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Use of Supplemental Audiovisual Materials with Remedial Science Students

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USE OF SUPPLEMENTAL AUDIOVISUAL MATERIALS WITH REMEDIAL SCIENCE STUDENTS

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by

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This project was undertaken to determine if the use of supplemental audiovisual materials would benefit identified remedial seventh grade science pupils. Two experimental groups of remedial pupils were presented various amounts of supplemental audiovisual materials. Both groups were then compared to a control group of remedial pupils receiving no experimental treatment. The results showed support for the hypothesis that there would be no significant difference in learning when supplemental audiovisual materials were used.

Acknowledgements

This project is dedicated to my husband Dan for his continual support and encouragement, and to the staff and pupils at Selah Junior High, without whom this project could not have been completed.

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CHAPTER ONE

Introduction

In our present day technocracy, science literacy is of the utmost importance. It is the responsibility of every science teacher to assist his/her pupils in reaching science literacy. In meeting this goal, the teacher must find ways of presenting material which will reach even those pupils with reading difficulties. It was the task of this writer to determine if the use of supplemental audiovisual materials would facilitate the learning of identified remedial seventh grade biology pupils at Selah Junior High.

There are nearly as many theories about why pupils encounter difficulties in their science classes as there are theorists, but most seem to agree that science literacy depends on the pupil's understanding of the basic terminology involved in the science field he/she is studying. According to Bryan (1954), if the student has difficulty reading, he/she will either be unable to master the terminology, or will be slow in achieving mastery. Thus the student will fall behind.

> Many reading difficulties faced by pupils in the study of science arise in the introduction, all at one time, of numerous new concepts, in the interpretation of

> mathematical formulae, and in solving problems. To read science material successfully, pupils must master certain reading skills. (Bryan, 1954, p. 1)

Since most teachers have very little time to correct all of the pupil's difficulties, they attempt to help the pupil master the concepts in various other ways. Pupils included in this study were deficient in reading ability. Supplemental audiovisual materials were used in an attempt to help the pupils master the concepts which they would have difficulty reading, providing they would have to master these primarily from reading the text.

The Problem

Statement of the Problem

The problem investigated in this study was will selected supplemental audiovisual materials facilitate the learning of remedial seventh grade biology pupils at Selah Junior High?

Importance of the Study

This study may be of importance in helping other teachers in Selah to understand to what extent pupils with reading difficulties and a past history of low achievement may be further assisted in the mastery of the basic concepts taught through the use of selected supplemental audiovisual materials. All pupils should have a firm grounding in the basic concepts and understandings of science if they are to survive in the technocratic world of tomorrow.

Statement of the Hypothesis

For the purpose of research, the following hypothesis was tested. There will be no statistically significant difference in learning using the 5% level of confidence when the remedial seventh grade biology curriculum is supplemented with audiovisual materials at Selah Junior High.

Research Design

The research design selected by this writer was the "Quasi Experimental Group" design. The 5% level of confidence was used to determine statistical significance of differences in group performance. This writer compared a control group of remedial pupils to each of two variable groups.

Control. Remedial pupils in the control group were taught with the regular class, and received no experimental treatment.

Variable I. Remedial pupils in this group received aural assistance with the reading of the difficult portions of the text, and assistance with the use of their texts to locate key concepts in the reading.

Variable II. Remedial pupils in this group received the same treatment as the members of variable group I, but also received audio assistance with the use of their text to locate key vocabulary words. Other supplemental

materials included continuous directions in methods of use of the text, hands-on instruction during labs, and extended use of overhead transparencies. Students were also allowed to take home tapes of the reading of the text for review of the material.

Selection of Instruments

Since a one year reading deficit was a major criterion for selecting the remedial science pupils, the California Achievement Test was utilized as a means of identifying those pupils who were at least one year below their seventh grade placement in reading. All pupils in the Selah School District are administered the C.A.T. at the end of each school year. Those pupils receiving very low scores retake the test at the beginning of the following year, along with several other tests to assess the need for placement in remedial or special help classes. A collection of growth data is maintained for each child from year to year. Level 4, grades 6-9 was used, and the total reading score was used to determine those pupils one or more years below their seventh grade placement in reading ability.

The other criterion was the selection of those pupils who, after the end of one trimester of seventh grade biology, averaged 59% (D+) or less on assignments, labs, quizzes, and tests during the previously stated period. All tests were the standardized tests which come with the textbook and are designed to test those concepts presented in the text.

Limitations of the Study

1. This writer had no control over the number of remedial pupils assigned to each class.

2. Audiovisual materials selected were limited to those prepared by the teacher, or available through E.S.D. 105, Central Washington University, CISPUS, the Selah School District #119 Media Center, various sources of free educational materials, and others approved by the Selah district.

3. The primary factors used to identify the remedial pupils were based on deficient reading ability, and previous science grades.

4. Lack of funds in the Selah district prevented the purchase of new materials.

5. The subjects were limited to the classes of only one teacher.

6. Many of the teacher-created materials used during the research were not previously tested.

7. The length of research on the subjects was for a period of six months.

Definition of Terms

Remedial science pupil. Throughout this study, remedial science pupils are defined as those pupils with a reading deficit of one or more years below their seventh grade placement, and also those pupils who, along with their

reading deficit, averaged 59% (D+) or lower during their first trimester in their Selah Junior High biology class.

Audiotutorial. Throughout this study, "audiotutorial" refers to those methods which deal with the teaching of concepts in an aural manner, including lectures, discussions, and tapes.

Projected materials. Those materials which require projection equipment in order to be fully utilized, such as, but not limited to films, filmstrips, and overhead transparencies.

Non-projected materials. Non-projected materials are all materials which do not require projection equipment to be utilized. These include, but are not limited to books, pictures, models, and tapes.

Study center. Throughout this study, the term "study center" refers to a specifically designated area of the classroom designed for individual and small group utilization of supplemental audiovisual materials.

Technocracy. Throughout this study, the term "technocracy" refers to a government and social system dependent upon science technicians.

Technocratic world. Throughout this study, a "technocratic world" refers to the dependency of the earth and its inhabitants on technology.

Technology. Throughout this study, "technology" refers to the application of science, especially to commercial or industrial objectives.

Overview of the Study

Chapter one of this study provides an introduction to the study, giving its importance and a description of the problem. Chapter two contains a review of the literature as it pertains to the problem, and cites selected authorities who have done meritorious research in the area. Chapter three begins with an explanation of the procedures used in the study, and includes an analysis of the data obtained from the study. Chapter four contains an overview of the Selah Junior High seventh grade science program and its main objectives. An evaluation of the effects of the study is also included in chapter four. Chapter five summarizes the project and gives recommendations for possible use of the program in the classroom. Chapter five is completed with the inclusion of a reference list of sources cited in the report. An appendix section is included to give examples of the work assigned to the pupils during the study.

CHAPTER TWO

Review of Literature

During the review of literature, this writer researched works in the areas of remedial science education, audiotutorial programming, reading in the sciences, and individualization as it pertains to junior high science. The selected citations for review were predominantly from 1964 to the present. A few of the citations dated back to the 1950's, however. It was disappointing to find that very little locatable research had been done in the area of remediating the junior high science student in the regular classroom. Research did cover the use of audiovisual materials in the classroom, but little was mentioned as to the advantages or disadvantages of the use of these materials with identified remedial science pupils.

In a 1964 (Fowler) look at the future of science education, two of the trends foreseen were an increase in the use of audiovisual materials by individuals or small groups of pupils, and also a homogeneous grouping of pupils to allow them to work with other pupils working at the same pace. Now, eighteen years later, these trends are being used by a great many educators in a variety of fields. The subjects in this study were treated using both of these methods.

Since a prime criterion for the selection of the subjects used in this study was a deficient reading level, information on this subject as it pertains to science education was carefully scrutinized.

Benyon (1969) made a point which this writer believes is a key to the concept of using supplemental audiovisual materials with remedial pupils. She states that children use one sensory avenue to justify information they receive in other, less familiar or uncertain sensory avenues. If a child receives a variety of stimulations, one of which he should identify with, he should be able to absorb the material being presented in that mode. This writer attempted to present the identified subjects with a variety of audiovisual materials, thus taking a good deal of the pressure off the child by reducing the "read and remember" philosophy which many teachers cling to.

Variable group II received the largest variety of supplemental audiovisual materials. Sometimes these materials were presented to the entire test group, and other times they were presented to each of the subjects individually. These materials were added in addition to those audiovisual materials used by the entire class. Variable group II received assistance with the reading of the text, and with the location of key concepts in the reading. This was done by using taped readings of the text or by teacher presentation. The assistance these pupils received with the location of the key concepts in the

reading was basically a reminder of instruction given to the entire class at the beginning of the year, so this method was not new to the pupils. If Benyon (1969) is correct in her statement, then the students receiving a variety of audiovisual materials should be capable of learning the material providing they are taught using at least one sensory avenue with which they are familiar.

Reading in the sciences was broken down to a five step process by Bryan (1954). She described the five steps as readiness, concept development, silent reading, discussion, and rereading. Since one of the greatest problems experienced by the subjects of this study is the difficulty with the reading of the text, teacher-prepared tapes of the reading of the text were used and study guide questions were asked, directing the pupils to the key concepts and vocabulary words in the reading. The pupils had to follow along in their books in order to answer the questions. Using Bryan's (1954) model as previously stated, the subjects demonstrated the readiness to study science. They were naturally curious about the field of biology, and had a small, basic background of science knowledge to build upon. In this respect, the pupils were ready to proceed in the gain of new knowledge. When vocabulary words and concepts were presented and discussed orally in class, the subjects responded favorably, but when asked to read the text and answer specific questions relating to the reading, the subjects met with mixed periods of success and failure,

but mostly failure. It is this writer's observation that this demonstrated a breakdown in the pupil's mastery of step three, silent reading in Bryan's model. The pupils, when presented the taped reading and the guidance in the use of the text to locate key concepts, found they were able to master the use of many of the terms and concepts presented in the reading that they were otherwise missing due to their poor reading skills.

In Thelen's (1976) monograph, she states that until a student is sufficiently prepared through vocabulary and development of concepts, he is not ready to read the text. It seems to be the general concensus of many writers that pupils need guidance in the comprehension of concepts if they are to master them eventually. Davis (1977) and Shepherd (1960) agree with Thelen in that they believe the key vocabulary words and basic concepts must be developed before the pupil begins to read, but Shepherd carries the process one step further by stating the need to develop the purposes for reading.

Part of the treatment for all pupils in this study included an introduction to each chapter. During the introduction, important ideas were pointed out, and new vocabulary words were presented. Pupils were reminded to utilize the reading questions located in the chapter as a key to guide them in looking for main ideas. The pupils were thus guided by the reading questions toward the main purpose of each specific section.

Even though the pupils in this study were taught how to use their texts, and were given instruction in new vocabulary words and new concepts prior to reading the chapter, the fact still remains that these pupils had reading and comprehension problems. Thus, an audiotutorial approach was used. Marie Carbo (1979) used what she termed "talking books" with pupils having severe learning handicaps. "Talking books" were simply paperbacks read on tape, and played back by her pupils. This approach was used to benefit pupils with memory difficulties, trouble with phonics, and also problems with comprehension. One of Carbo's goals was "to enable students to read material on their language comprehension level with correct pacing, phrasing, voice inflection, and rate, regardless of their low reading ability" (Carbo, 1979, p. 62). These are generally advantages of an audiotutorial program.

It is this writer's belief that if a person can learn just by hearing something, then the learning should be further ingrained by also seeing the material at the time it is being presented. Carbo demonstrated this through her work with "talking books." Using taped readings of the text and guidance with the study questions during this project, the pupils receiving the experimental treatment were able to see and hear the vocabulary words and main concepts as they were read and emphasized. Three sensory avenues were stimulated during the process, going back to Benyon's (1969) model of sensory perception. The pupils

heard the words, they saw the words, and they were able to trace the words in succession with their fingers, when needed, to follow along. Using this model, the subjects in this project should have been able to identify with at least one of these sensory avenues, and should have absorbed some of the material being presented.

Samuel N. Postlethwait (1972) is credited with making great strides in the use of audiotutorial programming. He used this approach with college botany pupils at Purdue University. Postlethwait has also suggested many ways of implementing such a program at other levels and in other subjects.

Simpson and Anderson (1981) have described some advantages and limitations to the audiotutorial approach. Pupils are free to work at their own pace, starting and stopping the tapes and reviewing the material as needed. This may pose a problem for the slower pupil who may need more time than the secondary class will allow, and also for the pupil who finishes early. It has been this writer's experience that all early finishers do not use their free time in the same manner. Some may choose to use the extra time to review previous material, while others tend to distract pupils who are still working. The early finisher can pose many problems for an unprepared instructor. Using the audiotutorial approach, pupils take a more active role in their own learning, but secondary pupils require more guidance and one-to-one help than do the college pupils

that Postlethwait originally worked with. The audiotutorial method allows for a variety of approaches to be used in presenting the material, and also provides the pupil with a selection of modes to work in. This often proves to be a serious problem however, due to the lack of facilities and equipment needed to carry out an audiotutorial program.

Lazarowitz and Huppert (1981) used individualized audiotutorial learning units with ninth grade biology pupils in a Kibbutz school in Israel. Since materials were very few in numbers, the class was divided into three groups, each of which studied one of three related units. When a pupil successfully completed one unit, he moved to the next unit, until he completed all three. All the materials were available in the room, including reading materials, work sheets, tapes, filmstrips, and labs. When the work for a unit was completed, the teacher administered quizzes and tests. In order for the pupil to move to the next unit, he must have passed all of the assigned work and the test for the unit. Supplemental materials were supplied for pupils needing extra help, and those needing more advanced materials to work with. When all of the pupils had completed the three units, the teacher administered a final exam to the entire class. Although Simpson and Anderson (1981) felt that lack of materials would most likely be a problem with the audiotutorial approach to learning, Lazarowitz and Huppert demonstrated that by using a little

ingenuity, even a small supply of materials could be adequately used to educate a larger group of pupils.

In the review of literature, this writer has attempted to provide the reader with a variety of reference materials by which one can obtain information on the use of supplemental audiovisual materials and the use of the audiotutorial approach to learning. It has also been noted that the reading and comprehension capabilities of pupils may have a definite effect on their learning success.

This chapter cited notable works done in the areas of reading in the sciences, individualization, and the audio-tutorial approach to learning. According to most of the authors cited, the pupil must be prepared sufficiently in the development of key concepts and new vocabulary terms before asked to read and comprehend the text. If a pupil is taught using more than one sensory avenue, the pupil will have a greater chance of finding an avenue he can identify with, and thus, master the material more readily.

There are many ways of accomplishing the preparation of pupils for new materials. One such method uses taped readings to allow the pupils the chance to hear the terms and phrases presented in the proper manner. This method has been employed by many educators in many fields, and is also utilized in this study. It is hoped that the citations presented in this chapter will provide readers an introduction to the various areas covered, and give the reader a place to start when looking for works done in the

areas of reading in the sciences, individualization as it relates to science, and the audiotutorial approach to learning.

CHAPTER THREE

Procedures and Data

Method

Introduction

This project was designed to test the effects of the use of supplemental audiovisual materials on remedial seventh grade biology pupils at Selah Junior High.

Design

A "quasi-experimental" group design was selected as the method of research. In this design, each variable group is compared to a control group, and a statistical analysis between groups is performed to determine if significant differences exist.

Subjects

The subjects involved in this project were selected based on a deficient reading ability, and a below average grade in their seventh grade biology class.

The California Achievement Test, level 4, grades 6-9, was utilized to identify those pupils with a reading level one or more years below their seventh grade placement. The total reading score was used to determine the deficiency in each pupil's reading ability. The total reading score is a composite of the vocabulary and reading comprehension

scores. Since the C.A.T. was administered during the first month of school (7.1), a maximum total reading score of 6.1 on the C.A.T. was allowable. The mean deficiency of the scores of the pupils was 1.12 years below their seventh grade placement, or approximately a fifth grade tenth month reading level.

The second criterion for selection was a 59% (D+) average during the pupil's first trimester of seventh grade biology at Selah Junior High. Since the pupils selected as subjects in this study were all members of the classes of only one teacher, the population was limited, but the grading procedures were consistent from group to group. Pupil scores were computed based on a point system. Each assignment, lab, quiz, and test was assigned a specific number of points based on the number of questions on the instrument, and the degree of difficulty of the questions. At the end of each sixty day period (one trimester), the pupil's points were totaled, and a percentage of the total points was computed for each pupil. Grades were assigned based on the percentage of the total points that each pupil earned. Those pupils scoring 59% (D+) or lower, and also averaging one or more years below their seventh grade placement in reading were eligible to become part of the sample population for the study.

The group placement process consisted of placing the names of the eligible pupils in a box, and drawing the names of the pupils out to place them in one of the three

groups. It was predetermined that the first name drawn would be the first member of the control group, the second name would go into variable group I, the third name would go into variable group II and then the process would be repeated. Since there were fifteen pupils eligible for the program, five pupils were placed in each of the groups. No special consideration was given to any of the pupils based on the size of the class they were enrolled in, or the period of the day during which they attended their seventh grade biology class.

Procedure

As previously stated, there were three groups of subjects in this study, each of which was composed of five pupils. The control group was composed of five remedial science pupils who were taught along with the rest of the class, and who received no experimental treatment. They were to function as members of the regular class. These pupils were not informed that they were a part of an experimental study, and their scores were not examined until the end of the year when the statistics for each group were tabulated and compared.

Variable group I was composed of remedial science pupils whose experimental treatment consisted of aural assistance with the reading of the difficult terms in the text, and assistance with the use of their texts to locate key concepts in the reading. This was accomplished by

working with each of the pupils individually as well as in their group of five. New words were pointed out to the pupils, and the group practiced pronouncing the words out loud. The pupils were then told the definition of the word, and the place in the text where the word could be found.

The pupils were not told that they were a part of an experiment. The pupils believed that they were receiving special attention to help them improve their grades so that they would not face the risk of retention in the seventh grade. The practice of providing extra help for pupils having difficulty is understood and commonplace in the science department at Selah Junior High. Even though the methods used to help the pupils in this group were more individualized than usual, the pupils in variable group I did not seem to mind the extra attention they received.

Variable group II consisted of remedial pupils whose experimental treatment consisted of the same treatment as was applied to group I, but the pupils of group II also received audio assistance with the reading of their text, and location of key concepts and terms. An audiotutorial approach was utilized to provide the subjects with the audio assistance. After hearing the words spoken and after saying the difficult words, the pupils in group II listened to the reading of the text on tapes and followed along in their books. Pupils in group II were given continuous directions in methods of proper use of their

text, such as how to use section headings, reading questions, and the review section at the end of the chapter. Hands-on instruction during labs was accompanied by handouts asking questions and giving guidance in the proper use of equipment. Group II was allowed extended use of overhead transparencies also. The pupils in group II were allowed to take home the tapes of the reading of the text for review of the material.

All group work took place in a study center located on the side of the room. In the study center, all audiovisual materials needed by the pupils were provided. Tape recorders and tapes for individual and group work, filmstrips, lab materials, and an overhead projector were available to the subjects when needed. All subjects would receive the basic instruction with the full class, and would then move to the study center to work on the day's assignment. If a group meeting was necessary, the subjects would attend the meeting first before reporting to their respective work areas. Most materials were available for pupil use before and after the regular school day, as well as during the class period. This extra work time was provided for any pupil who wished to use it, regardless of the program of instruction the pupil was involved in.

At the conclusion of the school year, the data collected on each of the three groups of remedial pupils was tabulated, and an analysis was performed to determine if there was any statistical difference between the groups

prior to their receiving treatment, and upon conclusion of the experimental treatment. A 5% level of confidence was used to determine the statistical significance of differences in group performance. This was done by comparing the difference between the means of the scores with an F distribution table having an indicated fixed value of 5%.

A one-way analysis of variance was applied to the raw scores from the science pretest and also the posttest for the subjects in each of the three groups. Since the pretest and posttest were the same, but were simply given to the subjects at the beginning of the year and again at the end of the year, the growth shown should be contributed to the experimental treatment rather than to variations in the test instrument. A one-way analysis of variance was also applied to the percentage of academic growth for each subject from the first trimester to the third trimester. From this, a comparison could be made between the mean academic growth of each of the three groups, and it could be determined if the growth was statistically significant.

Results

A one-way analysis of variance was applied separately to the pretest and posttest scores of each of the three groups. The mean between and within scores was determined for each group, and the differences between the means of the scores with degrees of freedom at 2 and 12, was compared to an F distribution table with an indicated fixed

value of 5%. From this analysis, it was determined that there was no statistically significant difference between the means of the scores of the three groups either before or after the experimental treatment was applied.

Table 1

Science Pretest and Posttest Scores

for Control and Variable Groups

Group	Control		Variable I		Variable II	
	pre	post	pre	post	pre	post
	32.00	108.00	45.00	100.00	51.00	132.00
	13.00	102.00	26.00	144.00	32.00	100.00
	38.00	70.00	13.00	112.00	26.00	118.00
	45.00	108.00	45.00	104.00	19.00	116.00
	64.00	140.00	19.00	84.00	19.00	120.00
Total	192.00	528.00	148.00	544.00	147.00	586.00
mean score	38.40	105.60	29.60	108.80	29.40	117.20

Note: Maximum score = 160.00

As can be seen in Table 1, the control group of subjects scored slightly higher on the science pretest than did the subjects in either of the variable groups, but on an average, did not fare as well on the posttest. Variable group II did somewhat better on the posttest than did either of the two other groups, although this difference was not significant. It should be noted that all subjects improved their posttest scores considerably over the

pretest attempt. There was a mean improvement of slightly over 78 points in the three groups combined. This does seem to indicate that there was considerable positive growth by the subjects from the beginning of the year to the end of the year.

Table 2

Summary Table for One-Way Analysis of Variance

For Pre and Post Science Test Scores

Source	Degrees of Freedom	Sum of Squares	Mean of Squares
Pretest			
Sum of Squares Between	2	264.13	132.07
Sum of Squares Within	12	2,961.60	246.80
Total	14	3,225.73	
Posttest			
Sum of Squares Between	2	358.93	179.47
Sum of Squares Within	12	4,964.80	413.73
Total	14	5,323.73	

Note: .05 F (df - 2,12) = 3.89

Pretest F = .54

Posttest F = .43

In Table 2, the 5% level of confidence for F was 3.89. In order for there to be a statistically significant difference between the scores of the groups on the pretest or

posttest, the computed F value had to exceed 3.89. It was therefore concluded that, although there was evidence of growth in each group, there was no statistically significant difference between the groups either before or after the experimental treatment was applied.

According to the F values in Table 2, there was actually a greater difference between the groups before the experimental treatment than after the treatment. This might be explained by the fact that these pupils had different backgrounds in science preceding their seventh grade year, and the taking of the science pretest, as opposed to the conclusion of their seventh grade year where each pupil, regardless of the treatment given, had been taught the same basic principles and concepts by the same teacher.

Table 3

Differences in Percentages of Academic Growth

For Each Group Before and After Treatment

Group	Control	Variable I	Variable II
	3.80%	20.20%	28.70%
	20.00%	32.60%	18.30%
	3.00%	12.20%	21.00%
	14.80%	23.40%	15.70%
	29.60%	21.80%	21.90%
Total	71.20%	110.20%	105.60%
Growth of Each Group	14.24%	22.04%	21.12%

Table 3 is based on the academic growth of each pupil in each group before and after receiving the experimental treatment. It was demonstrated in this table that the pupils receiving the experimental treatment showed more growth than did the pupils in the control group. These statistics are also comparable to the pretest and posttest scores for each of the three groups (Table 1). In both instances, the control group demonstrated less growth than did either of the experimental groups. This seems to indicate that the treatment was beneficial to the subjects in the variable groups. The variable groups averaged 21.58% growth as compared to 14.24% growth for the control group.

Table 4

Summary Table for One-Way Analysis of Variance

For Academic Growth of All Groups

Source	Degrees of Freedom	Sum of Squares	Mean of Squares
Sum of Squares Between	2	181.70	90.85
Sum of Squares Within	12	813.79	67.82
Total	14	995.49	

Note: .05 F (df = 2,12) = 3.89

Academic Growth F = 1.34

Although the F value for academic growth in Table 4 was below the 3.89 level of statistical significance, it was considerably higher than the F values for either the

pretest or posttest scores in Table 2. This helps to demonstrate that, even though no statistically significant difference was shown between any of the groups, the general academic growth of the pupils was greater than their pretest and posttest scores indicate.

These figures are in agreement with the initial hypothesis that there would be no statistically significant difference in learning when the remedial seventh grade biology curriculum was supplemented with audiovisual materials at Selah Junior High. Even though some growth was shown under each evaluation form utilized, none of the growth met with the 5% level of statistical confidence.

Conclusion

In this project, a 5% level of confidence was used to determine the statistical significance of differences between the academic growth of each group. It was determined that the growth demonstrated by each group was not statistically significant based on the 5% level of statistical confidence.

As demonstrated in Tables 1 through 4, it should be noted that the groups receiving the supplemental audio-visual materials did show evidence of greater growth than did their counterparts in the control group.

CHAPTER FOUR

Selah Seventh Grade Science Program

The purpose of the Selah Junior High School's seventh grade science program is to enable the pupil to explore and become literate with the basic concepts and skills of scientific thinking. For the first time, the pupil is introduced to an in-depth, year-long study in the field of life science.

It is the science department's intent to develop in each pupil a higher degree of understanding of the fundamental concepts of science, and proficiency in the skills of science. Pupils in Selah's seventh grade science program investigate interrelationships as they apply, appear, and occur in living systems. Involvement in the course is stressed by encouraging pupils to participate in problem solving, data collection, and the drawing of conclusions. Pupils are also guided in the manipulation of scientific apparatus as it relates to the process of investigating.

The major areas of course content include, but are not limited to: cells, plants, animals, classification, human systems, and ecology. Pupils develop and use the basic vocabulary associated with each area studied. Meaningful laboratory work is instituted to increase the level of

understanding, and to allow pupils to be actively involved in the learning process.

The basic text used with the seventh grade program is Exploring Living Things by Laidlaw (1980). The seventh grade science program also makes use of supplemental materials for laboratory work, and adjusted materials for remedial and advanced level pupils. The basic supplemental texts include, but are not limited to, Activities for Exploring Living Things (Laidlaw, 1980), Life Science: A Problem Solving Approach (Ginn and Company, 1974), and The Biological Sciences (Laidlaw, 1974). Other materials are utilized as they apply to the content areas of the course, and the academic levels of the pupils in the program.

Special levelized tracking programs were attempted at Selah Junior High in the areas of math, science, and reading. As a result of the tracking, most of the pupils remained together throughout the rest of their day. Unfortunately, this type of tracking produced a lack of motivation in the remedial classes, and an increase in discipline problems. This program was discontinued as a whole in 1980. Currently, there are limited classes offered for identified advanced and remedial math pupils, and the language arts department has a "pull-out" program for pupils with severe reading problems. All other courses are required to provide supplemental materials to attempt to meet the individual needs of each of the pupils in the class. This project was undertaken in an attempt to meet

the needs of the remedial science pupil in the regular classroom.

Effects of the Study

Although the study as reported in this project produced no statistically significant results, it is heartening to see fifteen young people develop a greater understanding of science as evidenced in their academic growth from first trimester through third trimester in their seventh grade biology class. Of these fifteen, only two were retained in the seventh grade, whereas, they were all placed on a potential retention list following their academic failures at the conclusion of the first trimester.

The pupils receiving the various forms of experimental treatment generally became more academically oriented in their biology classes, and raised their grades to passing during the course of the year. Pupils in the experimental groups averaged a 7.34% increase in grades over the pupils in the control group. Although it would be impossible for one person to work individually with each pupil during a fifty minute period in the regular classroom, with the same intensity as was given to the pupils in the experimental groups, many of the experimental practices could be utilized with the entire class as a group. Practices such as assistance with difficult terms, and continual reminders of proper use of the text would be of benefit to all pupils.

Although there really was very little difference between the academic growth of each of the three groups of

subjects in this study, the pupils averaged 19.13% growth from the end of the first trimester through the end of the third trimester. This growth does seem substantial however, considering that the subjects of this study had a reading deficiency of no less than one year, and received a "D+" or lower grade during their first trimester of seventh grade biology.

Although it was, at times, difficult to work with three groups of pupils separately, the growth of these pupils, however small, was a positive improvement over their academic difficulties first trimester. It is this writer's opinion that the benefits of such a program, however small, are worth the extra effort required for preparation if it allows even one pupil to realize some measure of success.

CHAPTER FIVE

Project Summary

This project was begun by identifying those pupils, in the class of one biology teacher at Selah Junior High, who had a reading deficit of one or more years below their seventh grade placement, and who also averaged 59% or lower during the first trimester in their seventh grade biology class. After the subjects were identified, they were divided into three groups by drawing their names out of a box. It was predetermined that the first name drawn would be in the control group, the second in variable group I, and the third in variable group II. This process was repeated until all fifteen identified remedial science pupils were placed in one of the three groups. No special consideration was given to any pupil during the group placement process.

The control group of subjects was given no experimental treatment. They were unaware that they were actually part of an experimental procedure. The control group worked with the regular class on all assignments.

Variable group I consisted of five remedial science pupils who received aural assistance with the reading of the difficult terms in the text as well as assistance with locating the key concepts in the reading.

Pupils in each of the two variable groups assumed that the extra help they were receiving was to assist them in raising their science grade so they would not be retained in the seventh grade. This was in part true, but the pupils were unaware that they were actually a part of an experimental procedure.

Variable group II consisted of five remedial science pupils who not only received the same treatment as variable group I, but were also given continuous directions in proper use of the text, hands-on instruction during labs, taped readings of the text, and extended use of overhead transparencies.

All groups received general instructions with the entire class, and were then dismissed to a study center located on one side of the room. Projected materials such as transparencies and slides, as well as non-projected materials such as assignments and lab sheets were available in the study center. Tape recorders, tapes, and an overhead projector were also available at all times.

At the conclusion of the study, the pretest and post-test scores for each pupil were analyzed. The same test was given to each pupil at the beginning of the year, and again at the end of the year. Any growth shown should therefore have been a result of the instruction during the year rather than due to variations in the test instrument.

A collection of academic growth data was collected for each pupil. Percentages of academic growth from the

beginning of the year through the end of the year were computed for each pupil.

The pretest and posttest scores, as well as the academic growth percentages were analyzed using a one-way analysis of variance. A 5% level of confidence was used to determine statistical significance. The differences between the means of the scores were compared to an F distribution table with an indicated fixed value of 5%. It was found that there was no statistically significant difference between the three groups either before the experimental treatment or after the treatment. This data is in agreement with the original hypothesis that there would be no difference in learning when the remedial seventh grade biology curriculum was supplemented with audiovisual materials at Selah Junior High.

Although the academic growth of the subjects was not statistically significant, growth did occur, and the subjects in variable group I and II did show an average growth of 7.34% over the subjects in the control group.

As the year progressed, the pupils in variable group II relied most heavily on the taped reading of the text, and some would even request a copy of the tape to take home for their own personal use. The members of group II did not use the overhead transparencies beyond the time they were being used in presentations during the regular class period, even though they were available to the pupils at any time. Pupils in variable group I had difficulty

remembering from day to day how to pronounce the new vocabulary words. Variable group II did not have this problem due to using the taped reading of the text. They were able to master the pronunciation of the new words very quickly. It is this writer's belief that the directions in how to use the text to locate key vocabulary words and concepts, accompanied by the taped reading of the text seemed to provide these remedial science pupils the extra help they needed without becoming overwhelming or boring.

The approaches utilized in this project could be duplicated in any curricular area. Standardized or teacher created pretests and posttests could be utilized with this project format. Other learning deficiencies, besides reading problems, could be used as criteria for selection of subjects, or the approaches could be applied to an entire group of mixed ability pupils. However the approaches explained in this project are utilized, it is hoped that they will benefit the pupils, and possibly increase their academic growth.

The following is a list of possible changes, and recommendations for future use of a program such as this.

1. Test longer than 120 days.
2. Use only an audiotutorial approach to learning.
3. Work with a population larger than fifteen.
4. Select subjects from the classes of more than one teacher.

5. Compare the growth of identified remedial pupils to non-remedial pupils receiving the same experimental treatment to determine if one group benefits more than the other group, and demonstrates significant growth.

6. Use a 1% level of confidence for the analysis of statistical significance.

7. Apply a study skills analysis before and after the program to determine if the pupil's study skills improve during the course of the experimental treatment.

8. Use a general standardized science test to identify pupils with low science ability at the beginning of the school year, and begin the remediation immediately.

9. Provide private study areas for those pupils working individually.

10. Enlist the assistance of parents or aides to help with individualization in the regular classroom.

11. Allow the students to make tapes of the reading so that they can practice saying the new vocabulary terms.

12. Tape some of the assignments so that the pupils can follow the assignment sheet as they listen to the tape.

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Appendixes

Appendix A

Reading Guide

Name_____

1. In your reading the digestive system is divided into 5 main sections. Name them.

   A.

   B.

   C.

   D.

   E.

2. The mouth is made up of three main parts. List them and give their functions.

   A.

   B.

   C.

3. _____ are chemicals that break down food materials.

4. The main function of the large intestine is _____ _____.

5. Your tongue has two main functions in the digestive system. They are _____ _____.

6. Two important glands that help the small intestine digest foods are the _____ and the _____.

7. The term for the taking of digested food into the bloodstream is _____.

8. The finger-like projections that take in digested food are called _____ and are found in the _____.

Appendix B

Vocabulary

Chapter 21 Vocabulary

Note: Starred words are also spelling words.

Name_____ Period _____ Date _____

* 1) carbohydrates -

2) fats -

* 3) protein -

* 4) vitamins -

* 5) minerals -

6) Daily Food Guide -

* 7) Calorie -

* 8) digestion -

9) digestive system -

10) glands -

11) saliva -

* 12) enzymes -

13) esophagus -

* 14) stomach -

15) small intestine -

16) liver -

17) pancreas -

* 18) absorption -

19) villi -

20) large intestine -

21) carbon dioxide

22) urea -

23) kidneys -

* 24) urine -

25) bladder -

26) dental hygienist -

27) orthodontist -

Appendix C

Assignments

PERIOD_____ CHAPTER 21 GREEN BOOK I · NAME_____

1. An adult marathon runner often does what is called "protein loading" for 2 or 3 days, then goes to "carbohydrate loading" for the last day or two before a race. While "protein loading" they eat foods like:(list 5)

_____

while "carbohydrate loading" they are eating foods like (list 5)_____

_____

2. If a person went on a total vegetable diet, they would have to get certain protein types by a very careful selection of foods. Why are proteins so important to your body?_____

_____

3. What is the purpose of vitamins in human diets?_____

_____

4. Bones and teeth are made of minerals such as:_____

5. The four basic food groups we must select food from each day for a good diet are: a._____ b._____

c._____ d._____

6. Some early gold miners and prospectors often depended on beans and flour for their "grub stake". Eating only these foods would cause a deficiency in their diet. What nutrients would be missing?_____

_____

7. How many CALORIES should students your age, and of average body build, eat per day?_____

8. The recommended 3 glasses of milk a day will supply how many CALORIES?

_____

9. Digestion is:_____

_____

10. Two purposes of saliva are:_____

_____

11. The tube connecting the mouth and stomach is the_____

12. Food in the stomach stimulates muscle motions and movement of the food. What purposes (2) would you suppose this process has?_____

_____

_____

13. The two important processes occuring in the small intestine are _____

_____ and _____

_____

14. Why would you suppose loss of part of the small intestine from surgery would affect your body weight and eating habits?_____

_____

_____

15. What is urea?_____

_____

16. How is urea removed from the body?_____

_____

17. List two or more careers dealing with the teeth. Where would you write to find out about careers in dentistry?_____

_____

_____

Appendix D

Quizzes and Tests

Score = _____
50

Chapter 21 Quiz

Period_____ Date_____ Name _____

1) Sugar and starch are forms of food materials called _____.
2) _____ are found in butter and oily parts of meat.
3) _____ are building blocks of cells. They are used for growth, reproduction, and repair.
4) _____ provide building materials for bones and teeth.
5) _____ regulate what goes on in your body; in other words, how you use other materials in a proper way.
6) A, B_1, B_{12}, C are all types of _____.
7) Iron, Calcium, and Sodium are all types of _____.
8) The _____ is a listing of important foods according to their sources.
9) The unit used for the amount of energy in food is the _____.
10) _____ change food materials and control the rate of metabolism.
11) _____ is the changing of food so that cells can use it.
12) The _____ are the parts of your body where food is broken down so that cells can use it.

Chapter 21 Quiz p. 2

13) _____ are parts of your body which make chemicals. Some are used in digestion, some cool your body, etc.

14) _____ moistens food, and makes it easier to swallow.

15) The tube that goes from your throat to your stomach is called the _____.

16) The _____ are finger-like projections found in the small intestine that absorb digested food.

17) The _____ is a sac where some digestion occurs.

18) Completion of digestion and absorption of digested food occur in the _____.

19) Water is absorbed from the undigested food in the _____.

20) In addition to producing enzymes which help to break down proteins and fats, the _____ also produces a hormone called insulin to control the body's use of sugar.

21) _____ is the taking in of digested food.

22) _____ is a poison produced as a waste product of food being broken down. It is filtered out of the blood by the _____.

23) The _____ is a storage sac for a mixture of liquid wastes filtered out by the kidneys. This liquid is called _____.

Please note: Text on pages 53-54 has been redacted due to copyright concerns.

Appendix E

Laboratories

1. Why does our body have so many different types of cells?

Slide #1 View and read

2. What is the large dark spot in the center of the cell?

_____

3. What is the "grainy" purple material between the cell membrane and the dark spot? _____

Slide #2 View and read

4. What are three characteristics of red blood cells?

5. What are three characteristics of white blood cells?

Slide #3 View and read

6. What is the purpose of lymph cells?

Slide #4 View and read

7. What chemicals are produced by the bone cells that help harden the bones?

8. What stuctures are found in "B" of the bone cross section?

Slide #5 View and read

9. Why are these cells called voluntary cells?

10. What is another name for these kinds of muscles?

Slide #6 View and read

11. Why are these cells called involuntary cells?

12. What is another name for these kinds of muscles?

Slide #7 View and read

13. Why are nerve cells made of so many long branches?

Slide #8 View and read

14. Of what importance are the gland cells to digestion?

FOCUS ON LIFE SCIENCE Experiment
Section 4:5, Unit 4, p. 319(63M)

Title:

Testing for Fat

Problem:

To confirm a test for the presence of fats and oils and to test certain foods for the presence of fats and oils.

Materials:

brown paper bag
(unglazed wrapping paper)
butter
oil
potato
egg white (hard-boiled)
peanut butter

Procedure:

1. Hold a piece of brown paper (unglazed wrapping paper) toward the ceiling lights or toward a window. Does light pass through the paper? Record your observations.
2. Rub a small amount of butter onto the paper and allow a minute to dry. (The spot may appear not to dry.) Reexamine the paper by holding it toward lights or window. Does light pass through the paper? Record your observations. It should be noted that the formation of a translucent or semitransparent spot on the paper (one which allows light to pass through) is a positive test for the presence of fat.
3. Rub separate pieces of brown paper with the olive oil, potato, egg white, and peanut butter.
4. Allow a moment or two for drying to occur. (Not all the spots will apear to dry.) Examine each piece of paper by holding it toward the light. Check for translucent appearance.
5. Record your observations.

Observations:

Summarize and record observations on a chart similar to the one shown.

	Butter	Olive Oil	Potato	Egg White	Peanut Butter
Translucent Spot Formed	yes	yes	no	no	yes

Conclusions:

The presence of fat is detected by formation of a translucent or semitransparent spot upon brown paper after drying. Fat is present in butter, olive oil, and peanut butter. Many foods (egg white and potato) may cause spots to appear on the paper, but the spots will disappear upon drying and will not remain translucent if fat is not present.

Questions:

1. Why must you wait a moment for the spots to dry before examining them? You wait a moment to determine if the translucent spot will be permanent. Water will produce a spot on the paper but will dry in time. Therefore, water does not provide a permanent translucent spot.
2. What caused the temporary spot when the paper was rubbed with egg white and potato? water in the egg white and potato.
3. Sometimes translucent areas appear on classroom papers. Where do these spots come from and are they oil spots? These spots are formed from oils which are on hands.
4. How are fats used in the body? They are used to release energy and to store energy in body tissue.
5. Why does one avoid fats in the diet when attempting to lose weight? Any fat which is not burned for energy in the body is stored. This stored fat results in a weight gain.

Correlates with EXPLORING
LIVING THINGS, p. 411

Please note: Text on pages 60-67 has been redacted due to copyright concerns.

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