for individual testing included those with both high and low I.Q.'s, but none had an I.Q. below 100. The higher I.Q. students appeared to be more imaginative and to offer more suggestions for improvement of the program; however, this was not always the case. One of the best students in this respect was a boy with an I.Q. of 103. Boys and girls were used with equal frequency for the individual test phase of the program.

Following the administration of a unit of the program to an individual, he was asked to write what he had learned from the unit. The answer to this question was most revealing and gave insight about the importance placed by the student on different concepts. In addition it often revealed gaps in the program. The student was questioned about his answers when he did not appear to "get the point," and
revisions could be made to bring the point into better focus.

When the program reached the form in which five of the students tested on an individual basis and in succession could complete the unit under test without error or without apparent puzzle over any of the frames, the unit was ready for testing in written form. The language arts teacher was asked to read the unit and to comment on any potential communications barriers which might be present when testing the written responses. By this time, the program had usually been sufficiently tested with students and few questions were raised by the language arts consultant. Any suggestions made were carefully considered in preparing the written program.

**Psychological Consultation**

At this point the psychological consultants were asked to read the program. These consultants were particularly helpful during the first few units of the program. Their suggestions for improvement in construction techniques were invaluable. They were especially helpful in the area of prompting and made many useful and practical suggestions about cuing for responses. They made many useful and practical suggestions about other important areas.
The psychological consultants approved of the sequential arrangement of materials and of the general programing approach and technique. They emphasized the importance of continuing to work closely with the group for whom the program was being developed and suggested that testing of the written responses would be advisable at an early date.

**Procedures for Testing Written Responses**

Testing the responses of students to the written form of the program was an important part of the developmental testing of the program. Needs for program revisions which do not become apparent during the individual testing of the program often become apparent when students are asked to take the written program.

**Division of the research groups into sections**

Testing and revision of the written program often requires numerous revisions and retests on any one unit. Even a change of several frames necessitates a retest with a new group of students. For this reason, the research groups were divided into a number of different sections for the purposes of testing and revising the program in written form. Ten research study groups were planned. Two of these groups were special groups in respect to I.Q., being divided into
high and low I.Q. The low I.Q. group contained five boys with I.Q.'s ranging from 97 to 109 and five girls with I.Q.'s ranging from 90 to 105. The high I.Q. group contained five boys with I.Q.'s ranging from 111 to 122 and five girls with I.Q.'s ranging from 115 to 143. These two groups were reserved for a test run when a unit of the program appeared to be in the final form. The purpose of I.Q. division of these groups was to see whether there were indications that the above and below 110 I.Q. would perform differently. 110 was a somewhat arbitrary number to choose. It was suggested by school personnel as a dividing line between the upper and lower half of the class. In this particular school population, about half of the children in the seventh grade fell below this figure, and half above.

In the other eight research study groups, I.Q.'s were distributed throughout the high to low range. Five girls and five boys were placed in each group. Once a group was selected, it remained as a group throughout the balance of the testing. Students were not mixed between groups.

**Format of the written program units**

For testing written responses to a program unit, frames were mimeographed on one-third of a typewritten sheet.
The page was cut into three parts and made into a small book containing one frame on a page. All blanks within a frame were made the same length so that the length of the blank would not be a clue. If the blank called for an answer of more than one word, an asterisk was placed in the blank. The student wrote his answer in the test book. During the first units of testing, the answers to frames were placed on the back of the page containing a frame. It was later found to be more satisfactory to place the answer to one frame on the following page just above the next frame presented. This was followed in the testing of later units, and was used as the format on the pilot test.

**Directions for working the program**

Each child was given a set of mimeographed directions which gave instructions about working the program. The child was asked to read the directions carefully. Following this, the investigator covered the directions again, and the students were asked to go through the first two frames as an example. They were encouraged to ask questions if they did not

---

3 Appendix II contains a sample of a frame as it appeared in the test book.

4 Appendix III provides a copy of the directions that were used.
understand the process. Students were asked to refrain from "peeking" ahead to determine answers. It was explained that this was not a test, in the usual sense, and that no one would know the results of their work. They were urged to follow the directions, especially in regard to answering each frame before checking the answer. It was emphasized that if they did not know the answer, it was not their fault, but the fault of the program, and that the purpose of the testing was to find places where the program needed to be corrected. It was also emphasized that they would be helping the investigator to improve the program so that other seventh graders could benefit by its use.

Administration of the program units

The procedure for administration of the program was always the same. Students worked in a room which was designated by the school administration for the research study. The room contained two large tables, each of which would comfortably seat five children. Children were allowed to sit at the table of their choice. In most cases this meant the five girls in the group chose to sit at one table, the five boys at the other. The investigator was in the room at all times during administration of the program. Children were observed for signs of uncertainty as they worked, and
efforts were made to determine the source. Most problems occurred at the start of the testing, and as students learned what it was all about, they appeared to take the task quite easily. Students were asked to underline any unknown words and to comment upon any frames that either were not clear, or about which they had any questions.

**Checking the first written draft for medical accuracy**

A great deal of research preceded the writing of any one program unit, and attempts to clarify points that were questionable were made before the program was written. However, medical consultation was necessary to assure that accuracy had been achieved. The mimeographed draft was sent to the medical consultant so that any points or questions could be noted prior to the first revision of the written form.

**Developing the Criterion or Performance Test**

Statement of the performance expected of the student was done prior to writing the program, as described in Chapter VI. This was done on the basis of the content selected. These performance questions had to be converted to the language of seventh graders and written in terms that they could interpret.
The performance test for a program is a mastery test developed to measure whether the program has brought the students to mastery of the concepts that were to be learned. It is different from a discrimination test which distinguishes between the high and low ability students. On this subject Mager says:

Keep in mind that we are not interested in evaluating a student on the basis of how well or poorly his peers happen to perform (i.e., we are not interested in grading on a curve), but in evaluating each individual student on the basis of how well he reached the specified objectives.\(^5\)

Many programers prefer to select frames from within the program which are terminal frames or criterion frames,\(^6\) as they are sometimes called, and to use these as the performance test question. This kind of performance measure appears to be the "rote" approach to programed learning. The use of duplicate items in the program does not appear to give

---


\(^6\) At times, the words terminal frame and criterion frame are used interchangeably in the literature. At other times, a criterion frame is used to describe a test question within a program which is used for purposes of branching to different parts of the program. In either case, a criterion frame or a terminal frame has no cues within the frame.
students an opportunity to answer questions correctly prior to taking the program even if they essentially know the answer. While such questions would undoubtedly yield very high net gain scores, they were not considered desirable by the investigator. Accuracy of answers on terminal frames were to be checked directly from the program, and this evaluation was considered adequate in respect to performance on these frames. These are discussed in detail under \textit{Analysis of Terminal Errors} in Chapter VIII.

Tentative questions for the performance test were put into what appeared to be seventh grade language. These were given to a research study group before the administration of a unit of the program, and were repeated immediately following completion of the unit. Questions not answered prior to program administration were then checked to determine whether they were correctly answered after administration. If more than one student of the group missed a question, the question was discussed with the group to determine whether it was a matter of not interpreting the question, or whether it was a matter of inadequacy of the material in the program that caused the student to be unable to answer the question. If it was a matter of the program failing to present enough material, this was corrected by addition of frames, changing
the sequence of items or whatever seemed to be indicated to remedy the deficit.

If the question was not correctly answered because the student did not understand the question, students were told what answer was being sought, and were asked to make suggestions about rewording the question. Sometimes changing a single word was all that was needed, and other times a completely different approach had to be taken. The newly worded questions were then submitted to the same procedure with a new test group who were also given the revised unit of the program if a revision had been indicated in the previous test of the unit.

When questions appeared to communicate the intent of the investigator to students, and no more than one student in a group of ten missed the question, it was considered an adequate question. It was subjected to a retest with the same group in two weeks, and if not more than two students of the ten missed the question on the retest, it was retained as a performance question. The final performance questions are to be found in Appendix IV. The terminal frames that relate to each question are in parenthesis under the question.
Program Revisions and Retests

When students took the first written form of the program for any one unit, revision needs that had not been found during the individual testing phase were nearly always revealed. Some revision needs were revealed through errors made in frames, others through the additional time it took to go through a given number of frames. Some revision needs were revealed during the performance test development and others through answers to the open ended question asking the student to tell what he had learned from what he had just studied.

Special attention was devoted to errors made on frames, since the maximum error rate admissible is considered ten percent. Following the administration of each unit of programming, the error frequency was charted by frame to determine whether any frames had multiple errors. These frames were studied to ascertain their weaknesses, and revisions were made accordingly. Any error that a student made was studied in order to determine whether the error indicated a program weakness that could be strengthened.

Sometimes the way in which a student answered a performance question revealed that he had missed a point entirely. When this happened on a pretest, it usually
involved a previously held misconception. Such misconceptions were not always eliminated by the program, and probably are an area for special attention.

If even a single student appeared to develop a misconception from a unit of the program, the frames representing the materials about which the misconception developed were carefully studied, to determine whether the misconception appeared justified. Sometimes the error of a single student was the basis for a complete revision of a section of a unit.

As has been mentioned previously, when students were needed for testing, they were taken out of study hall. This appeared to be a highly motivating factor for most of the students. Nearly every seventh grade study hall had two groups within it that were used for testing purposes, and only one group could be used on any one day. Students were not aware of the process involved in selection of a group, and many students equated the selection with the success with which they had completed the last program. There was a great deal of competition to be chosen for the test group of the day. Being chosen meant that their name was called out at the beginning of the study hall period and they could then leave study hall and proceed to the test room. The factor that seemed to underlie their desire to be part of the test
group was the apparent dislike that most of the children had for study hall.

An inter-group competition developed in all the groups after the testing began. Groups differed in the way this developed. In some groups it was a friendly competition, in others a rather unfriendly competition. In all cases, it involved trying to finish first and trying to have correct answers to test questions. In some groups members appeared to enjoy their association with the group; these were the groups that developed a friendly kind of inter-group competition. They were very productive in group discussions following the program, making very useful suggestions for program improvement. They more frequently brought up questions on frames of the program that they felt needed clarification, and more freely discussed program faults and weaknesses, as they saw them.

Groups that appeared to have the rather unfriendly type of competition were task oriented, the task being visualized as completing the program rather than any discussions about it. Most of the groups were of the former, fortunately for the investigator. Over-all performance differences could not be noted on the program units between the groups, and the task oriented groups were of equal help
in determining error rates, time of performance and other things that were determined from written responses.

There was not as wide a variation of time between different students in finishing units of the program as had been expected. Many units took only fifteen or twenty minutes to complete. When the fastest student was able to finish a unit in fifteen minutes, the slowest student could be expected to finish the same unit in twenty minutes. The time differential was probably lessened by the competition within the group to finish first, or at least not to be last.

In revising, some of the units became too lengthy and this necessitated dividing them into two units. For example, this occurred with unit VII and VIII. Originally these units had no drawings and were much shorter. A large number of revisions was necessary. Drawings of the lungs and air passages were suggested by students in one of the developmental testing sections. When the unit grew too long for completion in a single class period, it was broken into two units.

Some units that were planned initially were deleted because they proved to be too complicated for the seventh grader without an undue number of frames to cover the
material. For example, the epidemiological approach to studying degenerative diseases was one area that was originally intended for program coverage. It turned out to be too complicated to handle within a number of frames that would justify its inclusion in a program at this grade level.

Each unit was developed in approximately the same way. Individual student testing was followed by revisions and retesting until individuals could complete the program without error. It then progressed to test, revisions and retest in written form. Not every group received every unit of the program. Units II, VII, VIII, and XIV were given to all test groups because they contained basic information that was desirable background for other units. For the most part, the program units were somewhat independent of one another, although they were designed to be used in succession and each successive program contained review frames from preceding programs. It did not appear to be a prerequisite that one program unit be taken in order for a student to have success on the next one.

When ten students of a test group were able to complete a unit of the program without more than random errors, these being considered as not more than one error on a frame by the total group, and when the criterion test for the unit
was ready for use, a trial test run was done using the two research study groups which were divided by I.Q. These groups were not used in any of the developmental testing phases, and were not involved in any post program discussions or other things which might influence their performance. The two groups were drawn from the same study hall, and the test room would not accommodate both groups at the same period, so time did not permit a test run with both of the groups on all of the units, as had been initially planned.

Since the low I.Q. group represented the lower common denominator of expected ability of the two groups, it was chosen to receive each unit. Lower ability students would be expected to bring out problems if the program had weak spots. When time permitted, the high I.Q. group also received the unit. This group appeared to perform somewhat better on a whole than the lower I.Q. group, although this was not clear-cut. These trial runs did not indicate any major difficulties or need for changes in the program. All units at this stage of testing appeared to be ready for the pilot test.
The Completed Program on Smoking and Health

The completed program may be found in Appendix III. It contained fifteen separate units on smoking and health. Each unit could be administered on a separate basis; however, units were designed to be given in sequence, and review frames were contained in successive units in order to reinforce certain points of importance.

Readability levels of each unit of the program were calculated and may be found in Appendix V. Both Unit VIII and Unit XV were a "corrected grade level," above seventh grade readability; however, in the judgment of the language arts consultant, a seventh-grade child could comprehend the programed material. The high grade level in respect to readability was due to repetition of many unfamiliar words. An expert in the field of readability suggested that the final judge in this matter should be the children for whom the program was written. As judged by their performance on the programs and on the performance tests, the seventh graders for whom this was written had no problems in receiving the intended message.

---

7 Personal Communication with Professor Edgar Dale.
At this time, the program was considered medically accurate, psychologically in sequence and educationally sound on the basis of small test groups. It was ready for the pilot test.

Summary

The first draft of any unit of the program was written on five by eight cards and tested with individual students who read it aloud. When five consecutive students were able to progress through the program without difficulty or error, the program was mimeographed in order to test written responses. Small groups of students were used in testing the written program units.

With the help of these small groups, the criterion test questions were shaped into suitable form and the program units were revised and retested until they appeared to be ready for general use. A trial run of the entire program was done with one group of ten lower I.Q. students, with I.Q.'s ranging from 90 to 109. These students were able to progress through the program satisfactorily and no major difficulties could be determined. The entire program was considered ready for the pilot test at this time.
CHAPTER VIII

PILOT TEST OF THE PROGRAM UNITS

The students to be used in the pilot test were not told they were to participate in the testing until shortly before the investigator was ready to begin the pilot test. They were notified by the principal a week in advance of the starting date, and were told they would be doing some experimental testing during the next few weeks during their study hall period.

This phase of programing is called validation testing, and is done with small numbers of students, often less than fifteen students.¹ The purpose is to gather data on performance characteristics of the program in respect to time, errors, and the criterion test. Validation testing is an over-all program evaluation.

Procedure for the Pilot Test

The two pilot groups were handled in exactly the same manner. One group met at eight and the other at nine in the

morning. The investigator was introduced to each pilot group by the teacher who did not remain, and was not present during any of the testing procedure.

The purpose of the pilot test was explained to the students as a research study to determine how students learn using a new kind of book called a programmed book. The procedure to be followed each day was outlined. Students were told that they would first be given a pre-test. Following this, they would receive a unit of programmed material. When this was completed, they would be given a post-test. They were asked to bring materials to study after they completed the program unit as it was anticipated that they would have some time left for study each day.

Students were informed that test scores would not be known to anyone, and that their school grades would not be influenced in any way by the test results. They were urged to cooperate and to consider that what they were doing would help other seventh grade students, not only in their school, but in other areas as well.

On the first day of testing, each student received a copy of the set of written directions that had been developed and used with the research study group. The directions were

---

2 Appendix III.
read aloud to the class, while each student looked at his own copy. Several examples were placed on the board to demonstrate the meaning of different directions. Students were told about some frames of the program that ask for a student's opinion. They were encouraged to express their views freely on such questions.

The same procedure was followed each day. The pre-test was given to the entire class. When a student finished the test, he was asked to turn his paper face down. The investigator collected the test and gave the student the programed book.

The same format was adopted for the pilot test book that had been used for the books given to the research study group. This is described in Chapter VII, and a sample is to be found in Appendix II. The student wrote his answers in the test book.

On the front of each book was an information page on which the student placed his name, age, school, grade, and class. There was also a place for the starting time and completion time of the program, and some spaces marked score, errors, and a blank space for I.Q. The page was arranged so that all pertinent data about each student could be placed on the top page and removed for ease in handling, later.
When the student finished his book, he placed the finishing time in the space provided for that purpose on the front page of the book, and raised his hand. The investigator collected the book and checked the time to be certain that it was correctly entered.

The student was then given the post-test. When this was finished, he turned in the test and was free to study. No talking was allowed in the classroom, and no discussions were permitted about the program, even after the entire group finished. Since the program was to be tested on its own merit, it was necessary to eliminate any possible factors from the test situation which might influence results.

An immediate post-test was given. This eliminated the opportunity for the student to gain knowledge from other sources between tests. Initial proficiency following programed instruction appears to be a good predictor of both short term proficiency, such as retention after three weeks, and delayed proficiency, such as retention after thirty weeks. Retests during the progress of this study with the

---

3Coulson and Silberman, p. 461.
research groups during the development of the performance tests also indicated the same trends when students were re-tested after a two-week period.

Programs were administered each day on Monday through Thursday. There was no study period on Friday. The entire administration was completed in three weeks, or twelve study periods. Usually a single program unit was given during a single class period, but, for some of the very short units that occurred in sequence, two units were given during a single class period. Every student finished the work well in advance of the end of a period. There were no pressures of time about finishing either the program or the performance tests. Each student was allowed to work at his own pace. Some students were observed to waste time, but no comment was made and they were allowed to work as they chose.

No units of the program were examined, except superficially, as they were collected. No performance tests were scored until the entire procedure was completed. All data from testing was held until the entire testing program was finished before it was examined.
Characteristics of the Test Group

There were forty-seven students in the pilot study test group, twenty boys and twenty-seven girls. The group was drawn from the general population described in Chapter IV. School records of children in the group indicated they were a cross-section of this same population. The majority came from middle class families. Parents were professional and white collar workers, for the most part, and represented lower middle to upper middle class. No history was taken to determine smoking practices of families of students in the test group.

The ability potentials of students, as measured by the California Test of Mental Maturity, revealed an I.Q. range of 77 to 130. Only one student, however, had an I.Q. below 90, and that was an I.Q. of 77. The mean I.Q. for boys was 109.6 and for girls 109.7. The mean I.Q. for the entire group was 109.6 with a standard deviation of 12.3. Since the mean I.Q. for the general population, using this same measure, is 100 with a standard deviation of 16.0, the pilot study group appears to have ability levels above the general population, and it is not nearly so variable.

The age of students in the pilot group ranged from 11.6 years to 14.2 years with a mean of 12.4 years. Only one
student was below the expected age for a seventh grade student and only one student was above this age range. The above age student was a girl with the I.Q. of 77.

**Analysis of Performance on the Criterion Test of Each Program Unit**

The criterion test for each unit of the program was designed to help determine whether the student reached the performance expected on the program unit. Identical tests were used for the pre and post-test measures of expected terminal behavior. Chapter VII describes the development of these questions.

**Gain rates**

The performance test for each program unit was analyzed separately. Performance questions were given no weighted value. Analysis was on the basis of the number of questions answered correctly on the pre-test, as compared to the number answered correctly on the post-test. Student gains, rather than pre-test and post-test scores, were used for the analysis. The pre-test score was subtracted from the possible pre-test score and the result was the gain possible for that student. This was designated as $c_{ijg}$. When the student completed the post-test, the pre-test score was
subtracted from the post-test score, the difference being the
gain made by the student. This was designated as \( cm \). The
ratio of the gain the student made and the gain he could have
made, \( cm/cp \), was his gain rate.

Table 1 contains a summary of the percentage of stu-
dents in each of four categories in respect to the \( cm/cp \)
ratio, or gain rate: 0.0 to 0.24, 0.25 to 0.49, 0.50 to 0.74
and 0.75 to 1.00. The mean ratio and standard deviation of
\( cm/cp \) for each unit are to be found in Table 2.

As would be expected with programed instruction, the
distribution of scores is negatively skewed for all units of
the program with the exception of unit X which presents a
nearly normal distribution curve. With this unit excluded,
over 50 per cent of the students had a \( cm/cp \) score of 0.75 or
better.

An occasional student seemed to have a learning
problem as reflected by his gain rate. One girl with an I.Q.
of 108 made zero gain on eight of the program units and very
small gain on the other seven. Because of the exceedingly
poor \( cm/cp \) ratios, other aspects of this student's perform-
ance were checked to see whether there were other indications
of a learning problem. Error rates were checked on both
total frames and terminal frames with no cues. In no case
### TABLE 1

**SUMMARY OF cm/cp GAINS, BY UNIT OF PROGRAM**

<table>
<thead>
<tr>
<th>Unit number of program</th>
<th>% Students with cm/cp score 0.0-0.24</th>
<th>% Students with cm/cp score 0.25-0.49</th>
<th>% Students with cm/cp score 0.50-0.75</th>
<th>% Students with cm/cp score 0.75-1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.00</td>
<td>0.00</td>
<td>12.8</td>
<td>87.2</td>
</tr>
<tr>
<td>II</td>
<td>4.5</td>
<td>0.00</td>
<td>20.5</td>
<td>75.0</td>
</tr>
<tr>
<td>III</td>
<td>8.9</td>
<td>11.1</td>
<td>22.2</td>
<td>57.8</td>
</tr>
<tr>
<td>IV</td>
<td>26.3</td>
<td>0.0</td>
<td>21.1</td>
<td>52.6</td>
</tr>
<tr>
<td>V</td>
<td>17.7</td>
<td>0.0</td>
<td>2.9</td>
<td>79.4</td>
</tr>
<tr>
<td>VI</td>
<td>31.6</td>
<td>0.0</td>
<td>0.0</td>
<td>68.4</td>
</tr>
<tr>
<td>VII</td>
<td>2.3</td>
<td>0.0</td>
<td>11.3</td>
<td>86.4</td>
</tr>
<tr>
<td>VIII</td>
<td>0.0</td>
<td>0.0</td>
<td>8.9</td>
<td>91.1</td>
</tr>
<tr>
<td>IX</td>
<td>8.1</td>
<td>0.0</td>
<td>5.4</td>
<td>86.5</td>
</tr>
<tr>
<td>X</td>
<td>16.3</td>
<td>37.2</td>
<td>34.8</td>
<td>11.7</td>
</tr>
<tr>
<td>XI</td>
<td>2.2</td>
<td>8.9</td>
<td>24.4</td>
<td>64.5</td>
</tr>
<tr>
<td>XII</td>
<td>0.0</td>
<td>0.0</td>
<td>2.1</td>
<td>97.9</td>
</tr>
<tr>
<td>XIII</td>
<td>8.5</td>
<td>2.1</td>
<td>31.9</td>
<td>57.5</td>
</tr>
<tr>
<td>XIV</td>
<td>0.0</td>
<td>2.3</td>
<td>27.9</td>
<td>69.8</td>
</tr>
<tr>
<td>XV</td>
<td>4.4</td>
<td>2.2</td>
<td>8.9</td>
<td>84.5</td>
</tr>
<tr>
<td>Unit Number of program</td>
<td>Mean cm/cp</td>
<td>St. Dev. cm/cp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>------------</td>
<td>----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0.930</td>
<td>0.147</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>0.772</td>
<td>0.230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>0.681</td>
<td>0.345</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>0.605</td>
<td>0.437</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>0.779</td>
<td>0.412</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>0.650</td>
<td>0.489</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>0.871</td>
<td>0.175</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIII</td>
<td>0.941</td>
<td>0.178</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IX</td>
<td>0.919</td>
<td>0.250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>0.457</td>
<td>0.296</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XI</td>
<td>0.779</td>
<td>0.256</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XII</td>
<td>0.940</td>
<td>0.111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XIII</td>
<td>0.773</td>
<td>0.314</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XIV</td>
<td>0.851</td>
<td>0.203</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XV</td>
<td>0.882</td>
<td>0.245</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
did she miss more than one frame in a unit, and missed only one terminal frame in the entire fifteen program units. She may have copied the answers to each frame without reading the frame, in which case she would be expected to be unable to improve performance on the post-criterion test. It is possible that she was unable to learn with this method of instruction even though she progressed through the program. Unfortunately, a follow-up of this student to determine the cause of her exceedingly poor performance compared to other students could not be done.

**Association of sex, I.Q. and time with gain rates**

The cm/cp ratio was analyzed to determine the contribution of three independent variables, sex, I.Q., and time, to the dependent variable, the cm/cp ratio. An analysis of covariance was done. The model used for this analysis was:

\[ y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \]

where \( y \) is the ratio of cm/cp, \( x_1 \) designates sex, \( x_2 \) I.Q., \( x_3 \) time, and \( b_0 \) is a contribution to \( y \) independent of all variables, and \( b_1, b_2 \) and \( b_3 \) are the estimated regression coefficients. The following hypotheses were tested:

1. Sex, I.Q., and time to complete a unit of the program, when considered together, do not influence the cm/cp ratio. \((b_1 = b_2 = b_3 = 0)\)
2. There is no difference between the sexes on the gain ratio of cm/cp. \( b_1 = 0 \)

3. I.Q. is not a factor in the gain ratio. \( b_2 = 0 \)

4. Time is not important in the gain ratio. \( b_3 = 0 \)

Table 4, Appendix V, contains the summary of the results of this analysis and Table 5, Appendix V, records the regression coefficients determined in the analysis. When the three independent variables, sex, I.Q. and time are considered together in relation to the cm/cp ratio, hypothesis one must be rejected for units II, III, XII and XV. For the remainder of the units, the hypothesis can be accepted.

For the units where hypothesis one was rejected, each variable was considered separately to determine which variables had an association with the cm/cp ratio. In unit II, both sex and I.Q. were associated with the ratio. Girls performed better than boys, significant at the five per cent level, and as I.Q. increased the cm/cp ratio increased, significant at the one per cent level. Only one variable was significantly associated with the cm/cp ratio in unit III. Girls performed better than boys on this unit, significant at the five per cent level.

Both I.Q. and time were factors in unit XII, higher I.Q.'s showing higher cm/cp ratios. Time showed a negative
correlation with the cm/cp ratio, time increasing as the score decreased. This was significant at the five per cent level.

The significance of the multiple correlation on unit XV is explained on the basis of I.Q., only. Significant at the five per cent level, increasing I.Q. was associated with increasing cm/cp ratios.

Considering hypothesis two, that the cm/cp ratio is no different between the sexes, girls performed better than boys on all the units except VII, VIII and XIII. However, the differences were significant only for units II and III, both significant at the five per cent level. Hypothesis two can be accepted for all units except II and III.

Hypothesis three, stating that I.Q. is not a factor in the cm/cp ratio can be rejected only for units II, XII, and XV. In all cases, higher I.Q. is associated with higher cm/cp scores.

Hypothesis four, that time is not a factor in the cm/cp ratio, is rejected for units XI and XII. Time has a positive correlation with the cm/cp ratio on unit XI, significant at the five per cent level, and a negative correlation with the cm/cp ratio on unit XII, also significant at the five per cent level. When the multiple correlation was done on unit XI, no significance was noted,
however, time was a significant variable when considered as a single factor. It had a positive correlation with the cm/cp ratio.

**Gain rates with I.Q.'s grouped above and below I.Q. 110**

In working with the two research study groups in which the I.Q.'s were divided into groups above and below I.Q. 110, the higher I.Q. group seemed to perform better than the lower I.Q. group. It was of interest to determine whether this was found in the pilot test group. The division separated the group into almost equal parts. Twenty-four students had an I.Q. of 111 or above, and twenty-three students had an I.Q. of 110 or below. The model used to study the grouped I.Q.'s was:

\[ y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \]

where \( y \) is again cm/cp and \( b_0 \) is again a contribution to \( y \) independent of all variables, \( b_1, b_2 \) and \( b_3 \) are the estimated regression coefficients, \( x_1 \) designates sex, \( x_2 \) the grouped I.Q.'s, and \( x_3 \) time. Table 6, Appendix V, contains the results of the significance tests and Table 7, Appendix V, records the regression coefficients for this analysis.

The result of the grouped I.Q. analysis was similar to that of continuous I.Q. analysis in respect to sex and
time to complete the program. However, there were differences in the association of the higher I.Q. group with higher cm/cp scores on every unit except units V and XIII. The association was statistically significant on units II, VII, and IX, X, XI, XII and XV.

**Error Analysis**

Errors on the program were considered in several different ways. They were charted by frequency of occurrence on the individual frames. They were examined on the basis of total errors on each unit of the program. They were analyzed on the basis of errors made on terminal or criterion frames with no cues.

No distinction was made between a wrong answer and a student's failure to put an answer in a blank. The latter was more often the case than the former. A few students consistently left answers blank, and these students accounted for a large part of the errors. One student left one-third to one-half of the answers blank on some units, and yet performed relatively well on the post-test, and made significant gain rates. Whether such students did not know the answer to the frame or did not want to bother to write the answer, is not known. It may have been the student's way of keeping up in completing time with his peers, although the competition
to finish first did not appear to be present in the pilot test groups, as it had been in the research study groups which had a different social situation and apparently a different level of motivation.

**Analysis of individual frame errors**

If a frame in the program contained only one error by a student, this error was considered a random error, and was ignored for the purpose of individual frame analysis. However, if a frame contained an error by more than one student, the frequency of errors for that frame was determined. The result of this analysis is found in Table 8, Appendix V. Ten frames out of the 528 frames of the program had error rates above ten per cent. These frames need to be considered for possible revisions.

**Analysis of total errors**

An analysis was made of the total errors on each unit of the program for all students combined. The total errors were added, and the percentage of errors on the entire unit was calculated. These ranged from a minimum of 0.2 per cent for unit VI to a maximum of 3.3 per cent for unit XV. In considering only the individuals who made errors, the mean total error rate is not above 3.0 per cent for any unit. The summary of these findings appears in Table 9, Appendix V.
Analysis of terminal errors

Correct performance on criterion or terminal frames indicates that the student has responded correctly in respect to expected behavior. It is of interest to analyze failure to reach the correct behavior. For this purpose the errors on terminal frames were totaled for all students, and the rate of terminal errors was calculated for the entire group. It ranged from zero errors on unit VI to 2.3 per cent terminal errors on unit XV. In considering only the students who made errors on terminal frames, the mean error rate of these students did not exceed five per cent on any program unit. A summary of these data is found in Table 9, Appendix V.

Association of errors with the cm/cp ratio

To determine whether an association existed between performance scores as measured by the cm/cp ratio and either the total or the terminal errors made by students, an analysis of covariance was done. The following model was used:

\[ y = b_0 + b_1x_1 + b_2x_2 \]

where \( y \) is the gain ratio, cm/cp, \( b_0 \) is a contribution to \( y \) independent of other variables, \( b_1 \) and \( b_2 \) are the estimated
regression coefficients, \( x_1 \) is the ratio of the terminal frames correct to the total number of terminal frames in a unit, and \( x_2 \) is the total number of frames correct to the total number of frames in a unit. Three hypotheses were tested:

1. Neither the terminal errors nor the total errors affect the size of the gain ratio, \( cm/cp \), \( (b_1 = b_2 = 0) \).

2. Terminal error rates alone are not important to the \( cm/cp \) ratio, \( (b_1 = 0) \).

3. Total error rates alone are not important to the \( cm/cp \) ratio, \( (b_2 = 0) \).

Table 10, Appendix V, contains the statistical data showing the significance of the variables. In considering both together, when the terminal and total error rates decreased an association was found with the increased \( cm/cp \) ratios on units I, II, IX and XII. However, when the error rates were considered on a separate basis, neither rate was significant on unit II, and only the total error rate of unit I and the terminal error rate of unit IX were significant. Hypothesis one is rejected for units I, II, IX and XII. Hypothesis two is rejected for unit IX and hypothesis three for unit I.
It has been previously noted that the error rates on both terminal frames and total frames were very low. The numbers under consideration are quite small as can be noted in Table 9, Appendix V. In dealing with numbers this small and with a small number of cases, the association determined needs to be explored more fully to ascertain whether it is meaningful. For the most part, error rates did not appear to influence the cm/cp score.

This is in line with findings that suggest that in sufficiently refined programs most of the errors are removed and the residual errors are a reflection of individual learning styles.\(^5\)

Time Analysis

The efficiency of a program can be measured in part by the time it takes subjects to work through the program. Table 12, Appendix V contains the summary of these findings on the pilot study group. From the standpoint of practical use of a program, the minimum and maximum time needed to complete a unit are probably the most important times to know. Maximum time will give an indication of what might be expected of the slowest student, and if a program is to be done during a

class period, this is important. The mean time and standard deviation were computed to show the variability that might be expected of each unit, and the over-all efficiency of the program units.

**Summary and Discussion of Validation Results**

Performance on the pilot test of the program units was measured by gain rate made by students on the unit, designated as cm/cp. Over fifty per cent of the students in the pilot group scored 0.75 or better on the fifteen units of the program with the exception of unit X, which did not show the typical negatively skewed curve that was noted on the rest of the units.

Unit X needs to be re-examined in respect to both the program and the criterion test questions. The criterion test gain rates resulted in a curve with a nearly normal binomial distribution of cm/cp ratios. It may be that some of the test questions are too difficult for the lower range of students, and that some of the questions need to be broken into two questions or reworded for clarity. Since the research study groups did not have a problem with the performance test on this unit, it is difficult to propose what the problem may be. The research study groups may have gained enough
additional background in some other way to better equip them to answer the questions.

Unit X, as a unit of programing, was re-examined. Time analysis and error analysis did not reveal any clues to a problem on the unit. It was a unit which neither time, I.Q., nor sex considered together, or separately on the whole student population showed any statistical significance in relation to cm/cp. When high and low I.Q.'s were analyzed, however, unit X did show a significant association between the higher cm/cp score and the higher I.Q. group. Both the program unit and the criterion test need to be scrutinized.

Analysis of the error rates on the program units indicates that these are not significant from the standpoint of acceptable error rates for programs. Errors were well below the acceptable rates of five to ten per cent.

When errors were studied on the basis of errors per frame, a small number of frames were found which needed to be re-evaluated since they were missed by slightly more than 10 per cent of the students. Examination of these frames reveals only one obvious weakness in the program, and that was the need for a reversal association that was not established on unit VII, frame 38. An association was established in one direction and the frame was then written for a
response in the reverse. It was expected that the student could make this reversal, but apparently this was an erroneous assumption and either the reversal association needs to be built into the program, or the frame calling for reversal of the association should be removed.

A study of other frames with multiple errors did not reveal so obvious a problem, but since the stimuli did not elicit the expected response, these frames need to be subjected to more student testing with a study of responses achieved on the frame. Since these frames do not constitute a large number of the total frames, and since they are distributed throughout the fifteen programs, they are not considered significant on the basis of total evaluation.

A study of cm/cp in respect to sex, I.Q. and time indicated that girls score better than boys, significantly so on some frames. Time to complete the program appeared to have little relationship to achievement, although it was positively correlated on unit XI and negatively correlated on XII with the cm/cp ratio. No explanation can be proposed for this.

A study of the program efficiency in respect to time revealed there was considerable variation between subjects, but that it was somewhat consistent from unit to unit.
Slower students complete one and a half to two frames in a minute while the faster students complete about twice that many. I.Q. and speed of frame completion is related, but not clearly and is not a good predictor of time to complete a unit.

I.Q. showed a positive relationship with the cm/cp score on some units when I.Q. of each student was studied separately, and on even more units when I.Q.'s were grouped into above and below I.Q. 110. While these findings indicate that I.Q. may have a relationship to somewhat better scores, it should be noted that gain rates were high for both groups, and this association should in no way be interpreted as a suggestion that the program should be used only for students with above 110 I.Q.'s. A case in point is one student, a girl, who had an I.Q. of 77. She scored a cm/cp ratio of 1.0 on seven of the fifteen units, and scored above 0.5 or better on the rest of the units. The program was expected to be adaptable primarily for I.Q. 100 or better, however, indications are that it can be successfully used with a wider range of I.Q.'s.
Limitations

A major limitation of the study was the lack of motivation of the pilot test group. In order to test the program in a way that was as unbiased as possible, the investigator participated at a minimum with students and avoided any discussions following the program. This was the only way that the program could be tested without possible external influence. Some students were somewhat unconcerned with their performance. They knew they were neither being graded nor would their scores be known. This limitation could have been eliminated by having a teacher administer the program in a classroom situation, however, this would introduce other variables which might be equally limiting.

Since the program was administered in book form, there was no rigid control over cheating on the program. Students were closely observed, and they were requested not to "peek" ahead. There may be some students who did look ahead, however. It is the opinion of the investigator that the number was small because of the close observation during administration of the tests. There were few students suspected of looking ahead before answering.

Although the program was administered daily for four days of each week for three weeks, this is not the way in
which the program would be used for a seventh grade class. The program units were developed to be used over the period of time during which a child was in the seventh grade, administered at four or five different points during the year.

The entire program was pilot tested toward the end of a school year. Some of the programs were developed at the beginning of the school year. In many units of the program, this would make little difference; however, on some of the less sophisticated areas such as the unit dealing with the social world of the child, it is felt that by the end of the seventh grade, this program unit may not be as suitable as it is in the early part of seventh grade when the child has just entered the environment of the junior high school. The last units in the program were developed toward the end of the school year, and if given out of order in the earlier period of the seventh grade, some of these units may prove too difficult.

During the year in Stark County, a special program about smoking and health was being conducted in the county with particular emphasis on education in the schools of the county. Teacher and parent workshops were held during the year, and a great deal of attention was given to education about smoking. This may account in part for the high
pre-test scores made by some students. All of the students in the pilot test group had been exposed to some education about smoking and health prior to administration of the programed units on the topic.

Performance test results were not divulged to the students; in fact, tests were not graded until after the entire testing had been completed. Some students were very interested in their test results, and were disappointed when they could not receive this information. It would have been preferable if they could have known their test results, for this would probably have increased motivation to succeed.

The research study group that was used in developing this program spent a great deal of time in group discussions aimed at determining needs for improving the program. These discussions coupled with release of the student from study hall accounted for an apparently much higher level of motivation on the part of students of the research study group. This may have been a limiting factor in pinpointing some of the program weaknesses. For example, the frame which had a high error rate with the pilot test group which called for an association reversal, presented no problem for the research study group. Higher motivation to succeed, or possibly better learning because of group discussions, or both factors may be involved.
It must be kept in mind that the program was developed for a specific population which is different from many other kinds of school populations. Not only did children come from predominantly middle to upper middle class backgrounds, but they had above average potential for achievement. Many came from privileged backgrounds and most children were from better educated families than the population as a whole in the county. Caution should be exercised in the use of this program for other kinds of populations without testing it with the new kind of population.
CHAPTER IX

RECOMMENDATIONS

This study was initiated because of the increasing problem of smoking among school children and the insufficiency of materials available for use in preventive education. Programed instruction is an approach that has not been used to date in education about smoking and health in the schools, and yet it appears to offer a number of advantages.

The major purpose of this study was to develop a program about smoking and health. Fifteen units were developed which covered areas about the topic considered pertinent and important to seventh grade children. These units were tested on a pilot basis and were found to yield significant gains, as measured by student performance.

The following recommendations are made for further study in regard to this program:

1. Since some students performed very well on one or more of the pretest questions in some units, ways of branching these students past the part of the program for which they already have a proficiency could be studied. This would
not be a difficult task in view of the sequential arrangement of the program. Repeating materials which are already well known to a student is undoubtedly discouraging and intensifies the boredom factor which is a problem, at times, with programed instruction, textbook reading, and other matters to which students must attend in order to learn.

2. Study the use of the program with a population having characteristics other than the one used. Higher or lower social class, different ethnic groups, different geographical areas, other kinds of communities such as rural communities or highly urban communities are some of the considerations that can be made.

3. Study the use of the program with lower ability students to determine whether it will benefit children with the below 90 I.Q.'s.

4. Since girls tended to perform better on the program, significantly so on some units, it is desirable to know whether this is due to the nature of the materials presented, or whether it is due to motivation to succeed, or to the more mature developmental level that has been reached by the seventh grade girl. The practice of smoking is more
prevalent among boys than girls in the seventh grade, and if the trend toward better test performance by girls is related to the materials per se, consideration of revision of materials using only boys in the developmental test groups would be indicated.

5. Measure of the retention of the materials learned from the program over time is desirable; a measure in six months, a year and possibly later is indicated.

6. Study the program in relation to attitudes and beliefs about smoking to determine whether attitude changes may be expected using this kind of instruction.

7. Compare the use of the program with other kinds of instruction to determine the relative value of the program as a means of instruction.

8. Experiment with the program adjunctively as homework for seventh graders as background knowledge for discussions in class.

9. Study the use of certain sections of the program in the classroom followed by discussion. Short units such as the social world, why adults smoke, and other units of

---

this kind within the program could easily be completed at the beginning of a class period, and be used by the teacher to motivate discussion.

10. Some of the units of the program may be suitable for use in lower or higher grades, depending upon the sophistication of students. Experiments are indicated to determine whether the program, or any part of it, has wider usefulness than seventh grade. The more difficult units that were developed toward the end of the seventh grade may be useful in early eighth grade. Correspondingly, the units developed for use in the early part of the seventh grade may be useful in the latter part of the sixth grade.

11. The ultimate concern in health matters is the action taken by the individual. To this end, the results of the use of the program should be measured over time to determine if the use of the program appears to be related to behavior in respect to smoking practices.

While this program was developed so that it could be used independently of a teacher, it is not implied that this is the only way, or even the preferable way for it to be used. This was the way that the program needed to be tested on its own merit, independent of the teacher variable. There are cases where there is no teacher to teach about smoking
and health, and since this program can be used independently of the teacher, it could serve a useful function in these cases.

It appears to be important that individuals be encouraged to make decisions in regard to future intentions about the health matters they study. Student discussions in which students make personal commitments, either to themselves or as part of a group, seem to be beneficial in this respect. It would seem desirable, whenever possible, to conclude the study of the program with some group inter-action. If this is not possible, other means of encouraging a decision about intended behavior should be sought. The student could be asked to make a written summary of the advantages and disadvantages of the practice of smoking, and to tell what conclusions he makes in regard to his own behavior.

The use of programed instruction in health education, and this program in particular, will need to be evaluated over time. There is much to encourage and little to discourage the use of this method of instruction. It is probable, however, that it will best be used to advantage along with lectures, discussions, films, T.V. and other teaching techniques. Whatever the use, the teacher in any given school situation is the best judge of how programed instruction fits into the particular school curriculum.
BIBLIOGRAPHY
BIBLIOGRAPHY

References Cited on Smoking and Health


Bergen, Bernard J., and Olesen, Edwina C. "Report on a Preliminary Survey of Smoking Habits of a Sample of Ninth and Eleventh Graders in a High School in Southern Connecticut" (Department of Epidemiology and Public Health, Yale University School of Medicine, 1963), 1-21. (Mimeographed.)

Burney, Leroy E. "Excessive Cigarette Smoking," Public Health Reports, LXXII, No. 9 (September, 1957), 786.


Dorn, Harold F. "Tobacco Consumption and Mortality from Cancer and Other Diseases," Public Health Reports, LXXIV, No. 7 (July, 1959), 581-593.


Heath, C. W. "Differences Between Smokers and Non-Smokers," AMA Archives of Internal Medicine, CI, No. 2 (February, 1958), 377-388.


Lilienfeld, A. M. "Emotional and Other Selected Characteristics of Cigarette Smokers and Non-Smokers as Related to Epidemiological Studies of Lung Cancer and Other Diseases," Journal of the National Cancer Institute, XX (1959), 259-282.


Sallak, V. J. "What are the Facts on Teen-Age Smoking?" Bulletin, National Tuberculosis Association, XLVI, No. 9 (October, 1960), 9-10.


Snider, Marvin. "The Relationship Between Fear Arousal and Attitude Change," Children's Service, Massachusetts General Hospital and Department of Pediatrics, Harvard Medical School (1963). (Ditto.)


"The Impact of an Educational Program on Teen-Age Smoking Habits," The Journal of the Maine Medical Association, LIV, No. 5 (May, 1963), 108-111.


References Cited on Programed Instruction

Akerman, John H., and Gilbert, Thomas F. Routine Epidemiological Investigation of Food-Borne Disease, Atlanta: Communicable Disease Center, Training Branch.


Campbell, Vincent N. "Bypassing as a Way of Adapting Self Instruction Programs to Individual Differences," Journal of Educational Psychology, LIV, No. 6 (December, 1963), 337-345.


Pressey, Sidney L. "A Puncture of the Huge "Programing" Boom?" *Teachers College Record*, LXV, No. 5 (February, 1964), 413-418.


Reynolds, Robert L. "Programmed Instruction: A Teaching Tool for the Health Professions." Paper read before the meeting of the Conference of Public Health Training Section, American Public Health Association, November 13, 1963. 1-10. (Mimeographed.)


Other References Cited

Dale, Edgar, and Chall, Jeanne S. *A Formula for Predicting Readability*. Columbus: The Ohio State University, Bureau of Educational Research, n.d.


Selected References on Smoking and Health


**Selected References on Programed Instruction**


APPENDIX I

READABILITY DETERMINATIONS
TABLE 3
READABILITY PREDICTIONS OF UNITS*

<table>
<thead>
<tr>
<th>Program Unit</th>
<th>Formula Raw Score</th>
<th>Corrected Grade Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>5.7</td>
<td>5-6</td>
</tr>
<tr>
<td>II</td>
<td>5.8</td>
<td>5-6</td>
</tr>
<tr>
<td>III</td>
<td>5.4</td>
<td>5-6</td>
</tr>
<tr>
<td>IV</td>
<td>6.2</td>
<td>7-8</td>
</tr>
<tr>
<td>V</td>
<td>5.2</td>
<td>5-6</td>
</tr>
<tr>
<td>VI</td>
<td>6.1</td>
<td>7-8</td>
</tr>
<tr>
<td>VII</td>
<td>6.6</td>
<td>7-8</td>
</tr>
<tr>
<td>VIII</td>
<td>7.2</td>
<td>9-10</td>
</tr>
<tr>
<td>IX</td>
<td>6.3</td>
<td>7-8</td>
</tr>
<tr>
<td>X</td>
<td>6.8</td>
<td>7-8</td>
</tr>
<tr>
<td>XI</td>
<td>6.8</td>
<td>7-8</td>
</tr>
<tr>
<td>XII</td>
<td>6.9</td>
<td>7-8</td>
</tr>
<tr>
<td>XIII</td>
<td>6.8</td>
<td>7-8</td>
</tr>
<tr>
<td>XIV</td>
<td>5.7</td>
<td>5-6</td>
</tr>
<tr>
<td>XV</td>
<td>7.2</td>
<td>9-10</td>
</tr>
</tbody>
</table>

*Edgar Dale and Jeanne S. Chall, *A Formula for Predicting Readability* (Columbus: The Ohio State University, Bureau of Educational Research, n.d.), pp. 1-28, was used as a guide for these predictions.
APPENDIX II

SAMPLE OF A PROGRAM FRAME
4. over

thinking

habit

5. We have learned that a habit is *_____________________

_____________________________________________________

_____________________________________________________
APPENDIX III

AN AUTO-INSTRUCTIONAL PROGRAM ON SMOKING AND HEALTH
Directions

You are going to be working with a new way of learning. It is called programmed learning. You will be asked to read carefully and to write the correct answer when you find a blank space like this___________.

You are not taking a test. You will be learning new things, and after you have learned them, you will be asked to write them down. This is how programmed learning works:

1. First, you read very carefully.

2. Second, you think about what you have read and decide on the correct answer for the blank or blanks.

3. Third, you write your answer in the blank.

4. Fourth, turn the page and you will find the correct answer.

5. Fifth, if you had the wrong answer, remember what the correct answer is so that you will know it next time.

You will not make a mistake very often because the program is written so that you will get most of the answers. If you do miss an answer, do not worry about it. You will probably have a chance later to answer the same question correctly. There are no trick questions.

Remember to read carefully. You should read every word. Work rapidly, but do not rush. Think carefully about your answer. Write your answer, and then turn the page to check your answer. Do not turn the page until after you have written your answer. Remember this is not a test. You will be tested at the end of the program to see what you learned.

If a blank has more than one word in the answer it will be marked with an asterisk (*) like this: *___________. If the answer is only one word the blank will look like this: ________.
Sometimes you will see a blank with one or more letters at the beginning of the blank. This means the word in that blank has those letters at the beginning. If the letters are at the end of the blank it means the word begins with those letters. For example, _________r means that the word ends with r and _______ means the word ends with er.
I. THE CIGARETTE ADVERTISER

1. Brushing your teeth every morning after breakfast is a habit. Every day you do many things that are__________.
   (habits)

2. Biting fingernails is something that some people do. They do it over and over without thinking about what they are doing. Biting fingernails is a__________.
   (habit)

3. Biting fingernails and brushing teeth are both___________. These are things that some people do__________and over without___________about what they are doing.
   (habits, over, thinking)

4. When a person repeats something over and___________until he does it without___________about what he is doing, it is a___________.
   (over, thinking, habit)

5. We have learned that a habit is *___________.
   (something that a person does over and over without thinking about what he is doing)

6. Most people would say that brushing your teeth after breakfast is good. Brushing your teeth is a___________ habit.
   (good)

7. Most people would say that nail biting is a bad___________.
   (habit)
8. Some habits are good and some habits are not good. We can say that there are _______ habits and _______ habits.

(good, bad)

9. To repeat something over and over is called repetition. (Repetition is pronounced rep'- e - tish'- un). Habits are learned by repetition. Repeating the same thing over and over is called _______. We learn _______ by repetition.

(repetition, habits)

10. Repeating the same thing over and over is _______. We learn _______ by _______ which means to repeat the same thing over and over.

(repetition, habits, repetition)

11. We know that habits are learned by _______ or by repeating the same thing over and over. We know that there are two kinds of habits, _______ habits and _______ habits.

(repetition, good, bad)

12. A habit that some people learn is cigarette smoking. Some people start repeating cigarette smoking over and over. These people _______ the habit of cigarette smoking by _______. Do you think cigarette smoking is a good or bad habit? _______. Why? _______.

(learn, repetition)

You were asked to give your opinion whether cigarette smoking was a good or bad habit. There is no right answer since you were asked to tell what you thought. You might like to discuss your opinion with your friends and your teacher to see whether they agree with you.
13. In order to sell more cigarettes a cigarette company tries to get more people to learn the habit of smoking cigarettes. One way they do this is by using advertisements about cigarettes. Advertising is the major way that cigarette companies try to _______ more cigarettes.

(sell)

14. Sometimes we use the word ad for advertisement. A short word for advertisement is _________.

(ad)

15. The more cigarettes a company ________ the more money it _________.

(sells, makes)

16. Cigarette advertisers try to get us to copy the way that people behave in cigarette ads. The people in the ads are smoking cigarettes. We are doing what the cigarette ________ wants us to do if we ________ cigarettes.

(advertiser, smoke)

17. Advertisers try to get us to smoke cigarettes by appealing to our imagination. They hope we will imagine ourselves in situations like they show in their ads. Advertisers appeal to our _________.

(imagination)

18. Cigarette advertisers know that most of us want to have friends. The advertiser often shows friends smoking together in an ad. He hopes that we will imagine that it is friendly to smoke. The advertiser is trying to appeal to our _________.

(imagination)
19. A cigarette ad may show a cute girl and a nice looking boy smoking cigarettes together. This ad is trying to appeal to our_________. The advertiser wants us to _________that attractive people smoke cigarettes.

(imagination, imagine)

20. Cigarette ads show pictures of young people who are doing interesting things. In cigarette ads boys have sports cars and girls have expensive clothes. These ads try to appeal to our_________.

(imagination)

21. Cigarette ads show young men that are strong, handsome, popular and athletic. These ads try to appeal to a boy's_________. The advertiser hopes that a boy will imagine that he must smoke if he wants to be like the man in the_________.

(imagination, ad)

22. Cigarette ads show young girls who are cute and popular. These ads are trying to appeal to a girl's_________. The advertiser hopes a girl will_________that all girls who smoke are cute and popular.

(imagination, imagine)

23. Popular people have lots of friends. Nearly all of us would like to be popular. This would mean we would have lots of_________.

(friends)

24. The cigarette ads try to make the people in the ads look like popular people. The cigarette smokers in these ads are always surrounded by people who look like friends. The advertiser hopes that you will imagine that
cigarette smokers are people who are _________ and have lots of _________.
(popular, friends)

25. The cigarette advertiser wants us to imagine that popular people always smoke cigarettes. He would like for us to imagine that we must smoke cigarettes to be _________.
(popular)

26. The advertiser is trying to persuade us to smoke cigarettes. If more people smoke cigarettes the cigarette company will make more money. The more cigarettes a company sells the more _________ it can make.
(money)

27. If the advertiser can persuade us to smoke cigarettes over and over, after a time we will learn the habit of cigarette smoking. Learning the ________ of cigarette smoking is what the advertiser wants us to do. If we learn this habit the cigarette company can make more money.
(habit)

28. By appealing to the imagination the advertiser has found a way to sell cigarettes to some people. The advertiser persuades these people by getting them to use their ________ in the way that he wants them to use it.
(imagination)

29. Advertisers have been called the "hidden persuaders" because they try to appeal to our secret wishes through our imagination. It is through our own _________ that advertisers try to _________ us to use cigarettes.
(imagination, persuade)
30. If we recognize that advertisers are trying to persuade us to use cigarettes so the cigarette company can make more money, then we can say NO if we want to say NO. We have a choice. We can either say_________I am persuaded or_________I am not persuaded.

(yes, no)

31. It is much easier to make our own choice and not be fooled by an advertiser, if we know HOW advertisers try to persuade us. We can recognize that the advertiser tries to appeal to our_______.

(imagination)

32. It is also easier to make our best choice if we think about WHY the advertiser is advertising his product. We can recognize that the advertiser is most interested in selling more of his product so his company can make more _________.

(money)

33. Every cigarette ad does not try to appeal to the same person. Some ads try to appeal to men and some to women. Some ads try to appeal to young people and some ads try to appeal to older people. Have you ever noticed how different cigarette ads appeal to different kinds of people?_________yes_________no. If you have not ever noticed this, perhaps you will the next time you see a cigarette ad. Next time you see an ad, maybe you will be able to guess what kind of a person the ad is trying to persuade.
II. HABITUATION

1. If a person smokes cigarettes regularly, by repetition he learns the _______ of smoking.

   (habit)

2. If he smokes cigarettes over and over he _______ the habit, and then he smokes them without _______ about what he is doing.

   (learns, thinking)

3. There are some habits that may endanger our freedom of choice when we try to stop them. We say that such habits make a slave of us or take away our freedom. If a habit makes a slave of us, it takes away our _______.

   (freedom)

4. Most habits do not take away our freedom because we are free to break most habits if we really want to. We are a slave to a habit if it takes away our _______.

   (freedom)

5. When a person loses his freedom to quit a habit, he has become a _______ to that habit.

   (slave)

6. It is called an habituation (ha - bit' - u - a - shun) when a person loses his freedom to quit a habit. When a person is a slave to a habit, he has an _______.

   (habituation)
7. We are going to discuss habituation (ha - bit' - u - a - shun). (This is a long word to learn. Notice how the first part of the word habituation comes from the word habit). We usually use the word habituation when we mean more than just a habit. When a person loses his freedom to quit a habit, this is an_________.

(habituation)

8. Pronounce habituation to yourself. (ha - bit' - u - a - shun). Habituation is a noun that comes from the word habit. The noun that you have learned that comes from the word habit is_________. An habituation is more than just a habit.

(habituation)

9. Doctors call it an habituation when a person is a slave to the habit of smoking cigarettes. It is an habituation if a person desires cigarettes and is a_________to the habit of smoking cigarettes. An habituation is more than just a habit.

(slave)

10. When a person is unable to quit smoking cigarettes he is a slave to the habit of smoking. Doctors say that he has an_________to cigarettes. This means it is_________ than just a_________.

(habituation, more, habit)

11. Everyone does not respond the same way to cigarette smoking. Some people seem to be able to quit smoking cigarettes when they want to. Other people do not seem to be able to quit smoking cigarettes when they want to. Doctors say that these people who cannot quit have an_________to cigarettes.

(habituation)
12. An habituation is more than just a habit. It is much harder to quit an_________than it is to quit a_______.

(habituation, habit)

13. There is no way to tell before you start smoking cigarettes whether you will be able to quit smoking them when you want to. It is very hard to_________an habituation.

(quit)

14. There is a reason why a person with an habituation cannot quit the habituation. The person may respond physically when he no longer has the thing to which he has an habituation. For example, if a person has an habituation to smoking cigarettes, and he is not allowed to smoke, he may respond__________.

(physically)

15. Signs of responding physically may be such things as a person feeling sick or dizzy. There are other signs of a person responding physically, but feeling sick and dizzy are two signs of a person responding___________.

(physically)

16. To feel irritable (cross) or "nervous" may be signs of a person responding physically. To be unable to concentrate may also be a sign of a person responding physically. There are many different ways a person will feel when he is responding___________.

(physically)

17. When a person responds physically, something is happening inside his body. There are different things a person feels when he is responding physically. These things are the result of something happening___________.

(inside)
18. If a person feels sick or dizzy, these are signs that something is happening inside his body. They are signs that he is _________physically to something happening _________his body.

(responding, inside)

19. If a person responds physically when he cannot smoke cigarettes, and he feels he cannot do without cigarettes, doctors say that the person has an _________to cigarettes.

(habituation)

20. One sign that some cigarette smokers notice when they cannot have cigarettes is that they feel very irritable. When they want a cigarette, but they cannot have one, some cigarette smokers say that they feel very _________.

(irritable)

21. Not being able to concentrate (keep the mind on something) is another sign that some cigarette smokers notice when they cannot have a cigarette. When they want a cigarette, but they cannot have one, some cigarette smokers notice that they are unable to _________.

(concentrate)

22. Some cigarette smokers feel ________ and some cigarette smokers cannot _______ when they try to quit smoking cigarettes. These are two signs that may happen when a person with an habituation tries to quit smoking.

(irritable, cross, concentrate)

23. If a cigarette smoker feels that he cannot do without cigarettes, and he notices he responds physically when he does not have cigarettes, doctors call this an _________to cigarettes.

(habituation)
24. This is more than just a habit. The physical response that happens is too unpleasant, and the person feels he cannot ________ smoking.

(quit)

25. You may have a habit of eating candy between meals. If you have to do without candy, you may miss it, but you do not have a physical response when you do not have candy. Eating candy every day between meals is not an habituation it is a ________.

(habit)

26. At first, smoking cigarettes is just a ________. A person is able to smoke or not smoke as he chooses.

(habit)

27. For most people, cigarette smoking rapidly changes from a simple habit into a strong habituation. When a person is no longer able to leave cigarettes alone, and has signs such as being irritable and "nervous" when he does not have cigarettes, then he does not have just a _________ of smoking cigarettes. He has an _________ to smoking cigarettes.

(habit, habituation)

28. Some people who smoke develop an habituation in a short period of time. For others, it takes a longer period of time. At the end, almost anyone who smokes develops an _________.

(habituation)

29. There is no way to predict how long it will take for a person to develop an _________.

(habituation)
30. There is no way to predict who will be able to quit smoking and who will not be able to quit smoking. A few people can give up smoking without any problem. Most people who smoke for any length of time develop an ________ and find it very difficult to_______ smoking. (habituation, quit)

31. At first, a person has full control of his habit of smoking. He can smoke cigarettes or not, just as he wishes. After awhile this may not be true. When a cigarette smoker no longer has full control of his habit, doctors say that he has an_________ to smoking cigarettes. (habituation)

32. Some people with both character and will power do not seem to be able to stop smoking cigarettes. To quit cigarettes seems to take more than_______ and *_______ for the people who have an habituation to cigarettes. (character, will power)

33. Some people may need medical help if they want to quit an habituation to cigarettes. Some people may need to see their_________ in order to get medical help with their habituation. (doctor)

34. Several hundred things are found in cigarette smoke. One of these is a chemical called nicotine. Nicotine is the thing that most doctors think causes an habituation to cigarettes. The cause of an habituation to cigarettes is thought to be due to a chemical in cigarette smoke called_________. (nicotine)
35. When a person has an habituation to cigarettes, he may respond ________ when he is not allowed to have a cigarette. The thing which he seems to miss from the cigarette smoke is ________.

(physically, nicotine)

36. When a person has an habituation to cigarettes, the thing in cigarette smoke which he does not seem to want to do without is ________.

(nicotine)

37. An habituation is ________ than just a habit. It is a habit that is out of control. An habituation is very hard to ________

(more, quit)

38. The reason it is so hard to quit an ________ is that the person may respond ________. He finds this unpleasant.

(habituation, physically)

39. When a person responds physically, this may be so unpleasant for him that he will not quit the thing which will relieve him of the unpleasant feeling. Many people who smoke regularly are unable to quit smoking cigarettes. They probably have an ________ to cigarettes. Of the hundreds of things in cigarette smoke, the thing which cigarette smokers do not want to do without seems to be ________.

(habituation, nicotine)

40. It is not possible to tell which people who begin smoking cigarettes will develop an habituation. In the end, most people who smoke regularly develop an ________ to the ________ in cigarette smoke.

(habituation, nicotine)
41. If a person is habituated to smoking cigarettes, he is a slave to the habit of smoking cigarettes. He seems to lose full control of making his own choice about whether to smoke or not. He finds it very hard to quit. Most people prefer to avoid an habituation because they do not want to lose control of their own actions. What advice would you give a teen-ager who has not started smoking if he asked you how to avoid an habituation to cigarettes.

(Put your answer below)

your answer:

41. One way that you could answer him (or her) would be to tell him that a small amount of smoking for a short time seems to lead to an habituation for some people. For this reason, the only way to avoid a possible habituation is to avoid smoking cigarettes.

42. Sometimes a young person is very curious. He or she may try smoking a cigarette to see what smoking is like. A person sometimes tries smoking a cigarette out of _______.

(curiosity)

43. Curiosity is natural and most people understand it because they are curious about new things themselves. Most people understand what it is like to smoke a cigarette out of _______.

(curiosity)

44. If a young person repeatedly tries out cigarettes, this is no longer _______.

(curiosity)
45. Repeatedly trying out cigarettes can develop into a problem for a person. The problem may be the development of an habituation. When this occurs the person may find that he is unable to _________ smoking cigarettes.
(quit)

46. Some teen-agers think that if they smoke a cigarette only once a week that there is no danger of developing an habituation. This is not true. Regular smoking as often as once a week can develop into an_________.
(habituation)

47. Some teen-agers think that if they only smoke once in awhile with their friends, that there is no danger of developing an habituation. This is not true. Any amount of cigarette smoking can develop into an_________.
(habituation)

48. Most teen-agers who smoke think they can quit smoking anytime that they want to do so. After smoking for a few months or a year many of them find that this is not true. By then, they may have an_________ and be unable to_________.
(habituation, quit)

49. When a teen-ager first develops an habituation, he usually will not admit it. At first he says, "I can quit smoking, but I do not want to quit smoking." When you hear a teen-ager say this, he may have already fallen into the "tobacco trap" of habituation. Have you ever heard a teen-ager say that he can quit smoking, but he does not want to? Yes_________ No_________.

It is possible that you have not heard a teen-ager say this. If you have heard one say this, it is quite possible that he is not being honest with himself. If he still smokes, he does not know whether he can quit or not.
III. THE PRETENDERS

1. Learning to smoke cigarettes is not easy. It is difficult. Learning to smoke is ______ rather than easy.
   (difficult or hard)

2. Some people pretend that learning to smoke is easy because if they pretend it is easy it makes them feel "big." They do not want to admit that learning to smoke is _______. They ______ that smoking is easy.
   (difficult, hard, pretend)

3. No one is born with the knowledge of how to smoke a cigarette. Everyone who smokes has to learn how to smoke. It is difficult rather than easy to ______ to smoke.
   (learn)

4. Some boys try to be "big shots" and pretend that they enjoyed their first cigarette. They pretend that smoking is ______ to learn. Some girls think they can impress other girls by ______ they enjoyed their first cigarette.
   (easy, pretending)

5. People who say that they enjoyed smoking their first cigarette are usually just trying to be "big shots" or trying to impress others. It is not likely that smoking the first cigarette will be an experience which will be ______ by the smoker.
   (enjoyed)

6. One reason that learning to smoke is difficult is because smoke irritates (bothers) your eyes. When smoke gets into your eyes, it ______.
   (irritates)
7. When smoke irritates your eyes, tears form. Cigarette smoke_________your eyes and causes_______to form.

(irritates, tears)

8. It is not easy to learn to smoke cigarettes. It is unpleasant. The smoke from a cigarette can cause_______to form in your eyes. This is a sign that your eyes are _________by cigarette smoke.

(tears, irritated)

9. Another thing that happens when people try to smoke is that smoke irritates their throat and lungs and causes_______ . When a person's throat and lungs are irritated by smoke, it causes_______.

(coughing)

10. When lungs or throat are irritated by smoke you_______ . When your eyes are irritated by smoke they form_______.

(cough, tears)

11. Throat, lungs and eyes can all be_______by cigarette smoke.

(irritated)

12. When some people first try smoking they get very_______ . This happens because some of the things in the smoke are irritating to a person. There are things in cigarette smoke that irritate some people and make them feel very _________.

(dizzy)
13. When a person is dizzy this is a sign that something is happening inside of his body. Irritation inside of a person's body can make him feel ________.

(dizzy)

14. There are things in cigarette smoke that can cause nausea in some people. (Do you know the word nausea? It means sickness of the stomach.) Some things in cigarette smoke can cause dizziness, ________ or both.

(nausea)

15. There are things in cigarette smoke that irritate a person. These things cause some people to be sick and some people to be dizzy. To become sick or dizzy from smoking cigarettes happens because there are things in cigarette smoke that ________ a person.

(irritate)

16. A person can be irritated by some of the things in cigarette smoke. When this happens, some people get ________ and other people get ________.

(sick or nauseated, dizzy)

17. Almost everyone who tries smoking cigarettes has some discomfort. Learning to smoke is not easy. It is ________ to learn to smoke.

(hard or difficult)

18. We have learned that when cigarette smoke ________ your eyes they form ________. When cigarette smoke ________ your throat and lungs you ________.

(irritates, tears, irritates, cough)
19. Some of the things in cigarette smoke irritate a person. He can have signs of irritation such as feeling_______ or feeling_______. Sometimes both of these happen to a person.

(sick, dizzy)

20. No one is born knowing how to smoke cigarettes. It is something that a person has to_______how to do. Most people find it_______rather than_______to learn to smoke.

(learns, difficult or hard, easy)

21. A pretender is someone who pretends or who makes believe that something is true. Have you ever heard a beginning cigarette smoker called a pretender? _______yes _______no

21. The people who say they enjoyed their first cigarette are sometimes called THE PRETENDERS. They are usually just pretending that they enjoyed their first cigarette. It is more likely that they coughed or had tears or that they were sick or dizzy. Have you ever heard anyone tell about smoking a first cigarette? _______yes _______no. If yes, what did they tell?

________________________________________________________________________
IV. TOLERANCE

1. To tolerate means to allow or permit. If you allow something you tolerate it.

(tolerate)

2. Sometimes a person that you do not especially like "runs around" with your crowd. If you allow this, you tolerate it.

(tolerate)

3. To allow or permit means to tolerate.

(tolerate)

4. When summer comes, you usually want to swim and play out in the sun. If your skin is light colored, you can get too much sun and your skin will burn. Light skin cannot tolerate too much sun.

(tolerate)

5. The first time you want to swim and play in the summer sun, if your skin is light colored it cannot tolerate too much sun.

(tolerate)

6. If you get out in the sun for a little while each day your skin will get darker in color. Your skin can tolerate a longer stay in the sun.

(tolerate)

7. Your skin builds up a tolerance to the sun. This means that after several exposures to the sun your skin can
tolerate more sun than it could at first. Your skin can tolerate a longer time in the sun without burning after it builds up a ________ to the sun.

(tolerance)

8. When your skin can tolerate a longer stay in the sun, it has built up a________ to the sun.

(tolerance)

9. Your body can develop a tolerance for other things. Not all of the things your body tolerates are useful. Some things for which your body can build up a tolerance may even be useless or harmful. Your body can develop a tolerance to some things that are useless or even ________.

(harmful)

10. Cigarettes are not useful to the body. We know that there are things in cigarette smoke that irritate a person and cause nausea and dizziness. Nausea and dizziness are caused by things in cigarette smoke that ________ a person.

(irritate)

11. We have seen that the body responds unfavorably because of the irritating things in cigarette smoke. One sign of this irritation is to get________.

(sick, dizzy)

12. Your body responds unfavorably to anything which is a poison. Cigarette smoke has some things in it which ________ your body.

(poison)
13. When a person responds to cigarette smoke by becoming sick or dizzy, this happens because there is something in cigarette smoke which acts as a ________ to him.

(poison)

14. When a person becomes sick, his body is trying to get rid of things that irritate it or act as poisons. The irritating things which ______ a person are rejected when he becomes ______ at his stomach.

(poison, sick)

15. Nicotine is one thing in a cigarette which is very poisonous. A substance in cigarettes which is poisonous is _________.

(nicotine)

16. The amount of nicotine found in several cigarettes could kill a person if he got all of it at one time. One thing in cigarette smoke that is very poisonous is _________. There is enough of it in several cigarettes to ______ a person.

(nicotine, kill)

17. When a person is trying out cigarettes and gets sick or dizzy from them, his body is responding to the poisonous chemicals in the smoke. His body is trying to reject the ________ in the smoke.

(poison or poisons)

18. Nicotine is one _______ in cigarette smoke. It seems to be the cause of beginning smokers feeling _______ or _______ or both.

(poison, sick, dizzy)
19. Some people keep trying to smoke even though they get sick and dizzy. First their body tries to reject the poison, and they become sick. If they keep smoking, their body tries to build up a tolerance to the poisons. The body defends itself against the__________in cigarette smoke by building up a__________to them.

(poisons, tolerance)

20. When a beginning smoker gets sick from a cigarette, his body is trying to reject the__________in the smoke.

(poisons)

21. If he keeps exposing his body to these poisons, it will defend itself by building up a__________to the poisons in the cigarette smoke.

(tolerance)

22. This does not mean that nicotine is no longer a poison to the person after he has tolerance to it. Nicotine is still a__________. It means that the warning signs of the dangers are gone.

(poison)

23. Now the body is able to take the effects of the poisons in cigarette smoke without signs of sickness or dizziness. This is unfortunate because the effects were warnings, and they have now gone under cover. Dizziness and nausea are__________against the__________in cigarette smoke.

(warnings, poisons)

24. Once the warnings are gone and there is tolerance; the signs of the poisons in cigarette smoke cannot be seen. Tolerance helps the body adjust to the__________in cigarette smoke. Tolerance also removes the__________signs that poisons are present in cigarette smoke.

(poisons, warning)
A person may get sick, dizzy, cough and have tears from the irritation of cigarette smoke, but if he keeps smoking cigarettes his body will build up a _______ to the smoke. When this happens, the signs of _______ are gone.

(tolerance, warning)
V. OUR SOCIAL WORLD

1. An important part of our world is our social world. Our social world is that part of our world that we spend in the company of our friends. When you go on a camping trip with your best friends, this is an example of being in your ________ world.

   (social)

2. When you have a party and invite your friends, this party happens in your ________ world.

   (social)

3. In your _____ world you have companionship with your best ________.

   (social world, friends)

4. We call our special friends "our group" or "our crowd." Our special friends are part of our ________ ________.

   (social world)

5. When "our group" gets together after school to play, we are in our * ________.

   (social world)

6. Our group is important to us because it is made up of our best________.

   (friends)

7. Sometimes our group meets, and someone in our group suggests an activity for the whole group. Usually we go
along with our group because it is made up of our best _________.

(friends)

8. Someone may suggest a picnic or party. We may either choose to go or refuse to go. Usually, if our group suggests it, we want to go. We enjoy a picnic or party with our group because it is made up of our best_______.

(friends)

9. Our social world is important to all of us because it is made up of our_______.

(friends)

10. Sometimes there will be someone in our group who has a plan for the group that we do not want to follow. Our group does not always plan things that we_______to do.

(want)

11. Most of us want to please our friends, and often we go along with our group just to_______our friends. We do not want to say_______to our group.

(please, "no")

12. Can you tell about a time when you DID NOT want to follow the group, but you went along with them because you could not say "no"? Tell about it:

All of us have experiences when we did not say "no" even though we wanted to. It is part of becoming mature when we can say "no" when we think it is best.

13. There may be times when someone in your group suggests something that you do not want to do because you think
you should not do it. Perhaps it is dangerous or unwise. This may be a time when you need to say________instead of "yes" to your group.

("no")

14. If you are just learning to swim, and someone in your group suggests that you dive off of the high diving board, you may not want to dive because you do not know how. It may be wise to say________instead of "yes" at a time like this.

("no")

15. If someone says "I dare you to dive," it may be best to say, "No, I *_________dare do it because I do not know how to dive."

(do not)

16. When someone says "I dare you," it may be very hard to say________instead of "yes" to the dare.

("no")

17. In winter your group may go skating on thin ice. They may dare you to follow. It is probably wise for you to say "no, I *________to do such a foolish thing."

(do not dare, do not want)

18. When your group suggests something to do, you need to choose whether you will say________or________.

("yes" "no")

19. When you do not want to follow your group, and you are able to refuse to follow along with them, you are
independent. If you can refuse to follow when you want to, you are ________.

(independent)

20. Some people are independent and some people are not ________.  

(independent)

21. If you do not follow the group just because someone suggests it, you are i______.

(independent)

22. It is more mature to think for yourself. When you think for yourself you are i_______. You do not just follow the leader without thinking things through.

(independent)

23. People who do not just follow the leader are_______ people. They think for themselves. Then they decide whether or not to_______ the group.

(independent, follow)

24. When you have a chance to make up your own mind about something, but you let others do it for you, you are dependent. When you do not think for yourself, you are d_______. When you think for yourself, you are _________.

(dependent, independent)

25. Independent people are more mature than d______people.

(dependent)
26. In your social world, sometimes your crowd treats someone unjustly. If you do not believe your crowd is right, but you go along with them just because they are your friends, you are allowing them to make up your mind for you. If you cannot decide for yourself when you think your crowd is wrong, you are _________.

(dependent)

27. If someone in your group suggests destroying property or doing something dishonest, you will not do it because you know it is not the thing to do. By refusing to follow along with the crowd, you are ________ rather than dependent.

(independent)

28. Cigarette smoking is something we sometimes see in our social world. Sometimes a member of our own group may suggest that we try cigarette smoking. This is a time when we can decide whether to follow the leader. If we follow the leader just to be like the group, we are being ________. If we make up our own minds, we are being _________.

(dependent, independent)

29. Learning to make up your own mind about things in your social world is part of becoming an adult. When you are able to be independent, you are more like a mature _________.

(adult, person)

30. We have learned that part of our world in which we work or play with our "group" is our * _________. It is important to us because it is made up of our best _______. Sometimes our group may want us to do things which we do not want to do. If we are mature enough, we make up our own minds and are ________. If we just follow the crowd without thinking things through, we are _________.

(social world, friends, independent, dependent)
31. Do you think you would rather be independent or dependent? Check the statement that you like best for yourself:

_____ (1) I would rather be more independent than dependent.

_____ (2) I would rather be more dependent than independent.

Why? __________________________________________________________

This is your own opinion, of course. There is no right answer. Did you choose to be dependent? Some people do because they are not yet ready to make up their own minds. They find it easier to follow the crowd. Did you choose to be independent? This shows you prefer to think for yourself. You probably look at all sides of a question and then decide what to do.
VI. ADULTS WHO SMOKE

1. One way that you learn is by copying the things you see older people do. You _______ by _______ older people.

(learn, copying)

2. Your parents use good manners at the table, and they hope you will copy good manners from them. Good manners are one thing that you _______ by copying from your parents.

(learn)

3. You learn to read and write and how to do mathematics by copying others who have already _______ how to do these things.

(learned)

4. You learn both social and mental skills by copying them from _______ who have already learned them.

(adults, people or parents)

5. Most of the things you see parents and teachers do are examples of things they would like to see you do when you are old enough. Parents and teachers set _______ of behavior for young people to copy when they are old enough.

(examples)

6. One way you learn to act grown-up is by copying adult behavior that you see. When you copy adult behavior, you are learning to act _______.

(adult, grown-up)
7. One adult behavior that girls copy is wearing lipstick. When girls start wearing lipstick, they are copying
________________________.

(adult behavior)

8. An adult behavior which boys copy is shaving. When boys start shaving, they are copying
________________________.

(adult behavior)

9. Young people copy many different kinds of adult behavior when they are learning to be adults. Young people learn
to be adult by copying________________________.

(adult behavior)

10. Some teen-agers think that cigarette smoking is adult behavior. Teen-agers see adults smoking, and some teen-
agers think it is __________to smoke.

(adult or grown-up)

11. Most adults who smoke wish they DID NOT smoke, and they urge teen-agers NOT to copy the practice of cigarette
smoking. Smoking cigarettes is one adult behavior that adults advise teen-agers __________to copy.

(not)

12. Even though some adults still smoke cigarettes, most of them advise teen-agers __________to smoke.

(not)

13. Have you ever wondered why adults who smoke still advise teen-agers NOT TO smoke? _____yes _____no Why do you
think this happens?
Lots of teen-agers wonder why adults seem to say "do as I say, don't do as I do." Have you ever thought that adults did NOT have the same advantages that you have of knowing the truth about cigarettes?

14. Most adults today recognize that cigarette smoking has many health dangers. They advise teen-agers NOT to smoke because of the health _______ of smoking cigarettes.

(dangers)

15. When most adults began smoking, they did NOT know about the health _______ of cigarette smoking.

(dangers)

16. The health dangers of smoking were NOT well known until recently. Most adults began smoking before the _______ _______ of smoking were known.

(health dangers)

17. Now that they know the health dangers, many cigarette smokers cannot quit smoking because they have a cigarette habituation. Some people find that they _______ quit smoking even though they know the dangers to their _______.

(cannot, health)

18. When a person with will power and character has tried to quit smoking cigarettes, but finds that he cannot quit, he probably has an _______ to cigarettes.

(habituation)

19. A person with an habituation to cigarettes hopes that his teen-age friends will avoid becoming a slave to the habit of cigarette smoking. This person will advise young people NOT TO smoke. Adults who smoke and who are unable
to quit, may still ________ teen-agers not to smoke. These adults hope the teen-ager will be able to avoid becoming a________ to the habit of cigarette smoking.

(advise, slave)

20. There is not any way to predict which people will be unable to quit smoking once they have started. It is possible for anyone to develop an________ to cigarette smoking.

(habituation)

21. The reason that adults hope teen-agers will not start smoking is because of the dangers to their health. Adults do not want to see teen-agers endanger their ________ by smoking cigarettes.

(health)

22. Adults who smoke cigarettes today began smoking them years ago. They began smoking before the health dangers of cigarettes were known. Adults who smoke today did not have a chance to know the______ dangers of cigarette smoking. They began to smoke cigarettes before the health_______ were known by doctors.

(health, dangers)

23. Even though they know that their health is in great danger from smoking cigarettes, some adults find that they are unable to quit smoking. This is because they have developed an________ to the nicotine in cigarette smoke.

(habituation)

24. Many adults who smoke have tried to quit smoking, but they have been unable to quit. These adults probably
have an________to the________in cigarette smoke.

(habituation, nicotine)

25. When people who cannot quit smoking cigarettes advise us not to smoke, we need to understand that these people did not have a chance to know the facts about the health ________of cigarette smoking when they began to smoke.

(dangers)

26. Most people would not have started cigarette smoking if they had known the great danger to their health. Many of these smokers have tried very hard to quit, but they have an habituation and find that they cannot________.

(quit)

27. Most adult behavior of parents and our adult friends is an example for young people to follow. In the case of cigarette smoking this is NOT the case. Most adults wish they did NOT smoke, and they advise teen-agers NOT to smoke. They smoke because they have a cigarette ________and cannot________smoking. They advise teen-agers not to smoke because of the health________of smoking cigarettes.

(habituation, quit, dangers)
VII. THE WORK OF OUR LUNGS

1. To understand some of the health dangers of smoking, we need to know how our lungs work. We are going to study about the purpose of respiration (breathing) so that we can understand the work of our lungs.

2. Air enters our body through our nose. We breathe air through our________.

(nose)

3. We can also breathe air through our mouth. We breathe air into our body through our________or our________.

(nose, mouth)

4. Air goes from our nose or mouth through a hollow tube called our trachea (pronounced tra' - ke - a). (Trachea is another word for windpipe. You may use either word in your answers.) Air goes into our body through our nose or________, and then goes through our________.

(mouth, trachea, windpipe)
5. After air enters our nose or mouth, it goes through our _________.

(trachea, windpipe)

6. Our trachea (windpipe) branches into two tubes. One tube takes air to our right lung and the other tube takes air to our left lung. So that air can get to both of our lungs, our trachea (windpipe) branches into _______ tubes. One tube takes air to our _______ lung and the other tube takes air to our _______ lung.

(two, right, left)

7. These tubes that branch into each lung are called bronchi (pronounced bron'- ki). Our trachea (windpipe) branches into two tubes which are called _________.

(bronchi)

8. Air enters our body through our nose or mouth from which it passes through our ________ which branches into two tubes. These two tubes take air to our right and left _______. The tubes are called _________.

(trachea, windpipe, lung, bronchi)
9. Air moves from our trachea (windpipe) into our two lungs through our two ________.

(bronchi)

10. Our bronchi are hollow tubes. Our bronchi branch into smaller and smaller tubes which are also hollow. Our bronchi, which are hollow tubes, branch into smaller and smaller ________.

(tubes)

A DRAWING OF THE BRANCHING BRONCHI

11. You know how the branches of a tree become smaller and smaller as they grow away from the tree trunk. The farther from our trachea that our bronchi are, the smaller they become. As they branch away from our trachea, the tubes of our ________ become smaller and ________.

(bronchi, smaller)
12. Air enters our body through our mouth or nose from which it passes through our________, and then through our two branching_________. They branch into small and smaller_________.

(trachea, windpipe, bronchi, tubes)

13. At the ends of our bronchi are our tiny air sacs (alveoli) where the work of our lungs is done. The work of our lungs is done by our tiny_______ _______which are at the ends of our_________.

(air sacs, bronchi)

14. We inhale air through our nose or mouth. It next goes through our_______. It then goes through our two _________. From there it goes on through smaller and smaller tubes until it reaches our tiny_______ _________.

(trachea, windpipe, bronchi, air sacs, alveoli)

A DRAWING OF WHERE AIR GOES IN OUR BODY
15. Our tiny air sacs are like bunches of balloons at the ends of our bronchi. They are arranged like grapes on a vine. The smallest tubes of our bronchi end with a bunch of tiny_________ _________.

(air sacs)
16. Air, which has oxygen in it, enters through our nose or mouth. From there, it goes through our_________ and then enters our lungs through our two branching_________ which branch into smaller and smaller tubes. Air goes through these smaller tubes until it reaches our tiny _________.

(trachea, windpipe, bronchi, air sacs)
17. Air has oxygen in it. Oxygen is needed in every part of our body by our cells. For our cells to live, they must have ________.

(oxygen)

18. Our cells make carbon dioxide which is waste. For our cells to live, they must get rid of waste ________ _________.

(carbon dioxide)

19. It is our air sacs which make the exchange of the oxygen that our cells need and waste carbon dioxide that our cells must get rid of. This exchange is very important to the life of our_______.

(cells)

20. This exchange is the major work of our lungs, and it is done by our air sacs. The major work of our lungs is the exchange of oxygen from the air for waste carbon dioxide from our cells. This work is done by the_______ ________ of our lungs.

(air sacs)

21. The major work of our lungs is the exchange of oxygen and carbon dioxide. The exchange of carbon dioxide and ________ is the major work of our_______.

(oxygen, lungs)

22. Our blood vessels carry oxygen and carbon dioxide between the cells of our body and the air sacs of our lungs. Oxygen is taken to our cells through our ________ _________. Carbon dioxide is taken from our cells through our_______ _________.

(blood vessels, blood vessels)
23. Our air sacs have small blood vessels that go to them. Small blood vessels go to each of our______ ________.  
(air sacs)

24. The walls of our blood vessels are very thin when they reach the air sacs. The walls of our air sacs are also very thin. The walls of our blood vessels and the walls of our air sacs are very_______.  
(thin)

25. The carbon dioxide in our blood vessels can go through the thin walls of our blood vessels and through the thin walls of the______ _______ of our lungs.  
(air sacs)
26. The oxygen can go through the thin walls of our air sacs and through the thin walls of our_______ _________.

(blood vessel)

27. This exchange of oxygen and carbon dioxide is the major work of our_______. This work is done by our_______ _________. This work is very important because our cells cannot live unless oxygen and carbon dioxide are _________.

(lungs, air sacs, exchanged)

28. Our blood vessels carry carbon dioxide away from our cells and oxygen to our cells. When our blood vessels reach our air sacs, the carbon dioxide goes through the thin walls of our________ ________and through the thin walls of the________ ________of our lungs.

(blood vessels, air sacs)

29. At the same time that carbon dioxide goes out of our blood vessels and into our air sacs, oxygen goes into our blood vessels and out of our air sacs. Carbon dioxide goes out of our blood vessels and into our __________ _________. At the same time, oxygen goes out of our air sacs and into our________ _________. This exchange is the major work of our lungs.

(air sacs, blood vessels)

30. The major work of our lung is the_______of carbon dioxide waste for oxygen from the air. The major work of our lungs is done by our *_________.

(exchange, air sacs)

31. The thin walls of the blood vessels and the thin walls of the air sacs are like thin curtains. If there are thin curtains over a window, air can blow through the curtains. Oxygen and carbon dioxide can go through the thin walls
of the blood vessels and through the thin walls of the air sacs just as air can move through a thin window curtain. Oxygen and carbon dioxide are exchanged between the *_________and the *_________.

(air sacs, blood vessels)

32. Since the major work of our lungs is done by our air sacs, they are very important. The major work of our lungs is the________of carbon dioxide from our cells for oxygen from the air.

(exchange)

33. The exchange of carbon dioxide for oxygen is done by our air sacs. This exchange is the major work of our ________.

(lungs)

34. The major work of our lungs is that oxygen from the air and carbon dioxide waste from our body are________by our air sacs.

(exchanged)

35. Why are our air sacs very important?

Our air sacs are important because they do the work of our lungs which is the exchange of carbon dioxide and oxygen.

36. Tell how air with oxygen in it goes into your body:
Air goes into my body through my_______or_________.
It goes from there through my________which branches into my two________.

(nose or mouth, trachea or windpipe, bronchi)
37. My bronchi branch into smaller and smaller tubes until they reach my tiny_________ ________which do the work of my lungs. The work of my lungs is: *______________

(air sacs, the exchange of carbon dioxide waste from the cells for oxygen from the air)

38. Oxygen is exchanged for carbon dioxide by your air sacs. Tell how carbon dioxide gets out of your body.

Carbon dioxide travels from my body cells through my blood vessels. It goes out of my blood vessels and into my air sacs. From there it goes through my smallest________. It continues through my bronchi which become larger and larger. It goes from my bronchi through my_______and then out through my __________.

(bronchi, trachea or windpipe, nose)

The writer is indebted to Elizabeth Laschinger, Ohio Tuberculosis and Health Association, Columbus, Ohio for the drawings in Unit VII and Unit VIII.
VIII. OUR AIR PASSAGES

1. Sometimes we talk about all the routes that air goes through to get to our air sacs. These routes are called the air passages. The air passages are all the ways that air goes through our lungs in order to get to our air sacs.

   (air)

2. Our nose, trachea (windpipe), our two large bronchi that go to each lung and all of our small bronchi are part of our air passages. All the routes of air from our nose to the ends of our bronchi are our air passages.

   (air passages)

3. Our air passages are all the routes of air from the time it is breathed into our nose until it reaches our air sacs where the work of our lungs is done.

   (nose, air sacs)

4. Our air passages include our nose, trachea or windpipe, and all of the branching tubes of our bronchi.

   (nose, trachea or windpipe, bronchi)
THE AIR PASSAGES

5. In the blank, write the part of the body to which the arrow leads:

1. __________
2. __________
3. __________
4. __________
5. __________

THE AIR PASSAGES

1. **nose**
2. **mouth**
3. **trachea** (windpipe)
4. **bronchi**
5. **air sacs**
6. It is through our air passages that air goes to get to our air sacs. Our air sacs are very important because they do the major work of our lungs. Our air passages help to protect our important air sacs. We are going to study HOW our air passages protect our air sacs.

7. Our air passages are hollow tubes. The insides of these tubes are lined with special cells. There are special cells that line the insides of all the tubes of our air passages.

8. Our air passages have one kind of cell that makes mucus (mu'kus) which covers the inside of the air passages. Special cells make mucus for our air passages.

9. Mucus is moist and sticky and covers the inside of our air passages. Special cells make mucus. It covers the inside of our air passages.

10. Mucus helps to protect our lungs. It is sticky and it catches irritating particles before they can reach our air sacs. Things which might damage our air sacs, are usually caught in our air passages by mucus.

11. Do you know what an irritating particle is? No_________ Yes_________, it is____________________

A particle is a very small piece of something. For example, dust is a particle because it is a very small piece of something. Dust is a small bit of matter.

To irritate means to bother. To irritate a part of your body means to bother this part. To scratch your skin is
to irritate your skin. It is not pleasing to your skin. It hurts your skin. It bothers your skin.

An irritating particle is a small bit of matter which bothers.

12. Mucus is sticky and usually catches irritating particles before they reach our air sacs. Damage to our air sacs might happen if mucus did not catch_________ __________.

(irritating particles)

13. Mucus helps to keep irritating particles from reaching our *________where the work of our lungs is done.

(air sacs)

14. Most of the time irritating particles do not reach the air sacs of our lungs. The particles are trapped on top of the moist, sticky________which is made by special cells that line our a________ p_______.

(mucus, air passages)

15. In addition to the cells which make mucus, there are other special cells along the inside of our air passages which help to protect our air sacs. These special cells have tiny hairlike brushes which grow from them. The special hairlike brushes are called cilia (pronounced sil'-i-a). The tiny hairlike brushes that grow from the cells that line the insides of our air passages are __________.

(cilia)

16. The cells which line the insides of our air passages have tiny hairlike brushes which grow from them. These hairlike brushes are called_________.

(cilia)
17. Our cilia move in a constant sweeping motion. The hair-like brushes that grow from the cells that line the air passage are our_______. They are in constant_______.
   (cilia, motion)

18. Mucus is moved upward toward our mouth by the movement of our_______.
   (cilia)

19. Just like an escalator moves up in a building, mucus moves up toward our mouth. The constant motion of our cilia brushes the_______up to our_______.
   (mucus, mouth)

20. A DRAWING OF THE INSIDE OF ONE OF OUR AIR PASSAGES
21. It is the job of our cilia to brush mucus and the irritating particles which are stuck in mucus out of our air passages. Our cilia _______ mucus and irritating particles that are stuck in mucus out of our _______.

(brush, air passages)

22. Just as a broom sweeps your kitchen, the hairlike brushes of your cilia _______ mucus and irritating particles out of your _______.

(brushes or sweeps, air passages)

23. The job of our cilia is to _______ the irritating particles out of our _______.

(brush or sweep, air passages)

24. The irritating particles that try to enter our lungs are caught in the sticky mucus and swept out of our air passage by our _______.

(cilia)

25. Our cilia are hairlike _______. Their job is to sweep _______ _______ from our air passages.

(brushes, irritating particles)

26. Irritating particles are caught in the sticky _______ which covers the inside of our air passages. The irritating particles are swept from our air passages by our _______.

(mucus, cilia)

27. Dust is an irritating particle that might try to enter your lungs. If dust tried to enter your lungs, it would
28. The dust which is stuck in the mucus would then be ________ from your air passages by the sweeping motion of your hairlike________. 

(brushed or swept, cilia)

29. The work of our lungs is done by our air sacs, so our air sacs are very important. Our air passages, which lead to our air sacs, have two things which help to keep irritating particles from getting to our air sacs. These two things are:

1. ________ 2. ________

1. Cells with cilia growing from them, which line our air passages.
2. Mucus, which covers the inside of our air passages.

30. What does each of these things do to keep irritating particles from reaching our air sacs:

1. mucus________________________________________________________
2. cilia________________________________________________________

Mucus is sticky and catches the irritating particles. The cilia sweep the mucus with the irritating particles out of the air passages. When they reach the mouth, you spit them out or swallow them.
IX. HIDDEN EFFECTS

1. When a person smokes a cigarette, the smoke mixes with the air he breathes into his lungs. We are going to learn about some of the things that are in cigarette smoke and how they affect our lungs.

2. There are several hundred things in cigarette smoke. Scientists group them into two kinds of things, gases and particles. Of the hundreds of things in cigarette smoke, scientists group them according to whether they are _______ or _______.

   (gases, particles)

3. A particle is a small bit of matter. Cigarette smoke contains many particles. Cigarette smoke contains many _______ bits of _______.

   (small, matter)

4. You have probably seen small bits of dust in a bright ray of sunshine. These small bits of dust are ______ of dust.

   (particles)

5. Cigarette smoke has many small bits of matter which scientists call _______.

   (particles)

6. Cigarette smoke has hundreds of things in it. These things are grouped by scientists into two groups according to whether they are (1) _______ or (2) _______.

   (1) gases
   (2) particles
7. There are (many? few?) _________ particles in cigarette smoke. There are (many? few?) _________ gases in cigarette smoke. The total number of gases and particles is (two? hundreds? thousands?) _________.

(many, many, hundreds)

8. Some of the gases and some of the particles found in cigarette smoke can cause hidden effects. Hidden effects can result from both the _________ and the _________ found in cigarette smoke.

(gases, particles)

9. We cannot see or feel all of the effects of smoking. Some of the most dangerous effects of smoking are the hidden effects. The hidden effects of smoking are those that we cannot _________ or _________.

(see, feel)

10. Every time a person smokes a cigarette there are some things that happen inside his body. These things are hidden effects because he cannot see or _________ them happen. They happen _________ his body.

(feel, inside)

11. The hidden effects of smoking are those that a person cannot _________ or _________ . They happen _________ his body.

(see, feel, inside)

12. There are hidden effects of smoking caused by some of the things that are found in cigarette smoke. Cigarette smoke is made up of hundreds of things, some of these things are the cause of _________ effects which a person cannot _________ or _________.

(hidden, see, feel)
13. Some of the hidden effects of smoking result in damage to the lungs. Hidden effects of smoking that we cannot see or feel can result in ______ to lungs.

(damage)

14. Review:

In order to protect our air sacs from irritating particles, the inside of our air passages are lined with special cells. Special cells line our air passages to help ______ our ______ ______.

(protect, air sacs)

15. Some of these special cells protect our air passages by making mucus. Mucus is sticky and catches ______ ______ that try to enter our air sacs.

(irritating, particles)

16. Other special cells have hairlike brushes called ______. They protect our air sacs by ______ irritating particles caught by mucus from the air passages.

(cilia, sweeping or brushing or moving)

17. The air sacs of our lungs are protected by mucus and cilia. Mucus protects our lungs by ______ ______ ______. Cilia protect our lungs by ______ ______ ______ ______.

(catching irritating particles, sweeping mucus and irritating particles out of our air passages)

18. One hidden effect of cigarette smoke is caused by the gases in the smoke. The gases in cigarette smoke cause one ______ ______ ______.

(hidden effect)
19. The hidden effect of the gases from cigarette smoke is on the cilia. The cilia are affected by the ________ in cigarette smoke. The gases in cigarette smoke cause the cilia to stop moving.

(gases)

20. To keep our air passages clean, our cilia usually move in a constant sweeping motion toward our mouth. This causes mucus to move upward to our ________ where we either spit it out or swallow it.

(mouth)

21. The gases in cigarette smoke STOP the motion of our cilia. The motion of our cilia is ________ by the ________ in cigarette smoke.

(stopped, gases)

22. If our cilia stop moving, the mucus also ________ moving toward the mouth.

(stops)

23. The effect of gases on the cilia is a hidden effect because it happens ________ the body. We cannot see the cilia stop moving. We cannot feel the cilia ________ moving.

(inside, stop)

24. The gases in cigarette smoke stop the movement of the ________. This cannot be seen or felt, so it is a ________ effect of cigarette smoking.

(cilia, hidden)
25. Gases from cigarette smoke paralyze the cilia. A hidden effect of the gases from cigarette smoke is that they ______ the ________.

(paralyze, cilia)

26. The cilia are made powerless and cannot move when they are paralyzed by the ______ in cigarette smoke.

(gases)

27. The cilia cannot move when they are ______ by the gases in cigarette smoke. They fail in their most important job, keeping the air passages clean.

(paralyzed)

28. The movement of cilia is stopped by ______ in cigarette smoke. When this happens, the cilia cannot ______ the irritating particles from the ______ ________.

(gases, sweep or brush or move, air passages)

29. When the cilia are made powerless by the gases in cigarette smoke, you cannot see or feel them stop moving because it happens inside a person's body. Since this effect of cigarette smoke cannot be seen or felt, it is a ______ ________.

(hidden effect)

30. The hidden effects from cigarette smoke happen every time a person smokes a cigarette. Every time a person smokes a cigarette, there are some things which happen which are called hidden effects because we cannot ______ or _______ them happen. They happen ______ the body.

(see, feel, inside)
31. One hidden effect of cigarette smoke is caused by the ________in cigarette smoke. They_______the cilia, which then fail in their job of________the air passages clean.

(gases, paralyze, sweeping or brushing, keeping)

32. Doctors have not always known about the hidden effects of cigarette smoke. This is new information that doctors have learned. Doctors did not always know that the gases from cigarette smoke paralyzed the cilia. Doctors learned this hidden effect recently.
X. TARS AND SOOT

1. Cigarette smoke paralyzes the cilia. They fail in their job. There are several things that happen as a result of the failure of the cilia to keep the air passages clean. We are going to learn about some of these things.

2. Among the hundreds of things in cigarette smoke, there is a group of particles that are called the cigarette tars. The tars are dark colored and sticky. The dark, sticky group of particles found in cigarette smoke are the ________.

(tars)

3. The tars are responsible for the taste of cigarette smoke. Cigarette smoke gets its taste from the______.

(tars)

4. You have seen tar used to patch the roof of a building. You have also seen tar used to repair cracks in streets. A dark, sticky substance used to repair roofs and roads is________.

(tar)

5. Scientists also find dark, sticky tars in cigarette smoke. Tars are dark,________substances. Tars are found in cigarette________.

(sticky, smoke)

NOTE: If you ask a cigarette smoker to blow some smoke through a handkerchief you can see the stain the tars make on the handkerchief.
6. The particles which make up the cigarette tars are irritating to our lungs. Cigarette tars are made up of irritating particles.

(irritating)

7. The irritating tars from cigarette smoke stick on top of the mucus along the air passages. They are not brushed from the air passages because the cilia are paralyzed by the gases from the smoke.

(paralyzed)

8. Cigarette smoke also contains soot. You have seen the black soot from smoke as it sticks on the inside of a chimney of a fireplace. All smoke contains soot.

(soot)

9. Cigarette smoke contains soot.

(soot)

10. The particles in soot are irritating to the air passages. Soot contains irritating particles.

(particles)

11. Review of how our lungs are usually protected from irritating particles: In order to keep irritating particles from getting into the lungs, the air passages are covered with sticky mucus which catches irritating particles.

(mucus, irritating)

12. The mucus and irritating particles are then brushed or swept from the air passages by the sweeping motion of the cilia.

(brushed or swept, removed, cleaned, cilia)
13. The irritating tar and soot from cigarette smoke stick on top of the mucus along the air passages. They are NOT brushed out by the cilia because the cilia are ________ by the gases from the smoke.

(paralyzed)

14. Because the cilia are paralyzed by the gases from cigarette smoke, they are unable to sweep the irritating _______ and irritating______ from the air passages.

(tars, soot)

15. When the heavy tars and soot are not removed from the air passages, they sink through the mucus to the cells. Heavy tars and soot remain in the air passages, and _______ through the_______ to the cells below.

(sink, mucus)

16. The tars and soot from cigarette smoke contain_______ particles. They are not brushed out of the air passages because the cilia are_______ by cigarette smoke.

(irritating, paralyzed)

17. You know what would happen if a piece of sandpaper were to be rubbed back and forth across the surface of your skin. It would irritate the cells of your skin. If sandpaper were to be rubbed back and forth across the surface of skin, it would_______ your skin.

(irritate)

18. If sandpaper were to be rubbed over and over in one spot on your skin, the usual appearance of your skin would change at that spot. Where your skin is irritated, it _______ in appearance.

(changes)
19. Just as sandpaper would irritate your skin if it were rubbed over the outside of your body, tars and soot from cigarette smoke irritate the air passages inside your body.

20. To irritate the outside of the skin can cause a change in the way the skin looks.

21. To irritate the air passages inside the body can cause changes in the way the lining of the air passages appear.

22. Cigarette smoke contains tar and soot which irritate the cells lining the inside of the air passages. This causes the inside of the air passages to change in the way they appear.

23. A person breathes cigarette smoke into his lungs. The smoke contains gases which paralyze the cilia. Cigarette smoke also contains irritating particles in the form of tars and soot.

24. The tars and soot are not swept out of the air passages because the cilia are paralyzed. The tars and soot irritate the cells along the passages and cause them to change in appearance.

25. Doctors did not know about these things until recently. Now that doctors know the hidden effects of cigarette smoke, they tell their patients NOT to smoke. Because...
they know the hidden effects of smoking cause damage to lungs, doctors advise their patients *not to smoke*.

(Not to smoke)

26. Not all of the effects of cigarette smoke can be seen or felt. There are hidden effects. One of these is on the cilia. Cigarette smoke *paralyzes* the cilia. This causes them to fail in their job. The result is that they do not sweep irritating particles, such as *tar* and *soot* from the air passages.

(Paralyzes, tar, soot)

27. The irritating tars and irritating soot sink through the mucus which covers the air passages. They irritate the cells below. This causes the cells to *change* in the way they *appear* or *look*.

(Change, appear or look)

28. The changes caused by the irritating tars and irritating soot from cigarette smoke result in TROUBLE IN THE AIR PASSAGES.
XI. REVERSIBLE AND PERMANENT CHANGES

How do we know that cigarette smoke causes changes in the cells along the air passages? There is a special kind of medical doctor called a pathologist (pa-thol'-o-gist) who tells us this.

1. Your body is made up of groups of cells called tissues. The tissues of your body are groups of_______.
   (cells)

2. The tissues of your body can look either normal or abnormal. If the tissues look as they should look, they look___
   (normal)

3. If a tissue has something wrong with it, it will not look_______.
   (normal)

4. There is a special kind of medical doctor (a pathologist) who studies cells and tissues under a microscope. By looking at cells and tissues under a microscope, a special kind of doctor (pathologist) can tell whether a person has cells which are______ or abnormal.
   (normal)

5. If the cells look like they are supposed to look, the doctor (pathologist) says the cells look_______. If the cells do not look as they should look, the doctor says the cells are_______cells.
   (normal, abnormal)
6. When special doctors (pathologists) study the cells and tissues from lungs, they find that the cells and tissues of cigarette smokers do not look the same as the cells and tissues of people who do not smoke cigarettes. Cells and tissues from the lungs of cigarette smokers appear different from cells and tissues of people who do not smoke.

(different)

7. Cells from the lungs of cigarette smokers do not look normal. There are changes in the cells of the lungs of cigarette smokers. The cells from the lungs of cigarette smokers change so that they look abnormal rather than normal.

(abnormal)

8. Special doctors (pathologists) can compare the lung tissues from people who smoke cigarettes with the lung tissues from people who do not smoke cigarettes. Under a microscope the lung tissues from smokers do not look normal. They look abnormal.

(normal)

9. Doctors think the irritation of tars and soot from cigarette smoke are the cause of the changes in the cells along the air passages of the lungs.

(air passages)

10. Using a microscope, the special kind of doctor (the pathologist) can see the changes which are caused by tars and soot from cigarette smoke. He can see the changes in the cells and tissues when he looks at them under the microscope.

(microscope)
11. The pathologist compares the cells and tissues of people who smoke cigarettes with cells and tissues of people who do not smoke. Under the microscope he can see that the tissues and cells of smokers are _______ from those of non-smokers.

(different)

12. Some things can change from one form to another and then back to the first form again. For example, water can change from liquid to solid ice. If the temperature becomes warm enough, the ice can _______ back to liquid water.

(change)

13. Some things cannot change back and forth like water can. Some things change permanently. If an egg is boiled, it cannot be changed back to the raw egg. The change is a _______ change.

(permanent)

14. If something can be changed back and forth from one form to another, the change is reversible (re - vur' - si - b'l). The change from liquid water to ice is a _______ change. When you boil an egg, this is not a _______ change.

(reversible, reversible)

15. If a change is NOT reversible, it is a permanent change. When an egg is boiled, the change in the egg is _______.

(permanent)

16. Cigarette smoke causes changes in our lungs. Some of these changes are reversible (can change back) and some of these changes are _______.

(permanent)
17. Cigarette smoke causes irritation of the cells lining the air passages. This causes these cells to _______ in appearance.

(change)

18. If a person smokes for a short time, the cells can return to normal when he quits smoking. For example, if a person smokes cigarettes for a month or two and quits, the irritated cells along the air passages will _______ back to normal. The change is reversible.

(change)

19. If the person keeps smoking, his cells will be constantly irritated. When his cells are irritated over and over like this, soon they will become permanently _______ in appearance.

(changed)

20. When cells are permanently changed, they will NOT return to normal, even if the person stops smoking. When a change is permanent, it is not reversible. A change which is not reversible is a _______ change.

(permanent)

21. Cigarette smoke can be the cause of changes which are not reversible. The changes which happen after a short period of smoking are temporary, so they are _______. The changes that happen after longer periods of smoking are often not reversible. They are _______ changes.

(reversible, permanent)

22. One change that cigarette smoke causes is a change in the cells that have cilia growing from them. The cilia disappear or become short and broken. Cigarette smoke can cause the cells along the air passages to lose their _______.

(cilia)
23. This happens because of constant irritation for a period of time. This change may not be reversible, it may be ________.

(permanent)

24. Remember, it is the job of our cilia to keep our air passages clean. Our cilia sweep mucus and irritating particles out of our air passages.

(irritating particles)

25. The cilia along the air passages brush irritating things out before they reach the air sacs which do the work of our lungs.

(air sacs)

26. If cilia are destroyed or damaged, an important protection is gone from our lungs. Our cilia help protect our lungs from irritating particles that try to enter.

(protect)

27. We know that cigarette smoke can paralyze our cilia. This is not a permanent change because if a person quits smoking, the cilia will return to their job of keeping the air passages clean or swept out, brushed out, protected.

(clean or swept out, brushed out, protected)

28. If the cells, which have cilia growing from them, are constantly irritated by cigarette smoke they will change in appearance. They may lose their cilia.

(change, cilia)

29. When cells lose their cilia, this change is not reversible. It is a permanent change.

(permanent)
30. During the time a person is smoking a cigarette, and for awhile afterwards, his cilia are paralyzed. If the person does not smoke too often during a day, his cilia will be able to work part-time.

(cilia)

31. When cilia are paralyzed they can recover, IF cigarette smoking is stopped. When cilia are paralyzed, this is not a permanent change.

(change)

32. If the person does not quit smoking, after a period of time, the cilia will be permanently destroyed or damaged. This change is NOT reversible, it is a permanent change.

(permanent)

33. When a person smokes a cigarette, and the cilia are paralyzed, this is not a permanent change. The cilia can return to normal if the person quits smoking cigarettes.

(change, quits)

34. If cilia are destroyed or damaged as a result of the constant irritation from tars and soot from cigarette smoke, this change is not reversible. This is a permanent change. The cilia do not return to normal.

(permanent)

35. When the cells that contain cilia are permanently damaged, the result to be expected is TROUBLE IN THE AIR PASSAGES.
XII. SERIOUS TROUBLE IN THE AIR PASSAGES

1. We have learned that some changes are reversible and some changes are NOT reversible. When a change is NOT reversible, this means that it (can, cannot) be changed back and forth. It is a permanent (cannot, change).

2. Some men are bald-headed. Their hair will not grow back. Being bald-headed is an example of a permanent change.

3. If cigarette smoking causes the cilia to be destroyed and they will not grow back, this is a permanent change.

4. When the cilia of cells are destroyed or damaged, this leaves the cells unprotected. Destroyed cilia leaves the cells along the air passages unprotected.

5. When the cilia are gone, the cells are bare and unprotected from the irritating tars in cigarette smoke. Cells without cilia are unprotected.

6. When the tars in cigarette smoke constantly irritate the cells along the air passages, these cells change. One way some of these cells change is that the cilia are destroyed or damaged.
7. There are other ways that the cells along the air passages change. When cells along the air passages are irritated by tars and soot from cigarette smoke, they change in several ways.

(change)

8. Tars and soot from cigarette smoke irritate the cells and tissues along the air passages. The constant irritation causes the cells and tissues to change in several ways.

(change)

9. Tars and soot from cigarette smoke cause cells and tissues along the air passages to change in several ways.

(cells, change)

10. Cigarette smoke causes tissues and cells of cigarette smokers to change from normal to abnormal. Tars and soot from cigarette smoke cause cells in the air passages to change from normal to abnormal.

(normal, abnormal)

11. It is where the cells change from normal to abnormal that cancer is found. Cancer is found in the air passages where tars and soot have irritated the cells and caused them to change in appearance.

(change)

12. Cancer usually starts to grow where the cells along the air passages change in appearance.

(change)
13. Cancer cells are frequently found growing in parts of the air passages where the cells and tissues of cigarette smokers change from normal to _________.

(abnormal)

14. Abnormal cells begin to grow as a result of the irritation from ________ and ________ in cigarette smoke.

(tar, soot)

15. The lungs of cigarette smokers often develop cancer where the cells are abnormal.

(cancer, abnormal)

16. Scientists have been able to find several things in cigarette smoke which cause cancer cells to begin growing. There are several things in cigarette smoke which scientists know can cause cancer.

(cancer)

17. Scientists call anything that can cause cancer a carcinogen (kar - sin' - o - jen). A carcinogen is something that causes cancer. (Note: carcinogen is a very long word, but it is a word that you should learn and remember because you will see it often.)

(cancer)

18. Things in cigarette smoke which cause cancer are called carcinogens. Anything in cigarette smoke which causes cancer is a carcinogen. A ________ causes cancer.

(carcinogen, carcinogen)

19. Scientists have found several carcinogens in cigarette smoke. This means that they have found several things in cigarette smoke that cause cancer.

(cancer)
20. Some carcinogens in cigarette smoke are found in the cigarette tars (remember, the tars are made up of irritating particles). Tars in cigarette smoke contain ________. This means they contain things that cause ________.

(carcinogens, cancer)

21. There are several things in cigarette tars which are known to cause cancer. Cigarette tars have several ________ in them.

(carcinogens)

22. Tars contain irritating particles, and some of these irritating particles cause ________.

(cancer)

23. The particles in tars which cause cancer are called the ________ in the tars.

(carcinogens)

24. Some carcinogens in cigarette smoke are found in the ________ of the smoke. They cause ________.

(tars, cancer)

25. Scientists have been able to prove that there are carcinogens in the tars of cigarette smoke. This means the tars have things in them that cause ________.

(cancer)

26. There are also carcinogens in soot from cigarette smoke. Carcinogens are found in both ________ and ________ from cigarette smoke.

(tars, soot)
27. Scientists have also been able to prove that your chances of having lung cancer are very high if you smoke cigarettes. If you smoke cigarettes, your chances of getting lung cancer are very ________.

(high, great, large or big)

28. If you do not smoke cigarettes, the chances of your having lung cancer are very low. The chances of a non-smoker having lung cancer are ________ ________.

(very low or very small)

29. Cigarette smokers often have ________ ________.
Non-smokers do NOT often have ________ ________.

(lung cancer, lung cancer)

30. If a person smokes cigarettes, his chances of having lung cancer are very _________. If a person does not smoke cigarettes, his chances of having lung cancer are very _________.

(high, great or big, low or small)

31. Very few non-smokers have lung cancer, but many cigarette smokers have ________ ________.

(lung cancer)

32. If you do not smoke cigarettes, your chances of getting ________ ________ are very _________. If you smoke cigarettes, your chances are very _________.

(lung cancer, low, high)

33. There are a number of things in cigarette smoke which can cause _________. These things are called _________.

(cancer, carcinogens)
34. Carcinogens are found in the_______of cigarette smoke. Carcinogens are also found in the_______of cigarette smoke.

(soot or tars, tars or soot)

35. The tars and soot from cigarette smoke contain many i________ p________. Some of them cause__________.

(irritating particles, cancer)

36. The cells which line the air passages are irritated by the tars and soot in cigarette smoke. This constant irritation causes the cells to_______in appearance. After the cells begin to change, they are no longer normal cells, they are_________cells.

(change, abnormal)

37. It is where cells are abnormal that_______begins to grow.

(cancer)

38. Some changes are reversible and some are not. The changes in cells which are caused by tar and soot from cigarette smoke are NOT reversible. This means that they are permanent_________.

(changes)

39. When cancer cells begin to grow in the air passages, this means dangerous TROUBLE IN THE AIR PASSAGES. This change is NOT reversible. Once cancer cells begin to grow, this is a permanent__________and it is NOT

(change, reversible)
40. People who do not smoke rarely have lung_________. People who smoke have_________ _________frequently.

(cancer, lung cancer)

41. Lung cancer is one serious trouble in the air passages that can be avoided if a person does not smoke.
1. If you scratch your skin, this is an irritation to your skin. A scratch is an _________.

(irritation)

2. A scratch makes a good place for germs to grow. Germs can easily ________ in a scratch on your skin.

(grow)

3. If you burn your skin and it makes a blister, this is an irritation to your skin. A burn is an _________.

(irritation)

4. A burn which has a blister is a place where germs can grow. An irritation such as a burn with a blister is a place where ________ can easily _________.

(germs, grow)

5. Any irritation of your skin is a place for germs to grow. Germs grow easily where there is an _________.

(irritation)

6. If a person smokes cigarettes, the bronchi are constantly irritated by tars, soot and other things in the smoke. The irritated bronchi are a good place for ________ to grow.

(germs)

7. Cigarette smoke irritates the ________ and this makes it easy for ________ to grow there.

(bronchi, germs)
8. Usually, the cilia quickly sweep germs out before they can begin to grow. This does not happen when a person is a cigarette smoker. Why? __________________________

The cilia of the smoker are paralyzed by the smoke. The cilia can also be damaged or destroyed permanently as a result of smoking. In either case, the cilia fail in their job of sweeping the air passages clean of irritating things such as germs.

9. When germs grow in the bronchi, doctors call this bronchitis. When germs are growing in the irritated bronchi, this is called__________.

(bronchitis)

10. Tars and soot in cigarette smoke__________the bronchi. This makes a good place for__________to grow. The result is what doctors call__________.

(irritate, germs, bronchitis)

11. Doctors very often see__________in cigarette smokers. They do not see it as often in non-smokers.

(bronchitis)

12. Cigarette smokers have__________very often, but non-smokers *__________have it so often.

(bronchitis, do not)

13. You know how an irritation such as a burn or a scratch on your skin gets red and swelled. When a person has bronchitis, his bronchi are also__________and__________.

(red, swelled)

14. The mucus-making cells make more mucus when the bronchi are irritated. As a result of irritation to the__________
there is an increase in ________.

(bronchi, mucus)

15. When the bronchi are ________, the mucus-making cells make________ mucus.

(irritated, more)

16. When a cigarette smoker has bronchitis, the bronchi are red and________. The mucus-making cells make________ mucus.

(swelled, more)

17. Usually the cilia keep mucus cleaned out of the air passages, but the cilia of the cigarette smoker do not work properly. When mucus cells make extra mucus, and the cilia are not working, they________sweep the mucus out.

(cannot or do not)

18. When the cilia do not________ the mucus out, some of the smallest bronchi fill with________.

(sweep, brush, clean or clear, mucus)

19. When the cigarette smoker has bronchitis, the smallest bronchi can be filled with mucus and become plugged or stopped. Bronchitis can result in small bronchi being ________with mucus.

(plugged, filled or stopped)

20. The smoker will cough to get rid of this extra mucus which is not brushed out by the cilia and which is plugging the smaller bronchi. When the bronchi are
red, irritated, swelled and plugged with mucus, the smoker often has to_________to get rid of the extra mucus.

(cough)

21. Cigarette smokers with bronchitis cough very often. Some people call this a "cigarette cough" or "smokers cough." A "cigarette cough" is often a sign the smoker has_bronchitis, and he is trying to get rid of the extra _________that collects in his bronchi.

(bronchitis, mucus)

22. When the bronchi are_________by cigarette smoke and ___________grow in them, the person has__________.

(irritated, germs, bronchitis)

23. When a person has bronchitis, the bronchi are red, swelled and often_________with extra mucus. One sign of bronchitis is the "cigarette_________" to get rid of the mucus.

(plugged, stopped or filled, cough)

24. If enough of the small bronchi are plugged, the cigarette smoker gets short of breath because air does not get through to some of the air sacs. When air cannot get through to some of the air sacs, the smoker will feel short of__________.

(breath)

25. When a smoker is short of breath, you sometimes hear him say he is "short of wind." When a smoker has bronchitis and his bronchi are plugged, he may feel_________of breath.

(short)
26. You have probably heard coaches say, "smoking cuts the wind." Smoking can make an athlete short of_______. This is one of the reasons coaches do not want their athletes to smoke.

(breath)

27. When a cigarette smoker has bronchitis, the smaller bronchi are often plugged with mucus. Less air goes into the_____ ____ of his lungs. This results in less oxygen for cells.

(air sacs)

28. Cigarette smokers have bronchitis very often. When they do, some of the bronchi may be______ with mucus. Air cannot reach the air sacs if the bronchi are plugged. The result is that the person feels______ of______.

(plugged, short of breath)

29. Shortness of breath or cigarette cough are warnings of TROUBLE IN THE AIR PASSAGES. If the person quits smoking soon enough, his irritated bronchi may heal. If he continues to smoke, permanent damage which is not reversible will occur.

30. At the ends of our smallest bronchi are bunches of tiny air sacs which do the work of our_______.

(lungs)

31. The work of our lungs is the______ of oxygen and carbon dioxide. This is necessary for our cells to live.

(exchange)

32. If the air sacs are permanently damaged, it is hard for cells to get enough oxygen, and the person always feels
short of breath. If a person has air sacs that are permanently damaged, the slightest activity which causes him to need extra oxygen makes him feel *___________.

(short of breath)

33. For example, such a person might be very short of breath from an activity such as putting on his shoes. When air sacs are damaged permanently, even mild_________will cause the person to be_________of__________.

(activity or exercise, short of breath)

34. Permanent damage to air sacs is a disease called *emphysema* (em - fi - se´ - ma). When a person is short of breath because of permanent damage to his air sacs, he has__________.

(emphysema)

35. The tiny air sacs are like a bunch of very tiny balloons at the ends of the smallest bronchi. (They are so tiny that you cannot see them without a_________.) When we breathe in, our tiny air sacs are filled with__________.

(microscope, air)

36. When we breathe out, most of the air goes out of our __________ __________.

(a. ir sacs)

37. When air is breathed into the air sacs, it is like blow­ing up a tiny balloon. When air is breathed out, it is like air going out of a balloon. Air fills our air sacs when we_________in. Part of the air goes out of our air sacs when we_________out.

(breathe, breathe)
38. If some of the air sacs are permanently damaged, ______ is unable to go in and out of the damaged air sacs as it should.

(air)

39. When air sacs are damaged or destroyed, this change is not reversible, it is a ______ change.

(permanent)

40. If enough of the air sacs are damaged, the person will notice that he feels ______ of breath.

(short)

41. These people have emphysema. They notice that even a mild activity causes them to be ______ of ______.

(short of breath)

42. Emphysema is a disease that has been linked to cigarette smoking. Cigarette smokers have signs of ______ often. Non-smokers do not have signs of ______ as often.

(emphysema, emphysema)

43. The major sign of emphysema is the person feels ______ of breath.

(short)

44. Because so many of the air sacs are permanently damaged, a person with emphysema will notice that even mild ______ causes him to be ________.

(activity or exercise, short of breath)
45. Emphysema happens more often to cigarette smokers than to non-cigarette smokers. Some doctors think emphysema is ________ by cigarette smoking.

(caused)

46. The major sign of emphysema is the person with emphysema feels ________ of _________.

(short of breath)

47. Emphysema happens often to cigarette _________. Non-smokers do not have ________ as often.

(smokers, emphysema)

48. Because of this, emphysema has been ________ with cigarette smoking.

(linked, connected or associated)

49. The changes to air sacs of a person with emphysema are ________ reversible.

(not)
XIV. PULSE RATE AND BLOOD PRESSURE

1. Your blood is moved through your body in your blood vessels. It moves because your heart pumps it. Your heart_______your blood through your_________.
   (pumps, blood vessels)

2. There are some blood vessels near the surface of your body where you can feel the pressure of the blood against the blood vessel each time the heart pumps. When you touch your fingers lightly to the surface of your body and feel the pressure of the blood against the vessel, your heart is_______blood through your blood vessels.
   (pumping)

3. One place to feel this pressure of the blood against the wall of your blood vessel is at your wrist. If you place your fingers lightly on your wrist above the blood vessel, you can feel the pressure of blood every time the heart_______blood.
   (pumps)

4. When your heart pumps blood, you can feel the pressure in the blood vessel at your wrist. If you place your fingers on your wrist, each time your heart pumps blood, you can feel the pressure of the blood against your _______v_________.
   (blood vessel)

5. The pressure that you can feel is the result of a heart beat. Each time your heart pumps blood you can feel the pressure if you place your fingers lightly against
your wrist. This pressure is the result of a heart

(b) _______.

(beat)

6. The pressure of the blood against the blood vessel happens every time your heart pumps blood. This pressure that you can feel against your wrist is the result of your_________beat.

(heart)

7. If you count the number of times your heart beats in one minute, this is your pulse rate. Your pulse rate is the number of_________of your heart in one_______.

(beats, minute)

8. When your doctor counts the number of beats of your heart in one minute, he is taking your________rate.

(pulse)

9. The number of times that your heart beats in one minute is your________ _________.

(pulse rate)

10. Your pulse rate is the_______of beats of your heart in one________.

(number, minute)

11. Between each beat, your heart relaxes and fills with blood. Your heart pumps, then relaxes, pumps, then relaxes. Between beats your heart________and fills.

(relaxes)
12. When your heart relaxes between beats, it is resting. When your heart beats, it is working. When your heart relaxes, it is _______ and filling.

(resting)

13. When your heart is beating, it is _______. When your heart is not beating, it is _______.

(working, resting)

14. Sometimes your heart works and sometimes your heart _______.

(rests or relaxes)

15. If you count your pulse rate, you are counting each beat of your heart. Your heart is not relaxing, it is _______ when you can feel your pulse.

(working)

16. The more times that your heart beats in one minute, the higher your _______ rate. The higher your pulse rate, the harder your heart is _______.

(pulse, working)

17. When your pulse rate is higher than usual, your heart is working _______ than usual.

(harder)

18. An increase in your pulse rate means that your heart is doing an increased amount of _______.

(work)
19. When your heart beats faster, it has less time to rest between beats. The faster your heart beats, the harder it works and the less time it has to__________.

(rest)

20. One way that your doctor can tell how hard your heart is working is by counting your__________rate.

(pulse)

21. Your pulse rate is the number of__________of your heart in one__________. It is one measure that tells your doctor how hard your heart is__________.

(beats, minute, working)

22. Your blood vessels are always full of blood. The blood pushes against the sides of the blood vessels as it moves through them. This push of the blood against the sides of the blood vessels is the blood pressure. The blood pressure is how hard the blood pushes against the sides of the__________________.

(blood vessels)

23. Your doctor can measure your blood pressure with a special instrument. You cannot measure your own blood pressure. Your blood pressure is usually measured by your__________.

(doctor or physician)

24. When your doctor measures your blood pressure, he knows how hard your blood is pushing against the walls of your blood vessels. Your doctor can measure the push of your blood against your blood vessels with a special instrument. This measure is called your__________________.

(blood pressure)
25. Right after your heart pumps blood, the blood vessels coming from your heart have the most blood in them. This is when the push of blood against the walls of your blood vessels is greatest. Your highest blood pressure is immediately after a _______beat.

(heart)

26. Your blood pressure is greatest right after a heart _______.

(beat)

27. Each time your heart beats, blood flows from your heart through your blood vessels. The pressure of blood against the walls of your blood vessels is greatest right after a _______ of your________.  

(beat, heart)

28. Right after a beat of your heart is your highest _______ _______.

(blood pressure)

29. Your blood pressure is highest when the most blood is in your blood vessels. This happens right after a _______ of your_________.

(beat, heart)

30. Right after your heart pumps blood into your blood vessels, your_________ _________is highest.

(blood pressure)

31. Your highest blood pressure is your systolic pressure or your upper pressure. Following each beat of your
heart your blood pressure is highest. Your highest blood pressure is called your ______ blood pressure.

(systolic or upper)

32. When your heart relaxes, your blood pressure is lowest. Your lowest blood pressure happens when your heart is ______.

(relaxed, relaxing or resting)

33. Your lowest blood pressure is called your diastolic pressure or lower pressure. When your heart is relaxed and your blood pressure is lowest, this is called your ______ blood pressure.

(diastolic or lower)

34. You have two blood pressures which your doctor can measure. The two pressures are your ______ (systolic) pressure and your ______ (diastolic) pressure.

(upper, lower)

35. The measure of your blood pressure shows how hard your blood is pushing against the walls of your ______ ______. Your highest blood pressure is right after your heart ______. Your lowest blood pressure is when your heart is ______.

(blood vessels, beats, relaxed)

36. Your doctor always measures both blood pressures. Your blood pressure right after your heart beat is your ______ blood pressure. Your blood pressure when your heart is resting is your ______ blood pressure.

(systolic or upper, diastolic or lower)
37. How hard your blood pushes against the walls of your blood vessels is your __________ _________. When your doctor measures it, he measures both the _________ and the _________ pressures.

(blood pressure, systolic or upper, diastolic or lower)

38. The measure of your blood pressures tells your doctor how hard your heart is working to pump blood through your blood vessels. Your blood pressures are measures of the work of your _________.

(heart)

39. Your blood pressure and your pulse rate are both ways to measure the work your heart is doing. The work that your heart is doing can be measured by your ________ rate and your blood _________.

(pulse, pressure)

40. If your pulse rate is higher than usual, your heart is _________ harder. If your blood pressure is higher than usual, your heart is working _________.

(working, harder)

41. One thing that can make your blood pressure increase is for the size of the blood vessels to become smaller. When the blood vessels become smaller, the pressure of the blood against the walls of the blood vessels will be greater. Your blood pressure will measure _________.

(higher, greater or more)

42. If the size of the blood vessels becomes larger and the same amount of blood flows out of the heart, the pressure against the sides of the vessel will be _________.

(lower, less or smaller)
43. When the size of the blood vessels change, the blood pressure changes. If the blood vessels become smaller, the blood pressure goes_________. If the blood vessels become larger, the blood pressure goes_________.

(up, down)

44. Your heart must work harder to push blood through the smaller blood vessels. If your blood vessels become smaller in size, your blood pressure is_________ and your heart has to work_________.

(higher, harder)

45. There are different things that can make your blood vessels become smaller in diameter. When blood vessels become smaller, your blood pressure goes_________ and your heart has to_________ harder.

(higher or up, work)

46. There are two ways your doctor can tell how hard your heart is working. One way he can tell is by measuring your_________ _________. The other way is by measuring your_________ _________.

(blood pressure, pulse rate)

47. When our heart beats faster, it is working_________ than when it beats slower. An increase in our pulse rate is one way our doctor can tell when our heart is working harder.

(harder)

48. When our blood pressure increases, this means our heart is working_________.

(harder)
49. Our doctor knows that our heart is working harder when he finds an increase in our _______ or an increase in our ________.

(pulse rate, blood pressure)

50. When the doctor measures our pulse rate and it is increased, he knows our heart is ________.

(working harder)

51. If the doctor finds an increase in our blood pressure, he knows that our heart is ________.

(working harder)

52. An increase in blood pressure or an increase in pulse rate means an ________ in the work of the ________.

(increase, heart)
XV. NICOTINE

1. Some effects of cigarette smoking do not happen immediately. They take a period of time to happen. For example, a person smokes for a period of time before the cells along the air passages change from normal to abnormal cells. Before some effects of cigarette smoking show, a person must smoke for a period of _______.

(time)

2. There are other effects of cigarette smoking that happen immediately and every time a person smokes a cigarette. For example, cilia are paralyzed by cigarette smoke immediately and _______ a person smokes a cigarette.

(immediately, every time)

3. Some effects of cigarette smoking happen immediately. Some effects do not show for a period of _______.

(immediately, time)

4. The gases in cigarette smoke paralyze the cilia. This happens immediately and every time a person smokes.

(immediately)

5. The nicotine in cigarette smoke has effects which happen immediately and every time a person smokes. Some effects of nicotine happen immediately and _______ a person smokes.

(immediately, every time)

6. One effect of nicotine that happens immediately and every time a person smokes is the effect on the blood vessels. Nicotine causes the blood vessels to become smaller in size. Immediately and every time a person
smokes a cigarette, nicotine directly affects the blood vessels. They become ________ in size.

(smaller)

7. The blood vessels become smaller in size immediately and ________ ________ a person smokes a cigarette.

(every time)

8. Immediately and every time a person smokes a cigarette, the blood vessels become ________ in size because ________ affects them directly.

(smaller, nicotine)

9. When blood vessels become smaller in size, the blood pressure (increases? decreases?) ________.

(increases)

10. When nicotine causes the blood vessels to become smaller, this causes the blood pressure to _________. Nicotine causes the blood pressure to _________.

(increase, increase)

11. Nicotine causes the ________ ________ to increase. This happens immediately and ________ ________ a person smokes a cigarette.

(blood pressure, every time)

12. When the blood pressure increases, the heart works (harder? easier?) ________ to push the blood through the blood vessels. Nicotine makes the heart work ________ because it causes the blood pressure to _________.

(harder, harder, increase or go up)
13. Nicotine also has an effect directly upon the heart. It causes the heart to beat faster. The effect of nicotine on the heart is, it causes the heart to *_________.

(beat faster)

14. When the heart beats faster, the pulse rate increases. Nicotine causes the pulse rate to_________.

(increase)

15. As a result of the nicotine in cigarette smoke, the heart beats_________so the pulse rate is_________.

(faster, increased, up or higher)

16. When the pulse rate increases, the heart is working (harder? easier?)_________. Nicotine causes the heart to work_________.

(harder, harder)

17. Nicotine causes the_________ _________and the_________ _________to increase.

(blood pressure, pulse rate)

18. The work of the heart is_________by nicotine.

(increased)

19. The work of the heart is increased by_________. This happens_________and every time a person smokes a cigarette.

(nicotine, immediately)

20. The effects from nicotine on the pulse rate and the blood pressure last for 45 minutes to an hour. For 45
minutes to an hour after a cigarette is smoked, the heart is working _______ than usual.

(harder)

21. The effects of nicotine happen whether or not a cigarette is inhaled. To get the effects of nicotine, a person does not have to _______ the smoke.

(inhale)

22. Doctors say a person can absorb nicotine from the mouth. This means the cells take in, take up or suck up the nicotine. When cells take in nicotine from the mouth, they ______ it.

(absorb)

23. After nicotine is absorbed by the cells, it goes from the cells into the blood stream which takes it to all parts of the body. Nicotine is _______ from the mouth directly into the cells.

(absorbed or taken)

24. You do not have to inhale cigarette smoke to absorb nicotine. Nicotine can be _______ from the mouth. (Note: This is why cigar smokers, pipe smokers, tobacco chewers and snuff dippers also can be habituated to tobacco. They do not inhale, but absorb nicotine from their mouth.)

(absorbed)

25. More nicotine is absorbed if smoke is inhaled, but smoke does not have to be ______ for nicotine to be ______.

(inhaled, absorbed)
26. Nicotine increases the work of the heart. One way it does this is by ______ the size of the blood vessels. This causes the blood pressure to _______.

(decreasing, making smaller or shrinking, increase or go up)

27. Another way nicotine increases the work of the heart is by causing the number of beats of the heart in a minute to _______. This means the pulse rate _______.

(increase or go up, increases or goes up)

28. Nicotine _______ the pulse rate. Nicotine _______ the blood pressure. When the blood pressure and the pulse rate are _______ the work of the heart _______.

(increases, increases, increased, increases)

29. Nicotine also has an effect on how fast a person breathes. When a cigarette is smoked, nicotine causes the person to breathe faster. Nicotine _______ the rate of breathing.

(increases)

30. The rate of breathing is _______ by nicotine.

(increased)

31. Nicotine is absorbed from the mouth. It quickly reaches the blood stream which carries it to all parts of the body. It causes an immediate increase in: 1. _______; 2. _______; 3. _______.

(1. blood pressure; 2. pulse rate; 3. breathing rate or respiration)
32. The way a person's body responds to nicotine is very much like the way his body responds to any danger or threat: 1. The blood vessels ________ in size; 2. The blood pressure ________.

(1. decrease, become smaller or shrink); 2. increases or goes up)

33. Threat and danger to a person also cause: 1. The rate of breathing to ________; 2. The pulse rate to ________.

(1. increase; 2. increase)

34. The body responds to nicotine very much as it responds to anything that is a _______ or _______.

(threat, danger)

35. Increased blood pressure, increased pulse rate and increased breathing happens immediately and every time a person smokes. These things happen whether or not he _______ the smoke. They are caused by the ________ which can be ________ from the mouth.

(inhales, nicotine, absorbed)

36. The effects of nicotine are another reason that coaches usually forbid their athletes to smoke. No athlete can do his best when nicotine increases the rate of his _______ and _______ and increases his _______.

(breathing, pulse, blood pressure)

37. The increase in blood pressure and pulse rate which nicotine causes makes an extra work load for the _______.

(heart)
38. People who smoke cigarettes have heart disease in later life more often than people who do not smoke. This may be due to the effects of nicotine on the heart. One way you may be able to prevent heart disease is to take care of your heart by not smoking. One way to take care of your heart is by refusing to_________. This may prevent________disease in later life.

(smoke, heart)
APPENDIX IV

PERFORMANCE TESTS
PERFORMANCE TEST I

Name___________________

1. In order to make money, cigarette companies try to sell as many cigarettes as they can. What is the major method they use to do this?

(Terminal Frames: 13, 15, 32)

2. What two classes of habits are there? Give an example of each.

1.

2.

(Terminal Frames: 5, 7, 8)

UNDERLINE THE CORRECT ANSWER IN THE FOLLOWING QUESTIONS:

3. A word that means the same thing as to repeat over and over is:

1. repetition

2. revolution

3. resignation

4. revelation

(Terminal Frame: 11)

4. Cigarette advertisements are most likely to appeal to a person's sense of:

1. intelligence

2. imagination

3. humor

4. scientific knowledge

(Terminal Frames: 19, 20, 22, 31)
PERFORMANCE TEST II

Name___________________

1. Explain how a habit and an habituation are alike and how they are different:

   1. Alike:__________________________________________________________

   2. Different:_____________________________________________________

   (Terminal Frames: 10, 19, 23, 26, 27, 31, 37)

UNDERLINE THE BEST ANSWER TO THE FOLLOWING QUESTION

2. The length of time it takes for a cigarette smoker to develop a cigarette habituation is:

   1. three weeks

   2. six months

   3. one year

   4. unpredictable

   (Terminal Frames: 28, 29, 30)

3. What in cigarette smoke probably causes a cigarette habituation?______________________________________________________________

   (Terminal Frames: 39, 40)

4. When some people with a cigarette habituation try to quit cigarettes, they may feel very irritable, cannot concentrate or have other unpleasant signs. When this happens, the person is responding__________________________________________.

   (Terminal Frames: 20, 21, 22, 23, 35, 38)

5. How often can you smoke cigarettes and still call it "smoking out of curiosity"?__________________________________________________

   (Terminal Frames: 44, 46, 47)
PERFORMANCE TEST III

Name____________________

UNDERLINE THE BEST ANSWER TO THE FOLLOWING QUESTION:

1. The beginning smoker is often a person who is least likely to be:
   1. pretending it is fun
   2. trying to be a "big shot"
   3. trying to impress someone
   4. enjoying it
   (Terminal Frames: 4, 5, 20)

2. Name four unpleasant signs of irritation which a person may have as a result of trying to learn to smoke cigarettes:
   1. _____________________________________________________________
   2. _____________________________________________________________
   3. _____________________________________________________________
   4. _____________________________________________________________
   (Terminal Frames: 8, 10, 12, 16, 18, 19)
PERFORMANCE TEST IV

Name___________________

UNDERLINE THE BEST ANSWER TO THE FOLLOWING QUESTION:

1. Tolerance to cigarette smoke means:
   1. the person no longer gets sick or dizzy
   2. the person no longer notices signs of poison
   3. the person no longer has the warning signs
   4. all of these
   (Terminal Frames: 20, 21, 24)

2. Explain how a person develops tolerance to smoking cigarettes:

   (Terminal Frames: 8, 13, 17, 18, 21, 25)
PERFORMANCE TEST V

Name__________________

An independent person and a dependent person will act differently when a group of friends suggest smoking cigarettes.

1. An independent person will__________________________

________________________________________________________________________

(Terminal Frames: 23, 27, 28, 29)

2. A dependent person will__________________________

________________________________________________________________________

(Terminal Frames: 26, 28, 30)
UNDERLINE THE BEST ANSWER IN THE FOLLOWING QUESTIONS:

1. Most adults who continue to smoke, advise teen-agers NOT to smoke, because these adults know:
   1. smoking cigarettes affects your intelligence
   2. smoking cigarettes causes you to gain weight
   3. smoking cigarettes has health dangers for you
   4. smoking cigarettes will stunt your growth
   (Terminal Frames: 18, 26)

2. At the time when most adults who now smoke started to smoke, they did so:
   1. even though they knew the health dangers
   2. before the health dangers of smoking were known
   3. because they did not believe the health dangers were true
   4. because there were no health dangers at that time
   (Terminal Frames: 14, 15, 24)
PERFORMANCE TEST VII

Name________________________

1. Look at the drawing above. Which part of your respiratory (breathing) system does each letter with a circle around it represent? Write your answers after the correct letter in the blank spaces to the right of the drawing.

(Terminal Frames: 5, 8, 12, 14, 16)

2. Name the part of the lung that does the major work of the lung._________________________________________________

(Terminal Frames: 27, 30)

3. What is the major work of the lungs?____________________

(Terminal Frames: 27, 30, 31, 32, 33, 35)

4. Oxygen is carried to the cells and carbon dioxide is carried away from the cells through the blood vessels. Is this true or false? Answer:________________________

(Terminal Frames: 22, 29)

5. In certain parts of the lungs, oxygen can go through the thin walls. Is this true or false? Answer:________________________

(Terminal Frames: 25, 26, 28)
PERFORMANCE TEST VIII

Name____________________

1. Look at the drawing above. Which part of your respiratory (breathing) system does each letter with a circle around it represent? Write your answers after the correct letter in the blank spaces to the right of the drawing.

(Review Question)

2. What are the air passages of the lungs? ___________________

(Terminal Frames: 3, 5)

3. What are two things in the air passages that protect the air sacs from irritating particles that may try to enter. Explain how they do this.

1. ___________________protects by_____________________

(Terminal Frames: Mucus—13, 19, 26, 27, 29, 30)

2. ___________________protects by_____________________

(Terminal Frames: Cilia—16, 18, 23, 25, 26, 28, 29, 30)
PERFORMANCE TESTS IX AND X

IX

Name______________________

1. Explain what it means to say, "cigarette smoke has hidden effects."

(Terminal Frames: 10, 11, 12, 13, 23, 29, 30)

2. What does cigarette smoke do to the movement of the cilia?

(Terminal Frames: 24, 26, 27, 28, 31)

X

1. Describe cigarette tars.

(Terminal Frames: 5, 6)

2. Tars and soot from cigarette smoke have effects on the air passages of the lungs. Name two of these effects.

1.__________________________________________________________

2.__________________________________________________________

(Terminal Frames: 15, 16, 21, 22, 24, 26, 27)
PERFORMANCE TEST XI

Name_____________________

1. What is a reversible change?
   (Terminal Frames: 16, 21)

2. Underline the correct answer to the following question:
   The special kind of medical doctor who studies cells and tissues to see whether they are normal or abnormal is a
   1. pediatrician
   2. pathologist
   3. psychoanalyst
   4. podiatrist
   5. peridontist
   (Terminal Frame: 4)

In the blanks before each question write whether the statement is true or false:

________3. Cells and tissues of cigarette smokers look the same as cells and tissues of non-smokers.
   (Terminal Frames: 7, 8, 11)

________4. If a person smokes cigarettes for a short time, the cells will not return to normal.
   (Terminal Frames: 18, 19)

________5. Cigarette smoke can cause the cells to permanently lose their cilia.
   (Terminal Frames: 23, 28, 32, 34)

________6. When cilia are paralyzed, this is NOT a permanent change.
   (Terminal Frames: 31, 33)
PERFORMANCE TEST XII

Name____________________

1. What is a carcinogen?

(Terminal Frames: 19, 20, 25, 33)

2. Name two things in cigarette smoke that have carcinogens in them.

1.___________________________

2.___________________________

(Terminal Frames: 22, 24, 25, 26, 34)

3. Cells and tissues of the air passages of cigarette smokers change from normal to abnormal, after a period of time. What condition is likely to happen at the places along the air passages where the cells and tissues are abnormal?

(Terminal Frames: 12, 13, 37, 39)
Name____________________

1. When the bronchi are constantly irritated by cigarette smoke, it is easy for germs to grow in them. What do doctors call it when a person has germs growing in his bronchi?_____________.

(Terminal Frames: 10, 22)

2. When the air sacs of the lungs are permanently damaged or destroyed, the person has emphysema. What is the major sign a person notices when he has emphysema?___________.

(Terminal Frames: 41, 43, 44, 46)

CHOOSE THE BEST ANSWER TO THE FOLLOWING QUESTION. UNDERLINE your answer.

3. The reason many doctors think that both bronchitis and emphysema are caused by cigarette smoking is

1. there are certain things in cigarette smoke that cause these same diseases in animals.

2. these diseases happen more often to cigarette smokers than to non-smokers.

3. in both diseases air sacs are destroyed, and cigarette smoke destroys air sacs.

4. all of the above.

(Terminal Frames: 12, 42, 45, 47, 48)
PERFORMANCE TEST XIV

Name____________________

1. Two ways your doctor can tell how hard your heart is working are by measuring your
   1. ______________________
   2. ______________________
   (Terminal Frames: 20, 38, 46, 48, 49, 52)

2. What is blood pressure?
   (Terminal Frames: 24, 35, 37)

3. What is the pulse rate?
   (Terminal Frames: 9, 10, 21)

4. If the size of blood vessels become smaller, what will happen to the blood pressure?
   (Terminal Frames: 43, 44, 45)
PERFORMANCE TEST XV

Name____________________

1. Explain what nicotine does to each of the following:

1. pulse
   (Terminal Frames: 15, 17, 28, 31)
2. blood vessels
   (Terminal Frames: 7, 8, 32)
3. blood pressure
   (Terminal Frames: 10, 11, 17, 28, 31)
4. breathing
   (Terminal Frames: 30, 31, 33)
5. heart
   (Terminal Frames: 16, 18, 19, 28)

2. One way you may be able to prevent heart disease is to take care of your heart by not smoking. Write whether this is true or false:

   ____________________________

   (Terminal Frame: 38)

3. A person must inhale cigarette smoke to get the effects of nicotine. Write whether this is true or false:

   ____________________________

   (Terminal Frames: 24, 25, 35)
CHOOSE THE BEST ANSWER TO THE FOLLOWING QUESTION. Underline your answer.

4. The pulse rate is affected by:

1. the tars in cigarette smoke
2. the gases in cigarette smoke
3. the nicotine in cigarette smoke
4. the arsenic in cigarette smoke

(Terminal Frames: 14, 15, 17, 28, 31)
APPENDIX V

PILOT TEST RESULTS
## TABLE 4

STATISTICS FOR TESTS OF HYPOTHESES IN ANALYSIS OF COVARIANCE OF cm/cp AND SEX, CONTINUOUS I.Q., AND TIME

<table>
<thead>
<tr>
<th>Program Unit</th>
<th>F</th>
<th>&quot;t&quot; (sex)</th>
<th>&quot;t&quot; (I.Q.)</th>
<th>&quot;t&quot; (time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2.78</td>
<td>-1.190</td>
<td>1.98</td>
<td>-0.69</td>
</tr>
<tr>
<td>II</td>
<td>6.56**</td>
<td>-2.33*</td>
<td>3.64**</td>
<td>0.08</td>
</tr>
<tr>
<td>III</td>
<td>2.89*</td>
<td>-2.02*</td>
<td>1.24</td>
<td>-1.21</td>
</tr>
<tr>
<td>IV</td>
<td>0.61</td>
<td>-0.05</td>
<td>0.87</td>
<td>-0.55</td>
</tr>
<tr>
<td>V</td>
<td>1.46</td>
<td>-0.94</td>
<td>-0.07</td>
<td>-1.88</td>
</tr>
<tr>
<td>VI</td>
<td>1.96</td>
<td>-1.44</td>
<td>0.54</td>
<td>1.69</td>
</tr>
<tr>
<td>VII</td>
<td>1.90</td>
<td>0.05</td>
<td>1.89</td>
<td>-0.38</td>
</tr>
<tr>
<td>VIII</td>
<td>0.37</td>
<td>0.18</td>
<td>-0.17</td>
<td>0.99</td>
</tr>
<tr>
<td>IX</td>
<td>1.40</td>
<td>-1.48</td>
<td>1.44</td>
<td>0.33</td>
</tr>
<tr>
<td>X</td>
<td>1.54</td>
<td>-1.08</td>
<td>1.95</td>
<td>0.75</td>
</tr>
<tr>
<td>XI</td>
<td>2.32</td>
<td>-0.73</td>
<td>1.52</td>
<td>2.29*</td>
</tr>
<tr>
<td>XII</td>
<td>9.79**</td>
<td>-1.18</td>
<td>3.86**</td>
<td>-2.48*</td>
</tr>
<tr>
<td>XIII</td>
<td>0.04</td>
<td>0.03</td>
<td>-0.32</td>
<td>0.02</td>
</tr>
<tr>
<td>XIV</td>
<td>2.78</td>
<td>-0.84</td>
<td>2.00</td>
<td>-1.13</td>
</tr>
<tr>
<td>XV</td>
<td>3.17*</td>
<td>-1.96</td>
<td>2.23*</td>
<td>0.42</td>
</tr>
</tbody>
</table>

*Significant at 5 per cent level
**Significant at 1 per cent level
TABLE 5
REGRESSION COEFFICIENTS, IN ANALYSIS OF COVARIANCE
OF cm/cp AND SEX, CONTINUOUS I.Q. AND TIME

<table>
<thead>
<tr>
<th>Program Unit</th>
<th>Sex</th>
<th>I.Q.</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>-0.027</td>
<td>0.004</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>0.027</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>-0.069</td>
<td>0.009</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>0.069</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>-0.101</td>
<td>0.006</td>
<td>-0.020</td>
</tr>
<tr>
<td></td>
<td>0.101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>-0.035</td>
<td>0.005</td>
<td>-0.018</td>
</tr>
<tr>
<td></td>
<td>0.035</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>-0.066</td>
<td>-0.0004</td>
<td>-0.055</td>
</tr>
<tr>
<td></td>
<td>0.066</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>-0.156</td>
<td>0.005</td>
<td>0.084</td>
</tr>
<tr>
<td></td>
<td>0.156</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>0.001</td>
<td>0.005</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>-0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIII</td>
<td>0.005</td>
<td>-0.0004</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>-0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IX</td>
<td>-0.066</td>
<td>0.005</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>0.066</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>-0.050</td>
<td>0.007</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>0.050</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XI</td>
<td>-0.027</td>
<td>0.005</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>0.027</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XII</td>
<td>-0.015</td>
<td>0.004</td>
<td>-0.011</td>
</tr>
<tr>
<td></td>
<td>0.015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XIII</td>
<td>0.001</td>
<td>-0.001</td>
<td>0.0004</td>
</tr>
<tr>
<td></td>
<td>-0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XIV</td>
<td>-0.025</td>
<td>0.005</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>0.025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XV</td>
<td>-0.068</td>
<td>0.007</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>0.068</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program Unit</td>
<td>F</td>
<td>&quot;t&quot; (sex)</td>
<td>&quot;t&quot; (I.Q.)</td>
</tr>
<tr>
<td>--------------</td>
<td>----</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>I</td>
<td>2.76</td>
<td>-1.40</td>
<td>-1.97</td>
</tr>
<tr>
<td>II</td>
<td>5.50**</td>
<td>-2.53*</td>
<td>-3.23**</td>
</tr>
<tr>
<td>III</td>
<td>3.00*</td>
<td>-2.13*</td>
<td>-1.34</td>
</tr>
<tr>
<td>IV</td>
<td>0.40</td>
<td>-0.47</td>
<td>-0.38</td>
</tr>
<tr>
<td>V</td>
<td>1.48</td>
<td>-0.94</td>
<td>0.25</td>
</tr>
<tr>
<td>VI</td>
<td>2.57</td>
<td>-1.58</td>
<td>-1.29</td>
</tr>
<tr>
<td>VII</td>
<td>3.50*</td>
<td>-0.25</td>
<td>-2.86**</td>
</tr>
<tr>
<td>VIII</td>
<td>0.38</td>
<td>0.15</td>
<td>-0.22</td>
</tr>
<tr>
<td>IX</td>
<td>2.72</td>
<td>-1.58</td>
<td>-2.41*</td>
</tr>
<tr>
<td>X</td>
<td>1.98</td>
<td>-1.27</td>
<td>-2.25*</td>
</tr>
<tr>
<td>XI</td>
<td>3.53*</td>
<td>-0.83</td>
<td>-2.36*</td>
</tr>
<tr>
<td>XII</td>
<td>6.88**</td>
<td>-1.32</td>
<td>-2.81**</td>
</tr>
<tr>
<td>XIII</td>
<td>0.02</td>
<td>0.04</td>
<td>0.14</td>
</tr>
<tr>
<td>XIV</td>
<td>2.33</td>
<td>-0.99</td>
<td>-1.67</td>
</tr>
<tr>
<td>XV</td>
<td>3.29*</td>
<td>-2.27*</td>
<td>-2.30*</td>
</tr>
</tbody>
</table>

*Significant at 5 per cent level
**Significant at 1 per cent level
TABLE 7

REGRESSION COEFFICIENTS IN ANALYSIS OF COVARIANCE OF cm/cp AND SEX, GROUPED I.Q.'S, AND TIME

<table>
<thead>
<tr>
<th>Program Unit</th>
<th>Sex</th>
<th>I.Q.</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>-0.033</td>
<td>-0.050</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>0.033</td>
<td>0.050</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>-0.077</td>
<td>-0.101</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>0.077</td>
<td>0.101</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>-0.105</td>
<td>-0.075</td>
<td>-0.018</td>
</tr>
<tr>
<td></td>
<td>0.105</td>
<td>0.075</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>-0.035</td>
<td>-0.028</td>
<td>-0.026</td>
</tr>
<tr>
<td></td>
<td>0.035</td>
<td>0.028</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>-0.066</td>
<td>0.019</td>
<td>-0.057</td>
</tr>
<tr>
<td></td>
<td>0.066</td>
<td>-0.019</td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>-0.162</td>
<td>-0.138</td>
<td>0.090</td>
</tr>
<tr>
<td></td>
<td>0.162</td>
<td>0.138</td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>-0.007</td>
<td>-0.076</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>0.007</td>
<td>0.076</td>
<td></td>
</tr>
<tr>
<td>VIII</td>
<td>0.004</td>
<td>0.006</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>-0.004</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td>IX</td>
<td>-0.067</td>
<td>-0.096</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>0.067</td>
<td>0.096</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>-0.058</td>
<td>-0.105</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td>0.058</td>
<td>0.105</td>
<td></td>
</tr>
<tr>
<td>XI</td>
<td>-0.030</td>
<td>-0.090</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>0.030</td>
<td>0.090</td>
<td></td>
</tr>
<tr>
<td>XII</td>
<td>-0.018</td>
<td>-0.041</td>
<td>-0.011</td>
</tr>
<tr>
<td></td>
<td>0.018</td>
<td>0.041</td>
<td></td>
</tr>
<tr>
<td>XIII</td>
<td>0.002</td>
<td>0.008</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>-0.002</td>
<td>-0.008</td>
<td></td>
</tr>
<tr>
<td>XIV</td>
<td>-0.030</td>
<td>-0.055</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>0.030</td>
<td>0.055</td>
<td></td>
</tr>
<tr>
<td>XV</td>
<td>-0.079</td>
<td>-0.081</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>0.079</td>
<td>0.081</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 8

ERRORS OCCURRING ON MORE THAN ONE FRAME OF A UNIT*

<table>
<thead>
<tr>
<th>Program Unit</th>
<th>Frame number</th>
<th>Number of errors</th>
<th>Number of students making errors</th>
<th>Per cent of students making errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>19</td>
<td>3</td>
<td>4</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>2</td>
<td>2</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>4.5</td>
<td>7</td>
<td>15.5</td>
</tr>
<tr>
<td>II</td>
<td>*37</td>
<td>3.5</td>
<td>5</td>
<td>11.1</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>2.0</td>
<td>2</td>
<td>4.4</td>
</tr>
<tr>
<td>III</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>IV</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>2</td>
<td>2</td>
<td>4.4</td>
</tr>
<tr>
<td>V</td>
<td>*26</td>
<td>3</td>
<td>3</td>
<td>6.5</td>
</tr>
<tr>
<td>VI</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>VII</td>
<td>13</td>
<td>2</td>
<td>4</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>*22</td>
<td>2.5</td>
<td>4</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>*27</td>
<td>4.3</td>
<td>7</td>
<td>15.9</td>
</tr>
<tr>
<td></td>
<td>*29</td>
<td>3.0</td>
<td>4</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>*30</td>
<td>2.5</td>
<td>4</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>5.5</td>
<td>10</td>
<td>22.7</td>
</tr>
</tbody>
</table>

* Denotes a terminal frame
<table>
<thead>
<tr>
<th>Program Unit</th>
<th>Frame number</th>
<th>Number of errors</th>
<th>Number of students making errors</th>
<th>Per cent of students making errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIII</td>
<td>*3</td>
<td>2.5</td>
<td>3</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>5.0</td>
<td>5</td>
<td>11.1</td>
</tr>
<tr>
<td></td>
<td>*18</td>
<td>2.0</td>
<td>2</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>2.5</td>
<td>3</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>*30</td>
<td>2.0</td>
<td>2</td>
<td>4.4</td>
</tr>
<tr>
<td>IX</td>
<td>14</td>
<td>2.0</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>2.0</td>
<td>3</td>
<td>7.0</td>
</tr>
<tr>
<td>X</td>
<td>*26</td>
<td>2.0</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td>XI</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>*11</td>
<td>2</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>*16</td>
<td>2</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>2</td>
<td>3</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>*21</td>
<td>2</td>
<td>3</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>2</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td>XII</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>2</td>
<td>2</td>
<td>4.3</td>
</tr>
<tr>
<td>XIII</td>
<td>13</td>
<td>2</td>
<td>2</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>2</td>
<td>3</td>
<td>6.4</td>
</tr>
<tr>
<td>Program Unit</td>
<td>Frame number</td>
<td>Number of errors</td>
<td>Number of students making errors</td>
<td>Per cent of students making errors</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------</td>
<td>------------------</td>
<td>-----------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>XIV</td>
<td>*24</td>
<td>3.0</td>
<td>3</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>2.0</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>3.0</td>
<td>4</td>
<td>9.3</td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>2.0</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>5.5</td>
<td>6</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>4.0</td>
<td>7</td>
<td>16.3</td>
</tr>
<tr>
<td>XV</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>5</td>
<td>5</td>
<td>11.1</td>
</tr>
<tr>
<td></td>
<td>*10</td>
<td>2.5</td>
<td>3</td>
<td>6.7</td>
</tr>
</tbody>
</table>
TABLE 8—Continued

<table>
<thead>
<tr>
<th>Program Unit</th>
<th>Frame number</th>
<th>Number of errors</th>
<th>Number of students making errors</th>
<th>Per cent of students making errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>*11</td>
<td>2.0</td>
<td>2</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>*15</td>
<td>3.0</td>
<td>3</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>*18</td>
<td>3.5</td>
<td>4</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>*19</td>
<td>3.5</td>
<td>4</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>*25</td>
<td>3.0</td>
<td>3</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>*28</td>
<td>2.0</td>
<td>2</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>*31</td>
<td>2.0</td>
<td>2</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>*35</td>
<td>2.0</td>
<td>2</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>*38</td>
<td>2.0</td>
<td>2</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Program Unit</td>
<td>Total terminal error rate</td>
<td>Mean terminal error rate of individuals making errors</td>
<td>Standard deviation of error rate of individuals making errors</td>
<td>Total frame error rate</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------</td>
<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>I</td>
<td>.006</td>
<td>0.01</td>
<td>0.03</td>
<td>.012</td>
</tr>
<tr>
<td>II</td>
<td>.010</td>
<td>0.01</td>
<td>0.04</td>
<td>.011</td>
</tr>
<tr>
<td>III</td>
<td>.011</td>
<td>0.01</td>
<td>0.03</td>
<td>.011</td>
</tr>
<tr>
<td>IV</td>
<td>.013</td>
<td>0.01</td>
<td>0.04</td>
<td>.010</td>
</tr>
<tr>
<td>V</td>
<td>.010</td>
<td>0.01</td>
<td>0.04</td>
<td>.007</td>
</tr>
<tr>
<td>VI</td>
<td>.000</td>
<td>0.01</td>
<td>0.02</td>
<td>.002</td>
</tr>
<tr>
<td>VII</td>
<td>.029</td>
<td>0.03</td>
<td>0.06</td>
<td>.012</td>
</tr>
<tr>
<td>VIII</td>
<td>.019</td>
<td>0.02</td>
<td>0.03</td>
<td>.016</td>
</tr>
<tr>
<td>IX</td>
<td>.006</td>
<td>0.01</td>
<td>0.02</td>
<td>.011</td>
</tr>
<tr>
<td>X</td>
<td>.021</td>
<td>0.03</td>
<td>0.01</td>
<td>.015</td>
</tr>
<tr>
<td>XI</td>
<td>.018</td>
<td>0.05</td>
<td>0.21</td>
<td>.018</td>
</tr>
<tr>
<td>XII</td>
<td>.012</td>
<td>0.01</td>
<td>0.03</td>
<td>.012</td>
</tr>
<tr>
<td>XIII</td>
<td>.018</td>
<td>0.03</td>
<td>0.01</td>
<td>.020</td>
</tr>
<tr>
<td>XIV</td>
<td>.015</td>
<td>0.02</td>
<td>0.03</td>
<td>.016</td>
</tr>
<tr>
<td>XV</td>
<td>.023</td>
<td>0.03</td>
<td>0.07</td>
<td>.033</td>
</tr>
</tbody>
</table>
TABLE 10

STATISTICS FOR TESTS OF HYPOTHESES IN THE ANALYSIS OF COVARIANCE OF cm/cp AND THE RATE OF CORRECT TERMINAL FRAMES AND RATE OF CORRECT FRAMES

<table>
<thead>
<tr>
<th>Program Unit</th>
<th>F</th>
<th>$t_{b1}$</th>
<th>$t_{b2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>10.087**</td>
<td>-0.230</td>
<td>2.646*</td>
</tr>
<tr>
<td>II</td>
<td>5.728**</td>
<td>-0.546</td>
<td>1.561</td>
</tr>
<tr>
<td>III</td>
<td>2.087</td>
<td>-0.991</td>
<td>1.832</td>
</tr>
<tr>
<td>IV</td>
<td>1.946</td>
<td>0.428</td>
<td>0.659</td>
</tr>
<tr>
<td>V</td>
<td>1.576</td>
<td>-0.835</td>
<td>1.702</td>
</tr>
<tr>
<td>VI</td>
<td>1.169</td>
<td>1.528</td>
<td>-0.669</td>
</tr>
<tr>
<td>VII</td>
<td>1.427</td>
<td>-0.295</td>
<td>0.980</td>
</tr>
<tr>
<td>VIII</td>
<td>0.105</td>
<td>0.355</td>
<td>-0.458</td>
</tr>
<tr>
<td>IX</td>
<td>3.334*</td>
<td>2.511*</td>
<td>-0.872</td>
</tr>
<tr>
<td>X</td>
<td>0.031</td>
<td>0.018</td>
<td>0.034</td>
</tr>
<tr>
<td>XI</td>
<td>2.036</td>
<td>-1.175</td>
<td>1.992</td>
</tr>
<tr>
<td>XII</td>
<td>4.049*</td>
<td>0.277</td>
<td>1.576</td>
</tr>
<tr>
<td>XIII</td>
<td>0.037</td>
<td>-0.029</td>
<td>-0.190</td>
</tr>
<tr>
<td>XIV</td>
<td>0.690</td>
<td>1.080</td>
<td>-0.709</td>
</tr>
<tr>
<td>XV</td>
<td>0.523</td>
<td>0.458</td>
<td>-1.016</td>
</tr>
</tbody>
</table>

*Significant at 5 per cent level
**Significant at 1 per cent level
TABLE 11

REGRESSION COEFFICIENTS IN ANALYSIS OF COVARIANCE OF
\text{cm/cp} AND THE RATE OF CORRECT TERMINAL FRAMES AND
THE RATE OF CORRECT FRAMES

<table>
<thead>
<tr>
<th>Program</th>
<th>Terminal Frames Correct</th>
<th>Total Frames Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terminal Frames</td>
<td>Total Frames</td>
</tr>
<tr>
<td>I</td>
<td>-0.328</td>
<td>4.448</td>
</tr>
<tr>
<td>II</td>
<td>-1.549</td>
<td>4.293</td>
</tr>
<tr>
<td>III</td>
<td>-2.222</td>
<td>4.878</td>
</tr>
<tr>
<td>IV</td>
<td>1.269</td>
<td>2.976</td>
</tr>
<tr>
<td>V</td>
<td>-1.718</td>
<td>11.924</td>
</tr>
<tr>
<td>VI</td>
<td>8.333</td>
<td>-8.772</td>
</tr>
<tr>
<td>VII</td>
<td>-0.286</td>
<td>1.262</td>
</tr>
<tr>
<td>VIII</td>
<td>0.428</td>
<td>-0.771</td>
</tr>
<tr>
<td>IX</td>
<td>6.403</td>
<td>-1.426</td>
</tr>
<tr>
<td>X</td>
<td>0.040</td>
<td>0.146</td>
</tr>
<tr>
<td>XI</td>
<td>-0.228</td>
<td>1.858</td>
</tr>
<tr>
<td>XII</td>
<td>0.211</td>
<td>1.803</td>
</tr>
<tr>
<td>XIII</td>
<td>-0.018</td>
<td>-0.225</td>
</tr>
<tr>
<td>XIV</td>
<td>2.011</td>
<td>-1.468</td>
</tr>
<tr>
<td>XV</td>
<td>0.292</td>
<td>-1.264</td>
</tr>
</tbody>
</table>
### TABLE 12

**TIME ANALYSIS OF UNITS**

<table>
<thead>
<tr>
<th>Program Unit</th>
<th>Total number frames</th>
<th>Time range in minutes</th>
<th>Mean time in minutes</th>
<th>Standard deviation</th>
<th>Frames completed per minute maximum - minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>33</td>
<td>11-29</td>
<td>16.9</td>
<td>3.7</td>
<td>3.0 - 1.1</td>
</tr>
<tr>
<td>II</td>
<td>49</td>
<td>11-28</td>
<td>20.6</td>
<td>3.7</td>
<td>4.5 - 1.8</td>
</tr>
<tr>
<td>III</td>
<td>29</td>
<td>04-19</td>
<td>9.9</td>
<td>3.2</td>
<td>7.3 - 1.5</td>
</tr>
<tr>
<td>IV</td>
<td>25</td>
<td>05-14</td>
<td>8.3</td>
<td>2.3</td>
<td>5.0 - 1.8</td>
</tr>
<tr>
<td>V</td>
<td>31</td>
<td>06-18</td>
<td>11.0</td>
<td>2.5</td>
<td>5.2 - 1.7</td>
</tr>
<tr>
<td>VI</td>
<td>26</td>
<td>07-17</td>
<td>10.5</td>
<td>2.1</td>
<td>3.7 - 1.5</td>
</tr>
<tr>
<td>VII</td>
<td>38</td>
<td>11-28</td>
<td>19.6</td>
<td>4.3</td>
<td>3.5 - 1.4</td>
</tr>
<tr>
<td>VIII</td>
<td>30</td>
<td>10-21</td>
<td>14.3</td>
<td>2.8</td>
<td>3.0 - 1.4</td>
</tr>
<tr>
<td>IX</td>
<td>32</td>
<td>05-19</td>
<td>12.4</td>
<td>3.1</td>
<td>6.4 - 1.7</td>
</tr>
<tr>
<td>X</td>
<td>28</td>
<td>04-15</td>
<td>9.2</td>
<td>2.3</td>
<td>7.0 - 1.9</td>
</tr>
<tr>
<td>XI</td>
<td>35</td>
<td>08-21</td>
<td>13.0</td>
<td>3.0</td>
<td>4.4 - 1.7</td>
</tr>
<tr>
<td>XII</td>
<td>41</td>
<td>09-21</td>
<td>13.0</td>
<td>3.0</td>
<td>4.6 - 2.0</td>
</tr>
<tr>
<td>XIII</td>
<td>49</td>
<td>09-28</td>
<td>16.3</td>
<td>3.6</td>
<td>5.4 - 1.8</td>
</tr>
<tr>
<td>XIV</td>
<td>52</td>
<td>09-29</td>
<td>16.6</td>
<td>4.4</td>
<td>5.8 - 1.8</td>
</tr>
<tr>
<td>XV</td>
<td>38</td>
<td>10-29</td>
<td>15.8</td>
<td>3.9</td>
<td>3.8 - 1.3</td>
</tr>
</tbody>
</table>
I, Helen Lou Tinnin, was born in Austin, Texas, graduated from Austin High School, and completed the first two years of higher education in Austin at the University of Texas. Later, I transferred to the University of California, Berkeley, California, from which I received my A.B. degree in 1952 with a major in the field of physiology. Following graduation, I worked as a pharmaceutical sales representative for Pfizer Laboratories, an ethical pharmaceutical house specializing in the development and marketing of pharmaceuticals, particularly antibiotics. This position took me to Youngstown, Ohio. In 1954, I left Pfizer and took a similar position with Ayerst Laboratories, another ethical pharmaceutical house specializing in the research, development and marketing of drugs, especially steroids. This work was in Birmingham, Alabama. In 1959, I resigned and spent a year traveling in Europe, Scandinavia, the British Isles and North Africa.

In September 1960 I returned to the University of California at Berkeley to do graduate study. I received my
Master of Public Health degree in health education in September, 1961. I continued graduate study to complete the requirements for a Junior College Credential, and at the same time taught health education at Chabot College, San Leandro, California. In February 1961 I received the California Junior College Credential.

In March 1961 I enrolled in the graduate school of The Ohio State University to study for the Ph.D. degree. My major field for the general examination was in school health education and my minor field of examination was in higher education. I worked as a teaching assistant in health education while at The Ohio State University.

In September 1963 I took a position in Canton, Ohio, as Project Director for a special inter-agency project for the Tri-Agency Health Education Council (TAHEC) which was sponsored by the Stark County Tuberculosis and Health Association, the Stark County Cancer Society, and the Stark County Heart Association, in cooperation with the Stark County Medical Association and the Stark County Schools. The project was delegated to develop a program of education about smoking and health in the schools and in the community.