1979

Enjoyment, Interest, and Achievement Levels of Third Grade Students in Separate Subject and Interrelated Subject Units in Science and Social Studies

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ENJOYMENT, INTEREST, AND ACHIEVEMENT LEVELS OF THIRD GRADE STUDENTS IN SEPARATE SUBJECT AND INTERRELATED SUBJECT UNITS IN SCIENCE AND SOCIAL STUDIES

by

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Thesis submitted to the Department
of Elementary and Secondary Education in
partial fulfillment of the requirements
for the degree of Master of Education

July 1979

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Abstract

The purpose of this study was to investigate the difference in the enjoyment, interest, perceived learning, and achievement levels of third grade students when social studies and science units were presented as interrelated subject units versus separate subject units. Eight units in social studies and science were chosen. Four of these units were selected at random to be presented as interrelated subject units and four to be presented as separate subject units. Interrelated units used the social studies or science topic as a core, and lessons in other subjects such as language arts, math, music, and art were related to this basic topic. Separate subject units focused on the particular topic of the unit and were not intentionally related to other subjects in curriculum. An attitude questionnaire and achievement test were administered as posttests after each unit.

The results of *t* tests for matched pairs indicated a significant difference in the levels of enjoyment, interest, perceived learning, and achievement for the two types of units. It was concluded that the 28 third grade students taught using interrelated subject units showed a significantly higher level of enjoyment, interest, perceived learning, and achievement than the same group when taught using separate subject units.

Table of Contents

List of Tables

List of Figures

Chapter I

Introduction

Problem Statement: Is there a difference in the enjoyment, interest, and achievement levels of third grade students when social studies and/or science units are presented as interrelated subject units rather than separate subject units?

Today's middle and upper elementary students will be in their early thirties in the year 2000. The rate of change in society and its needs are accelerating each year. The world in the year 2000 will be very different from the one of today. Students need to know about the past, to learn from the changes and developments; the present, to live with understanding about their environment; the future, to be more flexible and prepared for rapid change.

The Educational Policies Commission wrote in "The Central Purpose of American Education" that "the purpose which runs through and strengthens all other purposes - the common thread of education - is the development of the ability to think." This commission also stated, "The free man, in short, has a rational grasp of himself, his surroundings and the relationship between them." (1962, p. 12)

Francis Parker, whom Dewey called the father of progressive education, wrote that "no truth is more striking than the

essential relation of all subjects to each other. One can scarcely make an effective generalization without going outside of the subject immediately in hand." (1894, p.394)

John Dewey indicated that to lead to a better understanding of the larger problems of society, education needs curriculum synthesis on both the vertical and lateral planes - the vertical plane referring to the extension of knowledge to the higher levels, and the lateral plane referring to the necessary interrelationships of knowledge. (1938, p. 79)

Writing about the rational decision-maker and intelligent social actor, Banks and Clegg say that they "must learn how to synthesize the information they obtain from many sources and apply it to complex social problems." (1973, p. 20)

In their rationale for interdisciplinary studies, Wolfe and Taylor state their position against segmented learning and for interrelationship in learning.

> International cooperation and interdisciplinary understanding are twin pillars upon which peace and human progress depend. In order for people to cooperate, they must first perceive the relationships which exist among global ideas, ideologies, and events. Helping students discover such perceptions is the responsibility of schools. But with fragmented curriculum structures and linear, fact-centered teaching methods, schools do not often help students make connections which form the core of a meaningful education. Unless students make positive connections among all that they sense, believe and know, they can never think universally or develop cooperative and humane attitudes toward others. (1973, p. 193)

The recent trend in public schools in Florida has been away from the integration of subjects. The emphasis on accountability has brought about more testing of students for achievement of specific skills. This testing has put more stress on teachers to teach toward national, state, and county test objectives which, in turn, has fostered a rise in more separate subject teaching, drills, and compartmentalization of knowledge.

Daniel and Laurel Tanner recognize this trend. They stated their views in Curriculum Development.

> Most of the efforts to improve education have been based on a segmental curriculum model, with innovations being adopted on an ad hoc basis. If the schools are to fulfill a personal-social-growth function, an aggregate model of curriculum must be assumed. Through an aggregate model, the necessary interrelationships and cumulative interactions of the various elements can be taken into account. . . .
>
> The move for educational accountability has been marked by national and statewide testing programs and narrow performance objectives. These accountability and assessment programs have been premised on the notion that the amassing of data will provide answers to vital education problems. But intelligent questions must be asked before intelligent answers can be obtained. Without such questions and hypotheses, the data derived from these massive assessment programs defy intelligent interpretation and intelligent application in solving problems in educational practice. (1975, pps. 706-707)

The writer believes that there is no theory of education or teaching method that works in all instances. The teacher's love, effort, creativity, education, and background are what can help motivate children to learn. But it has been her experience that children need exposure to the direct teaching

of subjects for learning of basic skills and also to learning experiences which interrelate subjects. Science and social studies units have been interrelated with other subject areas in her classroom. Children have been observed to exhibit a keener interest and a higher degree of enjoyment and achievement when these subjects are interrelated. She has observed that children are more motivated, have more productive and interactive discussions, show more initiative and critical thinking in research and sharing of findings, and are more creative in writing and art, when subjects are interrelated rather than taught as separate subjects. A description of a science unit that was interrelated with other subjects in her third grade classroom is in the appendix.

Ragan and Shepherd set forth the position that "provision should be made for both the direct teaching of subjects and for broad, meaningful experiences for children - experiences that cut across subject lines. Because experience has shown that learning in the subject areas is more effective as well as more meaningful when provision is made for seeing the interrelationships between various subjects." (1977, p. 198)

Benjamin Troutman agrees that in the integrated curriculum, "each subject area with its particular perspective and analytic framework provides additional insight and understanding." (1977, p. 200)

Many authors of educational literature state the necessity

for integrated or interrelated curriculum, but few studies on the elementary level have been found to support or reject this position. The author feels that there is need for a study in this area because of the trend toward separate subject teaching as a means of accomplishing achievement of test objectives.

If the purpose of education is to provide students with the ability to think, using the knowledge and understanding of themselves and their surroundings and the relationships between them, as stated by the Educational Policies Commission, then education must provide opportunities for children to see these relationships.

Definition of Terms

Interrelated Subject Unit: A unit of study in which a basic topic in science or social studies is the core, and lessons in other subjects such as language arts, math, music, and art are related to this basic topic. The distinctive differences in subjects are retained, but the knowledge from these subjects add their own insights to the topic of the unit.

Separate Subject Unit: A unit of study in which the subject matter is taught in isolation from other subjects. This type of unit focuses on a particular subject which is not intentionally related with other subjects.

Chapter II

Review of Related Literature

Schools in the years between 1647-1776 were ungraded and emphasis was on separate subjects in curriculum. Methods of teaching centered on memorization, drill, and individual instruction.

From the time of America's independence to around 1876, rural schools were still mostly ungraded, but urban schools were usually graded. Separate subjects in curriculum continued to be the norm, but the trend was toward group instruction rather than on individualized instruction.

In the years that followed and until the late 1920's, more subjects were added to the graded curriculum. There was a move toward correlation and fusion of subjects in self-contained classrooms. The influence of Johann Herbart was seen in curriculum organization. Subjects were correlated and related to the interests and experiences of the child.

The movement of progressive education, in which Herbart, Francis Parker, and John Dewey played important parts, included other educators who also believed:

> Children learn best when the material meets some recognized need, not when they are forced to memorize meaningless material. . . that the school should be concerned with children's physical, emotional, and social development. . . that the school should foster freedom, not license; that subject matter should be a means rather than an end in the educative process;

> that understanding rather than fear should be used to motivate acceptable behavior; and that purposeful activity is more productive than imposed routine." (Ragan & Shepherd, 1977, p. 25)

The Committee of Fifteen on Elementary Education did not agree with curriculum synthesis. They believed in the "rigid isolation of the elements of each branch." (Tanner & Tanner, 1975, P. 174)

The years 1929-1945, overshadowed by the Great Depression and World War II, placed more responsibilities on the schools. Changes included a more unified curriculum. Schools began to combine many separate subjects into broad fields, such as social studies, science, and language arts. "Critics of the broad fields . . . pattern for organizing curriculum guides suggested it was still too subject-centered and therefore did not provide for a fully integrated and interrelated learning experience." (Ragan and Shepherd, 1977, p. 201) Unit teaching was implemented. Teachers and students participated in the planning and implementation of learning activities. Content for the units was taken from many sources.

In the years that followed World War II, there was a continuation of differing viewpoints on the organization of curriculum in order to keep up with the rapid changes and advances of society and knowledge.

In the separate subject curriculum, each subject was regarded as independent of the other subjects. Each had its

own content, skills, and methods. For example, English, spelling, literature, history, and geography were separate subjects. More recently, related subjects have been fused into disciplines. Language arts and social studies are examples of this on the elementary level. In separate subject curriculum, these disciplines were regarded as independent of each other. As explained by Boehnlein and Ritty, "the major emphasis in the subject-centered curriculum is on explanation, and often on rote learning and simple recall." (1977, p. 372)

Correlated subjects curriculum is defined by Smith, Stanley, and Shores as "a subject curriculum in which two or more subjects are articulated and relationships between and among them are made part of the instruction without destroying the subject boundaries." (1957, p. 252)

The interdisciplinary approach occurs when one discipline is used as the core around which other disciplines are organized. The related disciplines are supplemental and enrich each other.

Integrated curriculum is similar to the interdisciplinary approach and, according to Boehnlein and Ritty, "the subject matter is important, but it is related to the psychological and developmental needs of the child. . . . Learning should challenge the interests of the whole child." (1977, p. 373)

The question of specialization or integration of knowledge is the topic of much controversy. The subject centered approach has a long history in the traditional classical curriculum.

Some authors of professional literature who have defended it have been Thorndike and Woodyard (1934), Underwood (1939), and Anderson (1937). Hilda Taba summarizes the reasoning for separate subject curriculum:

> The more recent argument for the return to more compartmentalized subjects is that following subjects systematically provides disciplined knowledge and trains in special systems of thought; it is thus most appropriate for the development of intellectual powers. (1962, p. 387)

Integration of knowledge is an alternative to the separate subject curriculum. Taba gives a definition of integration as a concept of organization which she states is most frequently used in writing about curricula and which underlies experiments in integration of subjects.

> Integration is a concept of organization in which . . . the horizontal relationship of the various areas of curriculum to each other, such as relating what is learned in mathematics to what is learned in science, using the ideas generated in the study of literature to elucidate the perception of a historic period, or relating ideas about historic causality to causality as it functions in the dynamics of community life. (1962, p. 299)

Since the late 1960's, the rise of educational accountability programs has brought about the development of instructional management systems, national, state, and county educational objectives and testing, with minimum standards for achievement. Ragan and Shepherd (1977) recognize this trend and state their views.

> Accountability and its related programs, systems management programs, behavioral objectives, performance-

> based contracting, and others are realities. Those aspects of accountability programs that enable the professional and the public to cooperatively plan goals and priorities seem desirable. The need for schools to become more explanatory to the student and the public concerning its intended outcomes seems reasonable. However, what may be threatening is an imposed set of goals, a limited set of intended outcomes, the negotiation with a pluralistic society for a commom set of goals, or simply a visible accountability system for the powers and responsibilities of schools. (p. 65)

Tanner and Tanner agree and add, "the drive for educational accountability shifts the educational focus to those factors that are most easily quantified. But such factors may be the least consequential ones for the quality of the educative experience." (1975, pps. 704-705)

The move toward accountability places importance on assessment scores which are published in newspapers. This puts schools in the position of teaching toward test objectives which creates a tendency for more fact-centered teaching, more fragmented curriculum, and compartmentalization of knowledge. Wolfe and Taylor express their opinion in their rationale for interdisciplinary studies. "Indeed, one of the most dangerous problems in contemporary society is over-specialization. In order to make sense of the modern world, as well as to achieve a substantial degree of cross-cultural tolerance and understanding, one needs a broad knowledge base on which to operate." (1977, p. 193)

Integrated or interrelated curriculum has many proponents.

Among them is Arno Bellack who wrote in "What Knowledge Is of Most Worth?"

> In sum, scholars in the natural sciences, the social sciences, mathematics, and the humanities should now be invited to join in the search for new structures of teaching - structures that represent the integrity of the individual fields and at the same time help these fields find their place in a pattern of studies that provides a substantial measure of coherence and relatedness for the program as a whole. (1965, p. 112)

Gene Wise (1966), Benjamin Troutman (1977), and Charles Fethe (1977) also support this position.

There are diverse opinions as to which particular subject or discipline should be the core to which others are related. Margaret Ammons selects communication as the core discipline in the elementary school.

> Since communication appears to be a need which will exist as far into the future as I care to predict, and a need which exists at any level of development, I am willing to posit this area as the basis for organizing the elementary program. (1969, p. 190)

This selection of communication or language arts as the core discipline is supported by Boehnlein and Ritty (1977), Lehane and Peete (1977), and Fortson (1977).

Wolfe and Taylor advocate making connections between science and humanities.

> Perhaps only by bringing together science and humanity can we have the best of both classic and romantic modes of thought. Only by merging science and the humanities can we do justice in education to the brain's left hemisphere, with its rational and linear functions, and the right hemisphere, with its predilection for the abstract.

> Educating the whole person to heed [Francis] Bacon's "all knowledge" call means putting the human mind back together again. (1977, p. 196)

Other authors advocate the interrelation of science and language arts. Frances Cacha (1977) says that when scientific knowledge is combined with creative writing, it reinforces science facts and also helps develop critical and creative thinking abilities. Cacha concludes that interrelating science with language arts gives children the motivation to check their knowledge of scientific facts and to find additional information to incorporate into their stories. This process helps children develop research skills, practice new science vocabulary in meaningful situations, and increase oral and written language skills.

Stephen Lehane (1977) implemented a program interrelating science and language arts. The program, "The Amazing Adventures of Erik Stonefoot", combines language arts and science experiments while following Erik's imaginative adventures. These exciting adventures are continuous and are drawn form classics like Gulliver's Travels and The Odyssey. After reading about an adventure, students perform an experiment based on the scientific principal Stonefoot used to mastermind his escape and write conclusions to Erik's adventures. This approach was found to be motivating because it made language learning an active process. Students were so motivated in learning that they involved their families.

Richard Wiggin proposes an interrelated experience of art and science as a basic core of curriculum. He gives reasons in Art Education.

> In both science and art, the individual searches and sensitizes himself through study and investigation of the phenomena observed, and absorbs himself in the essence of the thing. In both, he records these observations, draws tentative conclusions about the nature of the observations, tests these conclusions, and applies them to the better solution of current problems or future imagined needs. (1969, p. 19)

Educators who are concerned with the limited scope of the arts in the curriculum suggest developing programs to integrate them with other subjects. Gene Wenner (1976), Ann Taylor (1977), and Carter and Adams (1978) are a few of those who have recently written journal articles advocating arts integration. Carter and Adams have developed a program they call Arts in Basic Curriculum or the ABC curriculum to integrate the arts into basic curriculum. The five schools involved in this program had classroom teachers and specialists who devised programs to fit their own students and resources. Carter and Adams summarized the program as having the following impact in the schools:

> The climate of the school changed.
>
> A humanistic concept of education took root.
>
> Principals, teachers, and administrators became a team.
>
> Teachers became intimately involved in the planning process.
>
> The arts took a rightful and meaningful place in the total curriculum.

Children exhibited the joy of learning.
(pps. 56-57)

A program called Performance Reading, described by Hayes and Smith (1975), synthesized music and language-experience techniques. They wrote that popular music motivated students to learn to read by the language-experience approach. Others who have indicated that music aids learning are Edwin Movsesian (1967), Diana Nicholson (1972), Mary Ann Mulligan (1975), Ruth Zinar (1976), and Brenda Cohn (1977).

Movsesian studied children in primary grades to evaluate the relationship of music reading skills to reading vocabulary and reading comprehension. He concluded that children in the first and second grades "became significantly more efficient in developing reading comprehension when concurrently taught specific music reading skills."

Diana Nicholson's study showed that music reading can improve abilities in young children who are considered slow readers or slow learners. Improvement in the experimental group was found in recognition of letters and in reading readiness skills.

Mary Ann Mulligan's handbook, Integrating Music with Other Studies, includes a series of lesson ideas to help children notice that "our world is more related than unrelated, more whole than fragmented." Many types of music lessons are suggested for enrichment when studying various subjects, other

musical lessons are based on concepts similar to those in other subjects. Mulligan affirms that musical experiences add creativity, motivation, and enrichment to other areas of study.

Authors of recent curriculum textbooks recognize the need for an integrated or interrelated subject approach to enhance learning with understanding: Taba (1962), Tanner and Tanner (1975), and Ragan and Shepherd (1977).

Difficulty in finding studies which show superiority of one type of curriculum over another is recognized by Boehnlein and Ritty (1977). Walker and Schaffarzic (1974) published a review of twenty-six representative studies of curricula from 1957 to the early 1970's. They reviewed traditional and innovative curricula to "compare the achievement of students who studied from traditional materials with that of students who studied from the new [innovative] materials." (p. 83) They concluded that what they "found was not superiority, but parity: each curriculum did better on the distinctive parts of its own program, and each did about equally well on the parts they held in common." (p. 108)

More recent studies have shown mixed conclusions in respect to the effects of innovation on achievement and attitude of students.

James Swisher (1974) conducted a study which compared the attitudinal change of an interdisciplinary program with a

traditional, departmentalized program. His finding was that there was a more positive attitudinal change in students in the interdisciplinary program than in the departmentalized program. Attitude was in respect to self-concept among peers and as a learner.

Eileen Mitchell (1975) compared immediate achievement and delayed retention of children instructed in informal classrooms with that of children instructed in traditional classrooms. Instruction was in the areas of social studies and science.

> Difference in immediate achievement significantly favored the traditional group; results in retention, however, were mixed. In social studies there was a significant difference in favor of the traditional group. In science there was no significant difference.

Elaine Cohen (1976) studied the implementation of an integrated language-experience approach in second and third grades. Findings showed that children gained from the program in many ways: students' reading skills improved markedly, writing was more mature when compared with writing of fourth grade students who had not been in the program, students' attitudes toward the program, school, and themselves were positive.

A study released by The American Institutes for Research (AIR) in November of 1976 was reviewed by Donald Graves (1977). It reported that intensive innovation in education

> produces little or no effect on the reading and math scores of students examined by the study. The principal finding was "no evidence could be found that

> either of the major instructional variables - level of innovation or degree of individualization - was substantially and positively related to posttest performance." (p.708)

Represented in the study were innovative practices of the last twenty years. Authors of AIR did find that children who showed a higher level of reading interest were higher in achievement. Also the study "makes a strong case for 'moderate innovation' . . . . 'moderate innovation' makes the real difference in student learning." This research report defines moderate innovation as having "a different pace from the start. Changes are more gradual, funding judiciously shared, and teachers more easily join in the effort." (Graves, 1977, p. 712) This is in comparison with more ambitious and intensive innovation programs.

Ragan and Shepherd (1977) attempt to settle the controversy between specialization and integration of knowledge. They suggest the need for specialization of skills in the "direct teaching of subjects" and the integration of subjects in

> broad, meaningful experiences for children - experiences that cut across subject lines. Because experience has shown that learning in the subject areas is more effective as well as more meaningful when provision is made for seeing the interrelationship between various subjects, many elementary schools provide for both the teaching of subjects at regularly scheduled periods and for long, uninterrupted periods for planning and working on problems or units. (p. 198)

In "The Process of Education Revisited", Jerome Bruner proposes that there should be a time for standard topics in curriculum to be covered and also a time when issues and

concerns should take the central place which will "bring all one's resources to bear on something that matters to you now." (1971, p. 20)

In Gordon Ashby's words in "Finding a Place in Space" (1973): "Putting together environments is really a way of 'seeing' . . . a way of looking at a situation . . . determining what might be done and acting on your own feelings about it." (Ashby's ellipses)

Summary

The review of related literature revealed that there have been two major theories in educational philosophy regarding the organization of curriculum which have created much controversy. The separate subject curriculum proponents declare the need to divide all subject matter into isolated and independent subject areas, each with its own content, skills, and methods. The fundamental premise relates back to Aristotle's division of of all knowledge into separate and distinct parts for study.

The theory of specialization of knowledge gained popularity with curriculum planners who felt that the "knowledge explosion" could best be dealt with or taught by isolating subjects. These compartmentalized subjects would systematically provide disciplined knowledge which was thought to develop particular systems of thinking and intellectual powers. All subject matter would be divided into smaller, more manageable tasks, then the student

himself would integrate the parts back into the whole again. Emphasis in this type of curriculum was on explanation, basic skills, and usually on the lower cognitive levels of knowledge. The increased importance on accountability has recently brought about a trend toward a more separate subject curriculum.

Alternatives to the separate subject curriculum have developed which show more of a gestalt view. Among these are correlated subjects, progressive education, and interdisciplinary or integrated approaches. These alternatives are based on a more aggregate model of curriculum in which interrelationships between subjects are viewed as necessary in meaningful education to achieve breadth and scope in understanding.

Some educators in the separate disciplines hold the position that integration of subjects within disciplines is effective, such as relating subjects within the discipline of language arts, but do not feel that the content and processes in one discipline particularly relate to other disciplines.

Those who support the theory of an aggregate model of curriculum see the need for educating the whole child with a broad knowledge base to help achieve growth toward more tolerance and understanding. Subject matter is felt to be important, but related to the psychological and developmental needs of the child. The interests of the child are taken into account. Emphasis on processes, discovery, problem-solving, socialization, and the development of higher level thinking skills is considered

important.

There have been differing opinions regarding the particular discipline that should be the core to which others are related. But agreement is seen in that, whichever discipline is chosen as the core, the other disciplines that are related lend insight, understanding, enrichment, and motivation, making learning more effective and meaningful.

Attitudes of students have been found to be more positive when they are in an innovative rather than a traditional program. Achievement of students has been shown to improve most in a moderately innovative program.

The controversy between the advocates of specialization and integration is bridged by the position that separate subjects should be taught for specific skills, then provision made for the interrelation of subjects during units or in the investigation of problems to enhance students' attitudes and achievement. This is the moderate innovation that was compared with the traditional approach for this study.

Chapter III

Methodology

Description of Subjects

The sample population used for this study was from one of the three third grade classes at Holiday Hill Elementary School in Jacksonville, Florida and based on the cluster sampling technique. Holiday Hill School draws students from low to middle socio-economic areas with the largest proportion of students in the middle socio-economic level. Approximately 10% of the students came from culturally disadvantaged environments. These students were heterogeneously grouped for social studies and science. In this classroom some social studies and science units were presented as separate subject units and some as interrelated subject units. The same population participated in both types of units.

The total number of students involved in the study was 28: 15 girls and 13 boys. The 28 students in the sample group entered this school year with these Stanford Achievement Test percentile score means: total battery, 81.821; social studies, 78.143; science, 79.321. Three of the students in this group were in the gifted program, leaving the regular classroom one day each week for enrichment. One of the gifted children also attended a resource class for specific learning disabilities along with two other classmates. One child was in an emotionally handicapped resource class. The children in resource classes left the

regular classroom for one hour each day for specialized help.

Description of Instruments

Students were given an attitude questionnaire at the end of each unit of study. (See Appendix B.) The questionnaire was designed for this study and measured the levels of students' interest, enjoyment, and perceived learning. It was validated for reliability.

An achievement test was designed and administered to students at the end of each unit of study. Each test covered the unit just completed and was of mixed format. These tests were validated for relevance and reliability. Samples of the achievement tests are in Appendix B.

Procedures

There was one group of third grade students involved in this study which was enrolled in the researcher's class. This group took part in both the separate subject units (control group) and the interrelated subject units (experimental group). Eight units which are normally taught on the third grade level in social studies and science were randomly selected: four were picked to be presented as separate subject units and four as interrelated subject units. These units were covered over a five month period during the regular school year of 1978-79.

Separate subject units focused on the particular science

or social studies topic and were not intentionally related with other subjects in the curriculum.

Interrelated subject units had the social studies or science topic as a core, and lessons from other disciplines such as language arts, math, art, and music were related to this basic topic. See Appendix A for a chart identifying activities used in units (Figure 5) and a description of an interrelated unit.

At the end of each unit, students answered questions on the attitude questionnaires and achievement tests. The attitude questionnaire was in the form of a Likert scale. See Appendix B. Each answer was weighted, with the most positive attitude given the highest score. A total score was obtained for students in three different areas: enjoyment, interest, and perceived learning from the four separate subject units. Also a total score for students was obtained in these three different areas from the four interrelated subject units. For example, all weighted responses to question one pertaining to students' level of enjoyment of all four separate subject units were totaled. The same procedure was used for responses to the level of enjoyment of all four interrelated subject units. These two total scores were compared using t tests for matched pairs with significance at the .05 level.

A set of eight raw scores for each child was gathered from the end-of-unit achievement tests: four achievement scores for each student for the four separate subject units and four

achievement scores for the four interrelated subject units. These raw scores were converted into scores which indicated the percentage of items correct out of the total number of test items on each test for each student. The mean of the converted scores from the four separate subject units was compared with the mean of the scores from the four interrelated subject units using t tests for matched pairs with significance at the .05 level. See procedures chart, Figure 1, on page 25.

Null Hypotheses

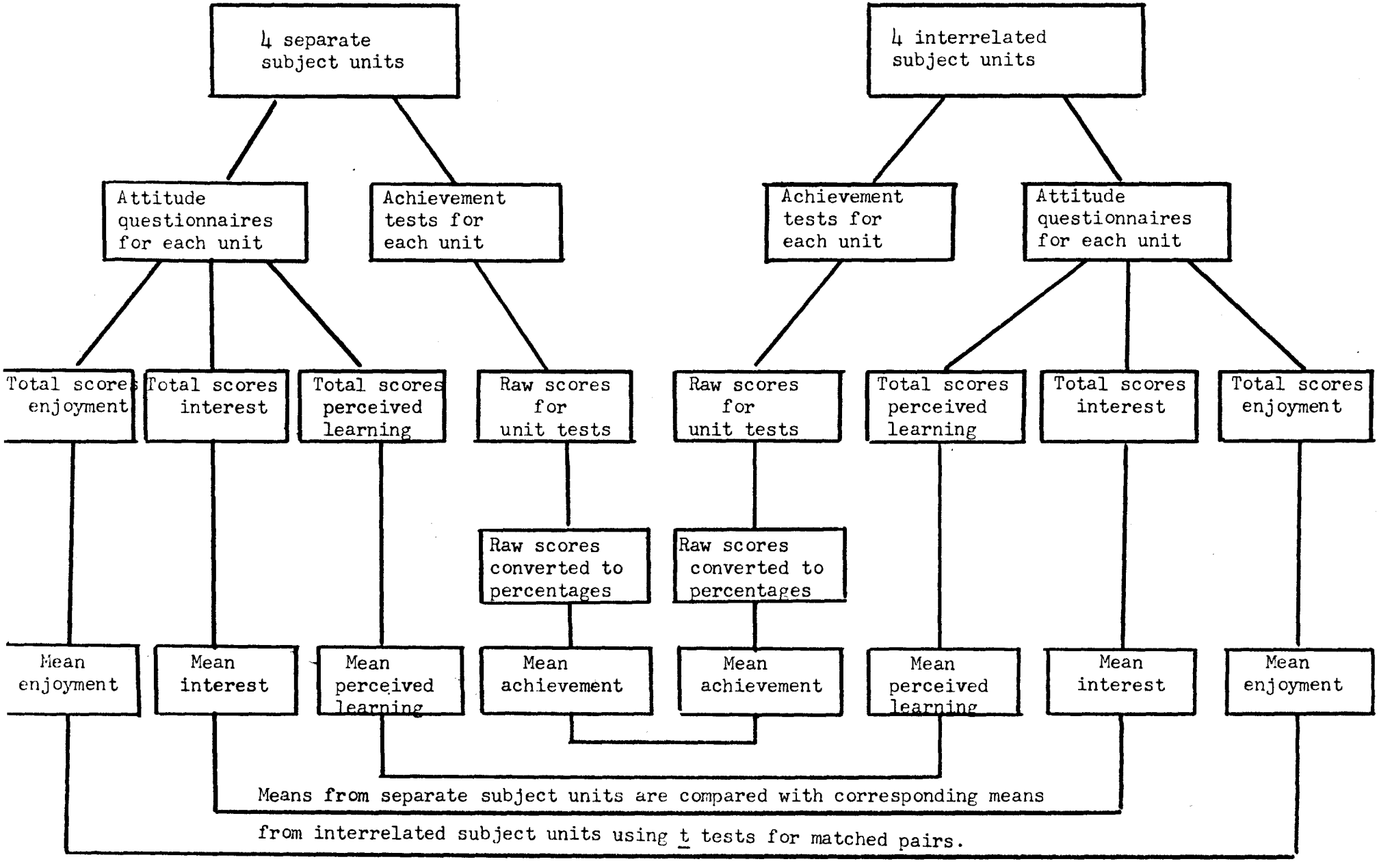
Ho_1: There is no difference in the mean of the responses to the measure of enjoyment in separate subject units and the mean of the responses in interrelated subject units.

Ho_2: There is no difference in the mean of the responses to the measure of interest in separate subject units and the mean of the responses in interrelated subject units.

Ho_3: There is no difference in the mean of the responses to the measure of learning as perceived by students in separate subject units and the mean of the responses in interrelated subject units.

Ho_4: There is no difference in the mean of the responses to the measure of achievement in separate subject units and the mean of the responses in interrelated subject units.

Figure 1
PROCEDURES CHART



Chapter IV

Results and Analysis of Findings

The attitude questionnaire was administered to the 28 third grade children at the end of each of the eight units of study. The questionnaire was divided into three sections: enjoyment, interest, and perceived learning in the unit. Two sets of raw scores were obtained for each section: one from the four separate subject units and one from the four interrelated subject units. These scores were compared with a *t* test for matched pairs and checked by computer.

The difference between the two sets of scores for enjoyment was 4.045. See Table I. The application of the .05 level to a sample of 28 yields a level of significance at 2.052. The score of 4.045 indicates that there is a significant difference in the students' enjoyment. The difference favors the enjoyment of interrelated units over separate subject units. Therefore, the null hypothesis which stated that there is no difference in the mean of the responses to the measure of enjoyment in separate subject units and the mean of the responses in interrelated subject units is not supported.

The difference between the two sets of scores for interest was 4.967. See Table 2. Comparison of this score with 2.052, the .05 level of significance for this sample, indicates that there is a significant difference favoring students' interest

in interrelated subject units over separate subject units. Therefore, the null hypothesis which stated that there is no difference in the mean of the responses to the measure of interest in separate subject units and the mean of the responses in interrelated subject units is not supported.

The difference between the two sets of scores for students' perceived learning was 3.566. See Table 3. When this score is compared with 2.052, the .05 level of significance, it shows a difference favoring interrelated subject units over separate subject units. Therefore, the null hypothesis which stated that there is no difference in the mean of the responses to the measure of perceived learning in separate subject units and the mean of the responses in interrelated subject units is not supported.

The Kuder-Richardson 19 reliability coefficient, alpha, for the questionnaire was: enjoyment, 8.30; interest, .839; perceived learning, .870. These reliability coefficients were obtained using the group in the sample and were checked by computer. See Tables 5, 6, and 7 in Appendix B.

The eight achievement tests were administered to the 28 third grade children. One test was given after the completion of each unit of study. The science and social studies units used for this study were:

Separate Subject Units	Interrelated Subject Units
Our Changing City	Solar System
Map Skills	Living Communitities
Suburbs	Great Events in History
Plants	Sound

Two sets of scores for achievement were collected: one was the total of the four separate subject tests and one was the total of the four interrelated subject tests. These scores were matched with a t test and checked by computer.

The difference between the two sets of scores for achievement was 6.135. See Table 4. The application of the .05 level of significance to a sample of 28 yielded 2.052. The score of 6.135 indicates that there is a significant difference in students' achievement favoring interrelated subject units over separate subject units. Therefore, the null hypothesis which stated that there is no difference in the mean of the responses to the measure of achievement in separate subject units and the mean of the responses in interrelated subject units is not supported.

The Kuder-Richardson 21 reliability coefficients for the achievement tests administered to this sample group and checked by computer were:

Separate Subject Units	Interrelated Subject Units
Our Changing City: .869	Solar System: .857
Map Skills: .895	Living Communities: .862
Suburbs: .894	Great Events in History: .894
Plants: .730	Sound: .854

See Tables 8 through 15 in Appendix B for reliability and Tables 16 through 23 for relevance of achievement tests.

Table 1

t Test for Matched Pairs - Enjoyment

Students	* X_1	** X_2	D	D^2
Lisa	13	16	+3	9
Scott	12	12	0	0
Wendy	14	14	0	0
Mike	16	20	+4	16
Jennifer	20	20	0	0
Kathy	20	20	0	0
Dee Dee	20	20	0	0
Jenny	16	19	+3	9
Stacie	17	20	+3	9
Tommy	18	20	+2	4
Johnny I.	16	19	+3	9
Carol	15	16	+1	1
Eddie	8	8	0	0
Johnny J.	20	20	0	0
Margaret	15	19	+4	16
Amanda	12	19	+7	49
Matthew	16	20	+4	16
Charmaine	20	20	0	0
David	7	13	+6	36
Jeff	16	16	0	0
Lydia	14	17	+3	9
Geraldine	20	20	0	0
Robert	20	20	0	0
Terry	17	20	+3	9
Samantha	14	19	+5	25
Staci	18	15	-3	9
Eric	20	19	-1	1
Greg	8	15	+7	49
Means	15.786	17.714	1.929	9.857

Mean Difference: 1.929
SEM: .477
t Test for Matched Pairs: 4.045 DF: 27

* X_1 - total scores of four separate subject units

** X_2 - total scores of four interrelated subject units

Table 2

t Test for Matched Pairs - Interest

Students	* X_1	** X_2	D	D^2
Lisa	9	13	+4	16
Scott	9	10	+1	1
Wendy	10	13	+3	9
Mike	14	16	+2	4
Jennifer	16	16	0	0
Kathy	15	16	+1	1
Dee Dee	16	16	0	0
Jenny	14	15	+1	1
Stacie	14	16	+2	4
Tommy	15	16	+1	1
Johnny I.	14	15	+1	1
Carol	12	12	0	0
Eddie	7	8	+1	1
Johnny J.	16	16	0	0
Margaret	12	15	+3	9
Amanda	12	15	+3	9
Matthew	13	15	+2	4
Charmaine	16	16	0	0
David	6	10	+4	16
Jeff	15	15	0	0
Lydia	13	13	0	0
Geraldine	16	15	-1	1
Robert	16	16	0	0
Terry	13	15	+2	4
Samantha	12	15	+3	9
Staci	14	15	+1	1
Eric	15	15	0	0
Greg	8	12	+4	16
Means	12.929	14.286	1.357	3.857

Mean Difference: 1.357
SEM: .273
t Test for Matched Pairs: 4.967 DF: 27

* X_1 - total scores of four separate subject units
** X_2 - total scores of four interrelated subject units

Table 3

t Test for Matched Pairs - Perceived Learning

Students	* X_1	** X_2	D	D^2
Lisa	8	10	+2	4
Scott	8	9	+1	1
Wendy	10	12	+2	4
Mike	11	12	+1	1
Jennifer	12	12	0	0
Kathy	12	12	0	0
Dee Dee	12	12	0	0
Jenny	12	12	0	0
Stacie	11	12	+1	1
Tommy	12	12	0	0
Johnny I.	10	11	+1	1
Carol	10	11	+1	1
Eddie	6	5	-1	1
Johnny J.	12	12	0	0
Margaret	9	12	+3	9
Amanda	10	11	+1	1
Matthew	10	12	+2	4
Charmaine	12	12	0	0
David	5	9	+4	16
Jeff	12	12	0	0
Lydia	8	9	+1	1
Geraldine	11	11	0	0
Robert	12	12	0	0
Terry	8	10	+2	4
Samantha	12	12	0	0
Staci	12	12	0	0
Eric	12	11	-1	1
Greg	7	10	+3	9
Means	10.214	11.036	.812	2.107

Mean Difference: .821
SEM: .230
t Test for Matched Pairs: 3.566 DF: 27

* X_1 - total scores of four separate subject units

** X_2 - total scores of four interrelated subject unit

Table 4

t Test for Matched Pairs - Achievement

Students	* X_1	** X_2	D	D^2
Lisa	89.3	95.8	+6.5	42.25
Scott	61.5	79.5	+18.0	324.00
Wendy	85.5	89.0	+3.5	12.25
Mike	92.3	93.5	+1.2	1.44
Jennifer	88.8	92.8	+4.0	16.00
Kathy	94.9	97.5	+2.6	6.76
Dee Dee	69.8	80.8	+11.0	121.00
Jenny	97.5	99.5	+2.0	4.00
Stacie	80.7	89.9	+9.2	84.64
Tommy	85.2	91.1	+5.9	34.81
Johnny I.	83.3	91.3	+8.0	64.00
Carol	93.1	91.6	-1.5	2.25
Eddie	88.4	94.7	+6.3	39.69
Johnny J.	86.9	96.4	+9.5	90.25
Margaret	78.4	86.9	+8.5	72.25
Amanda	88.1	95.6	+7.5	56.25
Matthew	92.8	96.8	+4.0	16.00
Charmaine	87.1	89.1	+2.0	4.00
David	84.5	85.9	+1.4	1.96
Jeff	97.4	96.3	-1.1	1.21
Lydia	60.0	72.0	+12.0	144.00
Geraldine	44.4	55.5	+11.1	123.21
Robert	86.7	90.1	+3.4	11.56
Terry	56.4	63.0	+6.6	43.56
Samantha	87.0	84.1	-2.9	8.41
Staci	86.7	95.3	+8.6	73.96
Eric	85.3	93.2	+7.9	62.41
Greg	78.8	90.7	+11.9	141.61
Means	82.886	88.496	5.968	57.276

Mean Difference: 5.611

SEM: .915

t Test for Matched Pairs: 6.135 DF: 27

* X_1 - total of test scores for separate subject units

** X_2 - total of test scores for interrelated subject units

Chapter V

Conclusions and Recommendations

Students' enjoyment, interest, perceived learning, and achievement showed a significant difference at the .05 level based on the results of the t tests for matched pairs. The application of the .05 level, using 27 degrees of freedom, yields a level of significance at 2.052. The difference between the means of the two sets of scores obtained for each of the variables examined for this study favored interrelated subject units over separate subject units:

Variable	Difference
Enjoyment	4.045
Interest	4.967
Perceived Learning	3.566
Achievement	6.135

The results of the t tests indicated that the significant differences between the scores in the two types of units were actually lower than the .05 level. Since P = 2.771 at the .01 level and 3.690 at the .001 level, the results of the t tests indicated these levels of significance:

Variable	Difference	Level of Significance
Enjoyment	4.045	.001
Interest	4.967	.001
Perceived Learning	3.566	.01
Achievement	6.135	.001

There are many factors which are believed to have contributed toward these results. Interrelated subject units were

observed to develop a more interactive learning environment. More specifically, these units provided students with opportunities to:

See relationships between subjects.

Develop abilities to transfer knowledge of one subject to another subject.

Use science or social studies learnings to motivate and increase oral and written language skills and research abilities.

Reinforce science and social studies knowledge.

Share ideas and feelings.

Develop critical and convergent thinking and problem-solving abilities.

Appreciate worth of self and others.

Become more flexible in thinking and feeling.

Use knowledge of science and social studies to motivate math and art.

Become more active in the learning process in looking up information, reading, discussing, and sharing with children from other classrooms.

Share new ideas for extending and enriching units.

These findings are consistent with those of many researchers including Cohen (1976), Walker and Schaffarzick (1974), Swisher (1974), Lehane and Peete (1977), and Cacha (1977).

When subjects were interrelated for this study, it was with the intention of comparing a moderately innovative technique with a traditional one. Moderate innovation was chosen over intensive innovation because it had been confirmed

in research that moderate, rather than intensive innovation, makes the real difference in students' achievement. (Graves, 1977)

Many studies which compared students' achievement in traditional and more innovative programs found that the more intensive innovative programs did not increase students' achievement and sometimes decreased it. (Walker and Schaffarzick, 1974; Mitchell, 1975; Graves, 1977) Only one study was found where a more intensely innovative program increased achievement. (Cohen, 1976)

When students' attitudes were compared when in traditional or innovative programs, it was found that their attitudes were more positive in innovative programs. (Carter and Adams, 1978; Hayes and Smith, 1975; Mulligan, 1975; Swisher, 1974; Cohen, 1976; Lehane and Peete, 1977)

The moderate innovation that was compared with the traditional approach for this study was in response to the conclusions supported by these authors: that innovation positively affects students' attitudes and that moderate innovation positively affects students' achievement. Moderate innovation for this study was the use of a curriculum which included time for specialization of skills in the direct teaching of subjects and also the interrelation of subjects in units. This type of curriculum was supported by Bruner (1971), Wenner (1976), and Ragan and Shepherd (1977). Science and social studies were chosen to be the cores of inter-related units because these subjects had been observed to motivate

third grade students more than other subjects.

There is an emphasis in Florida and much of the United States on educational accountability. This has brought pressure on teachers to teach toward national, state, and county objectives with intended outcomes which are limited. This development has brought about a rise in testing for achievement of specific skills and emphasis on test scores with publication of scores and ranking of schools in the newspapers. The drive for accountability promotes and encourages more separate subject teaching with drills, tests which require simple recall of facts, and fragmentation of knowledge. Time is to be allotted to each subject and few attempts are made to relate them to each other. The raising of scores - the quantity not the quality - seems to be the goal.

Since a moderately innovative approach has been found to have a more positive effect on students' attitudes and achievement than a traditional approach, it is suggested that room should be made in the curriculum for the direct teaching of subjects for specific skills and the interrelation of subjects to enhance students' attitudes and achievement in meaningful learning. As summarized by Wolfe and Taylor (1973), the interrelation of learning will also help students make positive connections among all that they sense, believe, and know so they can think more universally and develop cooperative and humane attitudes toward others.

Limitations of This Study

The questionnaire on enjoyment, interest, and perceived learning would be more reliable if some concrete evidence could be found to indicate the truth of their answers. When students' answers on the questionnaire were compared with their observable attitude toward the various units, it appeared that their answers were consistent. Students' observable attitudes were measured by their attentiveness, participation in discussions and other activities, and the quality of assignments. But there might be some variability in the consistency of results with with their actual feelings toward the units of study. Some type of observer's schedule could be used to gather data on the various types of interactions during each type of unit. Since the range of the reliability coefficients was between .83 and .87 on the three sections of the questionnaire, this could be considered evidence of acceptable reliability for this sample group and for a questionnaire which has not been standardized.

The choices for answers on the questionnaire could be improved, giving five choices for questions 1 and 2 and rewording these choices to allow for more specific responses.

The reliability coefficients of seven of the achievement tests were between .854 and .895. These coefficients could be taken as indicators that these seven tests have acceptable reliability for this study's homogeneous sample group, the test's mixed format, and the percentage of higher level

questions. The test on plants has a lower reliability coefficient of .73. This lower reliability coefficient is not as acceptable as those of the other seven tests and might have had some effect on the results of the total scores for the separate subject units.

The achievement tests should have had the same number of total points possible so that percentages would not have to be used to obtain the mean scores.

Ad Hoc Analysis

While doing this study it was noticed that students' initial interest in particular topics varied. A questionnaire was given to students after completing the eight units in this study. This questionnaire asked students to rank the eight units in the order that they liked them, with the favorite subject as number one. The totals of the responses were found for their first, second, and third choices of unit topics. The results of students' first three choices and the ranking of units accordingly are in Figure 2.

Unit Ranking	Unit Topic	Type of Unit	Total of Choices 1-3
1	Solar System	Interrelated	22
2	Great Events	Interrelated	19
3	Living Communities	"	14
4	Plants	Separate Subject	12
5	Sound	Interrelated	9
6	Map Skills	Separate Subject	6
7	Suburbs	" "	2
8	Changing City	" "	0

Figure 2

When only first choices of topics were tabulated, the order of unit topics differed slightly as shown in Figure 3.

Unit Topic	Type of Unit	Total of First Choices
Solar System	Interrelated	13
Great Events	Interrelated	9
Living Communities	"	4
Sound	"	1
Map Skills	Separate Subject	1
Plants	" "	0
Suburbs	" "	0
Changing City	" "	0

Figure 3

The results of this questionnaire indicated that students liked interrelated subject units more than separate subject units. This agrees with the conclusions taken from the results of the questionnaire given immediately after each unit.

If this questionnaire to rank units had been given before any of the units in this study had been introduced, results could have been compared with the results of this questionnaire to find if the method of presentation made a difference in students' ranking of subjects.

This researcher has taught third grade for four years. As a result of following students' interests and finding an increasing amount of materials and ideas to motivate and interrelate subjects, social studies and science units have become more interrelated each year.

Also during the last four years, the same Stanford Achievement Test has been administered in social studies and science. During the four years it has been found that the medians of students' percentile scores have increased as shown in Figure 4. This is not cited as concrete evidence that interrelating subjects increases SAT scores since the medians are from different sample groups, but as another indicator of this possibility.

	Medians of SAT Percentile Scores			
	1976	1977	1978	1979
Social Studies	82	86	90	96
Science	84	86	86	98

Figure 4

Recommendations for Further Study

It would appear that the results of this study indicate that the interrelation of subjects in units significantly enhance students' enjoyment, interest, perceived learning, and achievement, but further study is needed. Since there appear to be few studies which show the superiority of one type of curriculum over another as recognized by Boehnlein and Ritty (1977), additional studies could be designed to investigate:

The difference between these two types of units when presented to various sample groups.

The comparison between results of this study with one which interchanges the interrelated and separate subject unit topics, but keeps other variables as similar as possible.

The types of students (i.e., learning disabled) that show a difference in results when comparing attitudes and achievement in these two types of units.

The effect of the two types of units on self-concept.

The effect of the amount of interrelating of subjects in curriculum on students' attitudes and achievement.

The effect of the two types of units on students' transfer and retention of knowledge.

The effect of content, emphasis, or presentation of materials within the two types of units on students attitude and achievement.

The comparison of the effects of these two types of units on classroom climate using interaction analysis.

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APPENDIX A

Activities in

Two Types of Units

and

Description of

an Interrelated Unit

Figure 5

Activities in two types of units

Activities Related to Units	Separate Subject Units				Interrelated Subject Units			
	Our Changing City	Map Skills	Suburbs	Plants	Solar System	Living Communities	Great Events in History	Sound
Read textbook	X	X	X	X	X	X	X	X
Answer questions	X	X	X	X	X	X	X	X
Discuss ideas convergent/divergent	X	X	X	X	X	X	X	X
Watch films and filmstrips	X	X	X	X	X	X	X	X
Write word definitions	X	X	X	X	X	X		X
Do workbook pages	X	X	X					
Do research for reports or talks					X	X	X	
Write reports					X	X		X
Write creative stories					X	X		X
Give talks with puppets							X	
Share stories or reports					X	X		X
Share newspaper or magazine articles					X	X	X	
Do grammar lesson with science or social studies as topic					X	X	X	
Do handwriting lesson with science or social studies as topic					X	X		
Write haiku and cinquain poetry						X		
Use measurement		X			X			X
Do experiments				X				X
Make mobiles to hang from ceiling					X	X		
Make musical instruments								X
Draw pictures to go with stories					X	X		X
Make posters, dioramas, peep boxes, and/or roll movies					X	X	X	X
Listen to and sing music					X		X	X

Interrelated Unit on the Solar System

In the author's third grade classroom, a recent unit on the solar system was interrelated as an outgrowth of children's current interests. Most of the children had seen movies or television programs about fictionalized space exploration, encounters, and colonies. This brought additional interest to the unit. Children's interests related science to social studies, reading, creative writing, research, math, art, and music.

The unit began with reading and discussing a chapter on the solar system. Given the information in the text, active discussions at first centered around the possibilities of life on other planets in the solar system. Since the book being used had been published in 1968, it did not include man's landing on the moon or recent discoveries about the planets. It was decided that more information was needed in order to draw conclusions.

The children viewed many films and filmstrips, most of them very current. They did much reading on their own. They actively shared information with each other. Children in the class brought in articles from magazines and newspapers. It was found that they were updating what they had learned from the text and growing in understanding that the "facts" were open to change as new information became available. They visited the planetarium at the Jacksonville Museum of Arts and Sciences for a "Grand Tour

of the Solar System". There they gathered more information, both cognitive and affective, through the tour which seemed to actually take the visitors through space.

Articles were found on plans for a new space colony between the earth and the moon. One article had the slogan, "Conserve earth, colonize space". They decided that a supergraphic should be made and put up across one of the walls in the classroom. This led to discussions of who would like to go to the new colony and why; how they could actually live there; where and how they could get supplies.

The children did reports on their chosen subjects. Many did more than one report, made dioramas, pictures, posters, or models of the solar system. Reports were shared with each other, and data gathered was discussed for similarities and differences. They asked, "When was your book printed?", giving more credence to most recently published information.

Through reading and sharing they found that the planets' difference in proportion was hard to visualize. It was decided that planets be made in proportion to be hung from the ceiling. This involved much math and artistic creativity. Children from other classrooms who came for reading and math groups were introduced to the suspended planets and given reasons for their size by those who had made them.

The unit on the solar system also brought out many projected feelings which came out of discussions. Responses were to

questions such as: "How do you think you'd feel to be the first person to walk in space?" "Or travel to the moon?" "How do you think you'd feel and move in a place where there is less gravity?" "How would you feel about living in outer space?" "What kinds of people would you want to have with you?" The sound track from "Star Wars" was heard with appreciation and a lot of imagination.

The children did creative writing. "Imagine that you are from another planet outside our solar system." "Where is it?" "What is its name?" "You're traveling to Earth. How?" "What do Earthlings look like to you?" "How are they different from you?" "Will you stay on Earth or return to your planet?" "Why?" The stories written were much more imaginative and longer than other stories written for English. Conclusions drawn from readings and discussions were interwoven into the stories.

Two second grade classes and one first grade class visited the classroom. Students in those classes were beginning to study the solar system. The third graders presented an overview of the solar system, shared their displays, and answered many questions. The third graders seemed to thoroughly enjoy sharing their new-found knowledge and the visitors showed much interest in the presentation and asked many questions.

A quiz at the end of the unit indicated that the students had learned more than from most separate subject units. But evaluation of the unit was not only from the quiz. Children had been motivated to learn on their own. They had followed

their own natural curiousity. They had become more open-minded. They had found that knowledge grows and changes rapidly. The children had worked well together and complimented each other on reports, creative writing, mobile planets, and other things done and made. They had used cognitive, affective, and psychomotor domains. Many subjects had been interrelated in an interactive environment. The author was definitely left with the feeling that the interrelation of subjects was what made the unit so successful.

APPENDIX B

Attitude Questionnaire

and Achievement Tests

and

Tables for Reliability

and Relevance of Tests

Questionnaire

1. How much did you enjoy the unit on _____?

   (5) a. I enjoyed it a lot.

   (4) b. I enjoyed it a little.

   (3) c. It was all right.

   (2) d. It was not very enjoyable

   (1) e. I didn't enjoy it at all.

2. I think that this unit was

   (4) a. very interesting.

   (3) b. a little interesting.

   (2) c. not very interesting.

   (1) d. boring.

3. How much do you think you learned from this unit?

   (3) a. a lot

   (2) b. a little

   (1) c. nothing

Note: The answers to each of the three questions have been given a weight with the most positive attitude given the highest score. The numbers in parentheses before each answer indicate the weights.

Name Key

Social Studies
Chapter 3
"Changing City"

1. What are some reasons for West Bend's growth?

a) highways
b) airport
c) ocean port
d) natural resources
e) railroads
f) factories

2. The head of the city government is the

a) city manager
b) city planner
c) mayor
d) president

3. What one thing should people do to make a city a safe place in which to live?

a) They should obey the safety rules.
b) They should drive their cars very slowly.
c) They should work hard and be helpful.

4. What important thing is done by workers in the Fire Department to help keep fires from starting?

a) The firemen talk to each other about preventing fires.
b) The firemen teach other people how to prevent fires.
c) The firemen put out fires as soon as they can.

5. What is one way that the workers in the Health Department help to keep a city healthy?

a) Inspect kitchens in people's houses.
b) Clean kitchens in restaurants.
c) Inspect many kinds of foods and places which make and serve food.

6. Steel is made from a mixture of

a) iron ore, coke and limestone.
b) bricks, water and gravel.
c) cement, water and gravel

7. Things that are made from trees are:

a) houses
b) automobiles
c) paper
d) books
e) steel
f) furniture

8. Natural resources are:

a) water
b) trees
c) steel
d) schools
e) land
f) clay
g) limestone
h) playground equipment
i) soil

9. Where does the money come from to pay for city government workers, firemen, policemen, schools, teachers, and highways?

taxes

10. Number the following sentences in their correct order, 1-4.

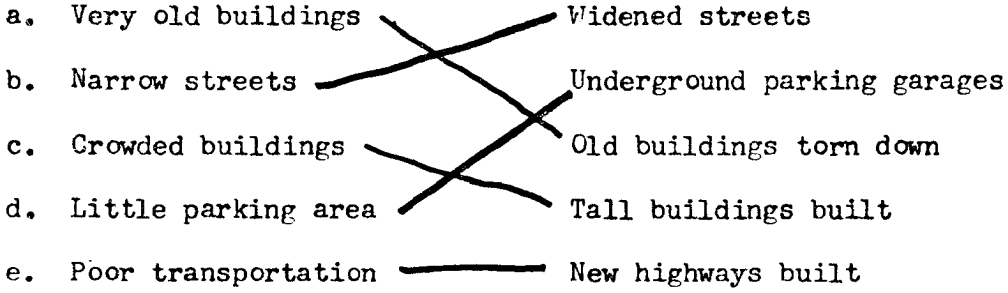
2 Cut trees are sent to the sawmill.

4 Lumber is bought to make furniture, buildings, etc.

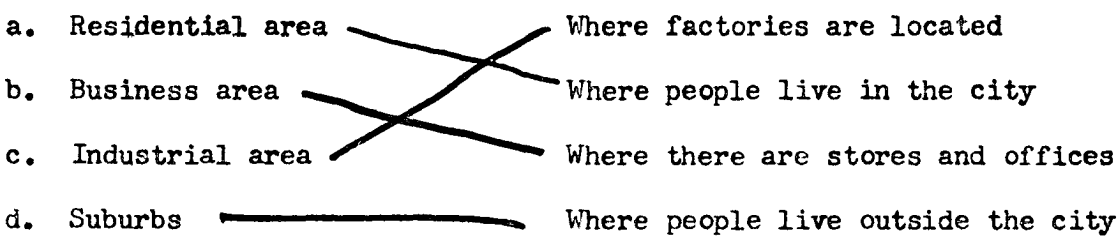
1 Lumberjacks cut trees in the forest.

3 Logs are cut into lumber.

11. Match the problems of a city with the ways to solve them.



12. Match the following areas in a city.



TRUE AND FALSE

T 13. The mayor of a city helps plan programs to solve problems of the city.

T 14. Firemen inspect buildings for safety and fire hazards.

F 15. The Safety Department makes sure water is safe to use.

T 16. The Public Works Department collects garbage and cleans streets.

T 17. The Safety Department learns what causes traffic jams and accidents and helps solve traffic problems.

T 18. Firemen help protect people and property.

F 19. Forests are important to people who make bicycles.

T 20. The Health Department has clinics that help keep people healthy.

T 21. Bricks are made from clay.

F 22. Countries do not need rules and laws.

T 23. Cement and steel are both made from limestone.

T 24. A policeman's main job is to protect people.

F 25. A salesman works for the government.

T 26. A government pays its bills from money it gets from taxes.

T 27. New highways are built to help solve traffic jams.

F 28. A forest ranger's most important job is to put out forest fires.

Bonus: Do all countries need laws?

Why? (Sensible reasons needed to back up response to first part of question.)

K = 51

1 point for each correct answer including bonus.

Name _____

You may use the map on page 226 in your textbook.

k=49

1 point given for each correct answer.

F 1. The United States is a continent.

T 2. North America is in the northern hemisphere.

F 3. The United States is in South America.

T 4. An island is land surrounded by water.

F 5. A peninsula is land with water on only two sides.

T 6. The equator crosses land and water.

F 7. The equator connects the North and South Poles.

T 8. The United States is a country.

T 9. Florida is a peninsula.

F 10. Maine is in the northwest United States.

T 11. The state of Alaska touches the northwest part of Canada.

F 12. The ocean east of the United States is the Pacific Ocean.

T 13. The Pacific Ocean is the largest ocean on the earth.

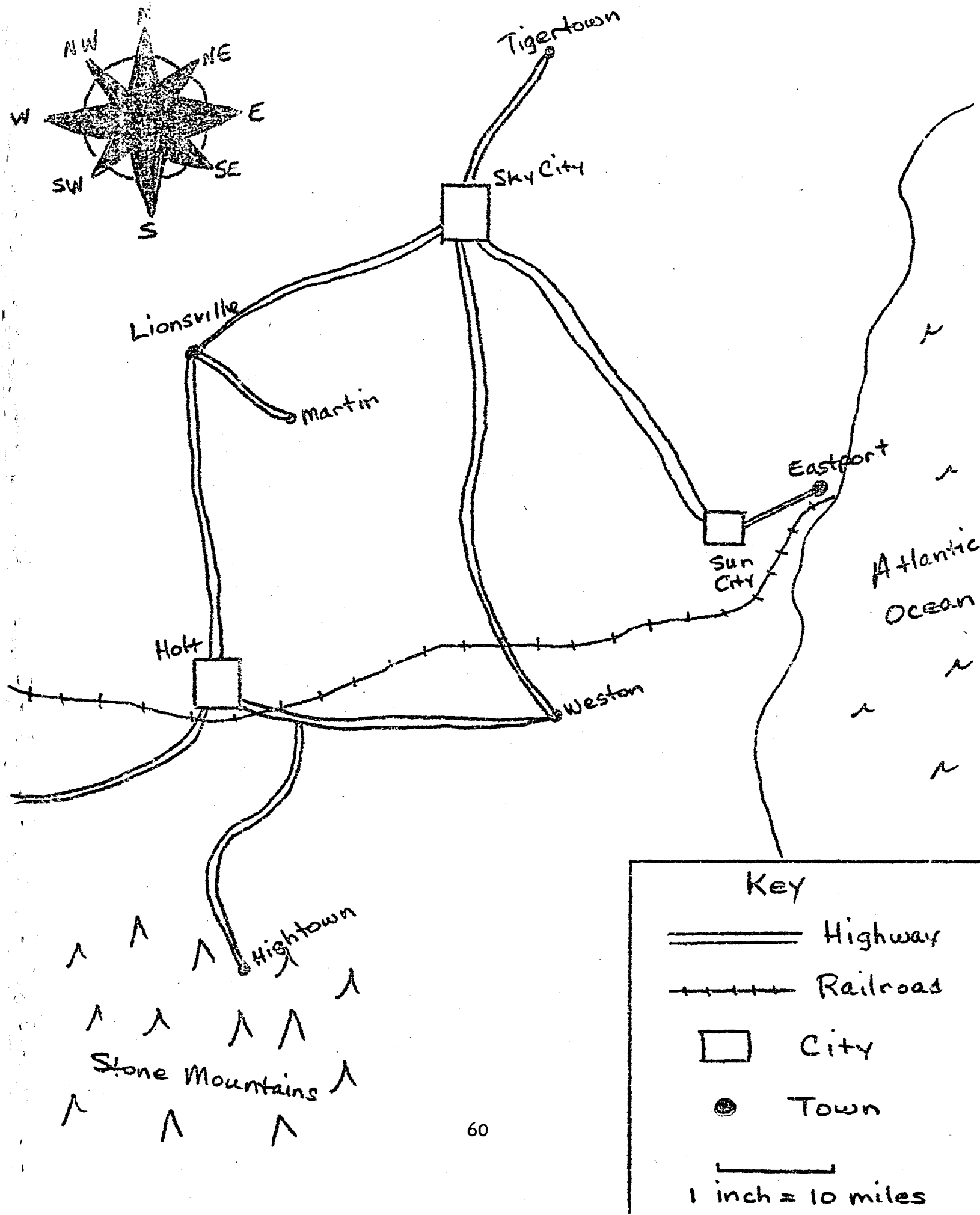
T 14. California is west of Nevada.

F 15. Mexico is southwest of California.

16. Which three states border on California? Oregon, Nevada, Arizona

17. Name the seven continents.
Europe, North America, South America, Africa, Asia, Australia, Antarctica

18. Name the four oceans.
Atlantic, Pacific, Indian, Arctic.


N
NW
NE
W
E
SW
SE
S
Tigertown
Sky City
Lionsville
Martin
Eastport
Sun City
Atlantic Ocean
Holt
Weston
Hightown
Stone Mountains
Key
Highway
Railroad
City
Town
1 inch = 10 miles

1. Which town is about 10 miles from Lionsville? Martin

2. Which city is located where two highways cross ? Sky City

3. Which town is probably a suburb of Sun City? Eastport

4. In which direction is Sky City from Sun City? NW

5. Traveling by car, which town is farthest from Sun City? Weston or Tigertown

6. In which direction would you travel from Holt to Lionsville? N

7. The ocean is E of Sun City.

8. To go from Martin to Lionsville, you would go NW.

9. Tigertown is closest to which city? Sky City

10. Vacationers probably go to which <u>two</u> towns? Eastport, Hightown

11. About how many miles by highway is it from Holt to Weston? 30

12. Stone Mountains are South of Holt.

13. Which city is closest to Sky City? Sun City

14. The railroad passes by the Southern part of Eastport.

15. Which town would you come to going north from Holt? Lionsville

16. The railroad goes by which <u>two</u> cities? Holt, Sun City

17. Give <u>two</u> reasons that the railroad probably goes to Eastport.

To take vacationers to ocean
To take goods to port

Name Key

Social Studies Quiz
Chapter 4
Pages 112-130
"Suburbs"

1. The major bank services are

a) loans
b) making blueprints
c) checking accounts
d) savings accounts

2. The pipes for water were laid

a) close to the surface of the ground.
b) along the edge of the streets.
c) deep under the streets and roads.

3. The streets and roads for the new suburb were made by

a) power shovels
b) bulldozers
c) electric drills

4. The pipes that carry away the waste water are called

a) transformers
b) stubs
c) sewer pipes

5. The plans for the new suburb were carefully made by the

a) plumbers
b) developer
c) carpenter
d) transformer

6. The water pipes in a house are joined with the water pipes under the street at the

a) stub
b) transformer
c) meter

7. A man from the electric company checks how much electricity has been used by reading the

a) outlets
b) stub
c) transformer
d) meter

8. A suburb is

a) an area in the downtown area of a city where people live.
b) an area to live outside the city.
c) a business area of a city.
d) an industrial area of a city.

K= 27
1 point for each correct answer including 2 bonus questions.

taxes	frame	outlets
blueprint	plumber	transformer
foundation	carpenter	interest

Fill in the blanks in these sentences with words from the word list above.

1. The foundation is the flat surface on which the frame of the house will be built.
2. The plumber is the person who puts in the water pipes for the house.
3. A bank earns money from the interest it charges on loans.
4. A blueprint is a plan for a house showing the rooms on each floor of the house.
5. Electrical things like lights, radios, TVs, and toasters are plugged into outlets.
6. The frame of a house is made of wood.
7. A Carpenter puts together ~~together~~ the parts of a house which are made of wood.
8. A transformer increases or decreases electric power needed for electricity in houses.

Number these from 1-7 to show the order in which water gets from the mountains to the Brook's house.

4 filtering station

2 rivers

7 Brook's house

3 reservoir

1 snow or rain

6 water pipes under the street

5 pumping station

Bonus: Why were the pipes and wires laid before the streets were paved in Forest Hills?

Answers vary.

Why was the bank willing to lend money to Mr. Brooks to build the house?

Answers vary.

Name Key

Science Quiz
Chapter 3
"Plants"

1. Circle those which are true about all living things.

(a) They can turn food into energy
b) They have roots
c) They have leaves
d) They can move around by themselves.
(e) They can grow and reproduce.
(f) They need air, water, and sun.

2. Circle those parts which all green plants have.

(a) roots
(b) stems
c) bulbs
d) flowers
e) spores
(f) food-making parts

3. Circle those which all green plants need.

K = 45

1 point for each correct answer.

(a) light
(b) water
(c) chlorophyll
(d) carbon dioxide
e) warm weather
(f) food

4. Circle those which are true about most green plants.

(a) They make their own food.
(b) They get water through root hairs.
(c) They contain chlorophyll
(d) They store food.
e) They can live in dark places.
(f) They grow from seeds or bulbs.

5. Circle those places where green plants would probably grow.

(a) desert
b) dark cave
(c) swamp
(d) forest
(e) jungle
(f) shallow water

6. Circle those which would probably be true if roots of a plant were cut off.

a) They would take in water and food through their leaves.
(b) They might begin to die.
(c) They might topple over without the support of roots.
(d) They would turn brown.
(e) They could not take in enough food and water.

7. Food chains in the forest begin with

   a) man

   (b) green plants

   c) animals

8. If one part of a food chain is removed or dies, the food chain becomes

   (a) weaker

   b) stronger

   c) larger

TRUE AND FALSE

T 9. The giant Sequoia or redwood tree is the largest living thing.

T 10. We would have no meat to eat if there were no plants.

F 11. Green plants would stay green even if they were covered with a cardboard box for a month.

T 12. The flower is the part of a plant in which seeds form.

T 13. Green plants need light to make their own food.

F 14. Plants take in the water they need through their leaves.

F 15. Mushrooms and molds make their own food.

T 16. A mushroom can grow from a spore.

F 17. Eskimos probably eat more plant foods than meat and fish.

T 18. A tulip bulb contains food for the growth of the tulip.

T 19. Lichens can be non-green or green and usually live on rocks.

T 20. Leaves for a bean plant form inside the bean seed.

T 21. Water comes up through the root hairs, roots, and veinlike parts of the stem to the flower of a plant.

T 22. Fungi do not make their own food and do not have leaves.

23. Name three foods you might eat which come from the <u>roots</u> of plants.
(Answers vary)

24. Name three foods you might eat which come from the <u>leaves</u> of plants.
(Answers vary)

25. How does a cactus plant stay alive when there is no rainfall in the desert for months.

Answers vary.

26. Draw a flowering plant and label the 5 parts.

Bonus: What do you think would happen to a green plant if it were in the sunshine for 24 hours each day?

Why? Answers vary.

Name Key

Science Quiz
Chapter 1
The Solar System

K = 48

1 point for each correct answer.

1. Circle the two planets that are the hottest.

a) Jupiter
b) Venus
c) Pluto
d) Mercury

2. Circle the two planets which are the coldest.

a) Venus
b) Pluto
c) Mercury
d) Neptune

3. How long does it take the earth to orbit the sun one time?

a) 365 days
b) 24 hours
c) one day
d) 88 days

4. How long does it take the earth to make one rotation on its axis?

a) 365 days
b) 24 hours
c) one year
d) 88 days

5. Why do you seldom see stars in the daytime sky?

a) There are no stars in the sky in the daytime.
b) The sky is too bright to see the stars.
c) The stars are too far away to see from the earth.

* In questions 6-8, circle all answers that answer each question.

6. What is in our solar system?

a) planets
b) galaxies
c) moons
d) the sun

7. The sun is

a) a star
b) made of glowing gasses
c) between Mars and Jupiter
d) the center of the solar system

8. Energy from the sun

a) heats the earth
b) is important for life to exist on the earth
c) gives planets their light
d) is not necessary for life on the earth

TRUE and FALSE

F 9. The hottest planets are those which are the farthest away from the sun.

T 10. A year on Pluto is longer than a year on the earth.

F 11. The change from day to night is caused by the moon's orbit around the earth.

F 12. We could live on the earth without any energy from the sun.

F 13. Saturn is the largest planet in our solar system.

T 14. The planets are held in orbit around the sun by gravity from the sun.

T 15. According to our book, a comet is made of gravel and gasses.

F 16. A meteorite is called a meteor when it strikes the earth.

T 17. A meteor which moves through the earth's atmosphere becomes white-hot because of friction.

T 18. Our solar system is part of the Milky Way Galaxy.

T 19. We have found that there is probably no life on Venus or Mars.

T 20. It takes one year for the earth to orbit the sun one time.

T 21. The earth makes one rotation on its axis in 24 hours.

T 22. The universe is larger than a galaxy.

T 23. There are many galaxies in the universe.

T 24. There is a possibility that there is life on another planet in another solar system.

T 25. There are plans for a space colony between the earth and the moon.

F 26. Right now scientists know everything there is to know about the universe.

F 27. The planets that have switched positions in our solar system are Pluto and Uranus.

28. Name the planets in order from the sun - in the order that they are now.
Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Pluto, Neptune

29. What planet in our solar system, other than Saturn, has rings around it? Uranus

30. Who was the first man on the moon? Neil Armstrong

31. What country sent him to the moon? United States

Bonus: 1. Do you think there might be life on another planet in the universe?
Answers vary.

Why?

Yes

in another solar system

same distance from their sun as our earth

Scientists think there might be

No

other planets may be too hot or too cold

scientists have not found evidence of life

Name Key

Science Quiz
Living Communities
Chapter 6

1. Animals will move to another area when

a. their food supply gets low.
b. there is little rainfall.
c. man builds in the area.
d. there are fires in the area.

2. Which animals would probably live in the desert?

a. rattlesnakes
b. lizards
c. elephants
d. camels

3. Which animals would probably live in the jungle?

a. monkeys
b. penguins
c. tigers
d. insects

4. Which animals live in colonies?

a. penguins
b. beavers
c. honeybees
d. ants

5. Which animals are amphibians?

a. frogs
b. toads
c. mice
d. salamanders

6. Which animals are herbivores?

a. cows
b. lions
c. sheep
d. bears

7. Which animals are carnivores?

a. goats
b. jaguars
c. sheep
d. coyotes

8. Which animals graze on grass?

a. goats
b. penguins
c. sheep
d. cows

9. The wool in a sweater is made from

a. man-made materials
b. plants
c. a mammal
d. an insect

10. Why are some animals becoming endangered?

a. pollution
b. hunting
c. pesticides

K = 60

1 pt. for each correct answer.

TRUE AND FALSE

T 11. If plants disappear, animals may also disappear.

F 12. There would be more birds than insects in a jungle.

T 13. There are more animals in the tropics than at the South Pole.

T 14. Herbivores are animals who eat mostly plants.

F 15. Carnivores are animals who eat mostly plants.

T 16. Animals have defenses for protection.

T 17. A nocturnal animal is one who is active at night.

T 18. A colony is where different members of the colony do different jobs.

F 19. Only the mother penguins raise the young penguins.

T 20. Animals usually use their defenses only when they have to.

T 21. Coyotes are carnivores and can be useful to man.

T 22. Man probably could not survive without plants and animals.

F 23. An amphibian cannot live on the land.

F 24. Man's food supply comes only from animals.

T 25. The amount of food an animal needs depends on its size and activity.

T 26. Green plants make their own food.

a.	lion	e.	endangered species
b.	flying squirrel	f.	penguins
c.	honeybee	g.	community
d.	sheep	h.	opossum

g 27. An area where many kinds of plants and animals live together.

e 28. Animals which are becoming extinct.

f 29. This mammal lives in a colony.

c 30. These insects line in a colony.

h 31. This mammal plays dead to protect itself.

b 32. This mammal is nocturnal.

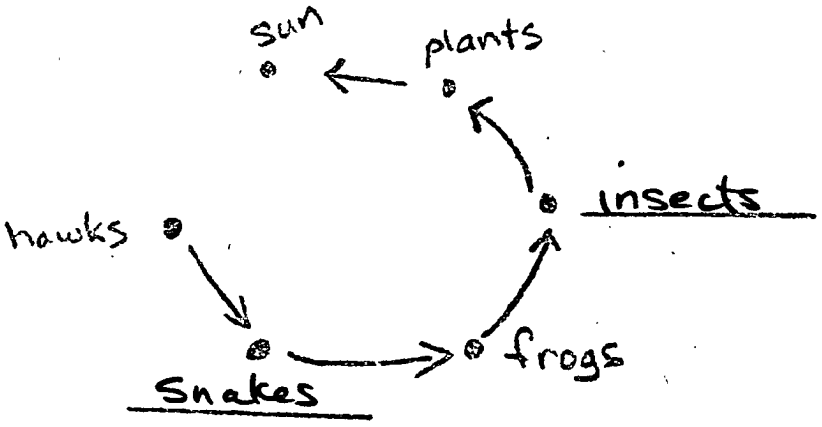
a 33. This mammal is a carnivore.

d 34. This animal is an herbivore.

35. Name <u>five</u> defenses that animals have for survival.

Answers vary.

36. Fill in the <u>two</u> blanks in this food chain.



Answers could vary.

<u>Bonus</u>: Why would there be more animals in the jungle than in the desert?

Answers vary.

Name Key

Social Studies Quiz
GREAT EVENTS IN HISTORY

K= 47

1 point for each correct answer.

1. The Discovery, Godspeed, and the Susan Constant were ships that brought the first English colonists to

a) Plymouth
b) St. Augustine
c) Jamestown
d) Fort Caroline

2. Many people came to our country for

a) religious freedom
b) adventure
c) freedom of speech
d) their own land

3. The two crops grown in Jamestown were

a) corn
b) sugar
c) cotton
d) tobacco

4. What taxes made the American colonists want freedom from England?

a) tobacco
b) sugar
c) tea
d) stamp

5. Where was our Constitution written?

a) Boston
b) Philadelphia
c) New York
d) Washington

6. Why is the Constitution important?

a) It gives a plan for our government.
b) It tells how to elect a president.
c) It gives us our rights and freedoms.

7. What city is called the Cradle of Liberty?

a) Boston
b) Philadelphia
c) New York
d) New Orleans

8. Who was a farmer, lawyer, representative, senator, general, and president?

a) Thomas Jefferson
b) Abraham Lincoln
c) Andrew Jackson
d) George Washington

True and False

T 9. Messages can be sent around the world by satellite.

T 10. Lewis and Clark explored the land from St. Louis to the Pacific Ocean.

F 11. The Statue of Liberty was given to us by Spain.

T 12. The Statue of Liberty is in New York Harbor.

T 13. Our country was once ruled by England.

F 14. A plan for government is called a convention.

F 15. England won the Revolutionary War.

F 16. Benjamin Franklin invented the light bulb.

T 17. We celebrate our independence from England on July 4.

T 18. A government gets money by collecting taxes from people.

T 19. Daniel Boone went through the Cumberland Gap to get to Kentucky.

F 20. The Mayflower brought the first settlers to Jamestown.

F 21. The part of the United States near the Pacific Ocean was settled first.

a. British soldiers
b. Abraham Lincoln
c. Sacagewea
d. 9
e. Lewis & Clark
f. Lexington and Concord
g. Daniel Boone
h. 13
i. George Washington
j. frontier
k. Paul Revere
l. Wright Brothers
m. Susan B. Anthony
n. 50

K 22. Who warned the colonists that the British were coming?

F 23. Where did the colonists fight the British?

A 24. Who were the "Redcoats"?

H 25. How many states were there when the Constitution was written?

N 26. How many states do we have now?

I 27. Who was a general and our first president?

C 28. Who helped Lewis and Clark find their way?

L 29. Who made and flew the first American plane?

G 30. Who explored the land west of the Appalachian Mountains?

J 31. What is the farthest part of a settled country called?

M 32. Who wanted women to have the right to vote?

B 33. Which president wanted freedom for slaves?

34. What one thing does every country need to have? laws

35. What was the Boston Tea Party? Colonists threw British tea into Boston Harbor to protest tax on tea.

36. Who were the Minutemen? Soldiers - colonists

37. Why were they called Minutemen?
Could get rifles ready to fire in a minute.

38. How was the fighting of the British different from the colonists?
British marched in lines or rows and fired on command.
Colonists hid and fired when necessary.

Bonus: What was the signal to tell Paul Revere that the British were on their way?
Two lights from belfrey of Old North Church told Revere the British were coming by sea.

Name Key

Science Quiz
Chapter 8
SOUND

a) fast
b) slow
c) vibrating
d) larynx
e) echo system
f) eardrums
g) invisible ripples of sound
h) vocal cords

1. Sounds are made by __c__ objects.
2. You hear sounds when sound waves vibrate your __f__.
3. A high sound is produced when an object vibrates __a__.
4. A bat can "see" in the dark by using his own __e__.
5. Man produces sound in his __d__.
6. When man produces sound, his __h__ vibrate.
7. Sound waves are __g__.

K = 39

1 point for each correct answer.

a) solids
b) keys
c) thin
d) closer together
e) farther apart
f) strings
g) thick
h) reflected
i) gasses
j) absorbed

8. Sound usually travels fastest through __a__ because molecules are __d__.
9. Sound usually travels slowest through __i__.
10. The __f__ of a piano produce sound by vibrating.
11. The __c__ strings of a guitar make the highest sounds.
12. An echo is __h__ sound.

True and False

F 13. Thick strings of a harp vibrate fastest.

T 14. You usually see lightning before you hear the thunder.

T 15. The speed of light is faster than the speed of sound.

F 16. You can find how far away something is underwater by using radar.

T 17. Radar is an echo system used to locate airplanes.

T 18. Fishermen use sonar to locate fish swimming in large schools.

TRUE AND FALSE

F 19. You can hear an echo better in your bedroom than in a barren hallway.

T 20. Musical instruments can produce either noise or music.

F 21. The longer and thicker strings of an instrument make the higher sounds.

T 22. Sounds come from some kind of matter that moves.

T 23. The faster something vibrates, the higher the sound is produced.

F 24. Your lips and tongue do <u>not</u> help you to say words.

T 25. Faraway sounds are heard farther through solids, like the ground, than through air.

F 26. Radar is an echo system that sends radio waves through the water to find objects.

T 27. You can hear much louder sounds if you bounce a ball on a wooden floor than if you bounce it on the grass.

T 28. The sound nearest the vibrating object would be the loudest.

a) sofa
b) brick wall
c) steel
d) pillow
e) submarine
f) carpet
g) mattress
h) rock walls of a cave

29. Which four things would <u>reflect</u> sound? b c e h

30. Which four things would <u>absorb</u> sound? a d f g

31. What is the difference between noise and music?

noise - unpleasant sound
music - pleasant sound
} may vary

<u>Bonus</u>: Name some noises that are useful to man.

(may vary)

whistles, RR crossing bells, alarms, sirens, telephones, car horns

Table 5

Reliability - Enjoyment

Students	* X_1	** X_2	Total
Lisa	13	16	29
Scott	12	12	24
Wendy	14	14	28
Mike	16	20	36
Jennifer	20	20	40
Kathy	20	20	40
Dee Dee	20	20	40
Jenny	16	19	35
Stacie	17	20	37
Tommy	18	20	38
Johnny I.	16	19	35
Carol	15	16	31
Eddie	8	8	16
Johnny J.	20	20	40
Margaret	15	19	34
Amanda	12	19	31
Matthew	16	20	36
Charmaine	20	20	40
David	7	13	20
Jeff	16	16	32
Lydia	14	17	31
Geraldine	20	20	40
Robert	20	20	40
Terry	17	20	37
Samantha	14	19	33
Staci	18	15	33
Eric	20	19	39
Greg	8	15	23
Means	15.321	17.714	33.5
Standard Deviation:	6.406		
Coefficient Alpha:	.830		

* X_1 - total scores of separate subject units

** X_2 - total scores of interrelated subject units

Table 6

Reliability - Interest

Students	* X_1	** X_2	Total
Lisa	9	13	22
Scott	9	10	19
Wendy	10	13	23
Mike	14	16	30
Jennifer	16	16	32
Kathy	15	16	31
Dee Dee	16	16	32
Jenny	14	15	29
Stacie	14	16	30
Tommy	15	16	31
Johnny I.	14	15	29
Carol	12	12	24
Eddie	7	8	15
Johnny J.	16	16	32
Margaret	12	15	27
Amanda	12	15	27
Matthew	13	15	28
Charmaine	16	16	32
David	6	10	16
Jeff	15	15	30
Lydia	13	13	26
Geraldine	16	15	31
Robert	16	16	32
Terry	13	15	28
Samantha	12	15	27
Staci	14	15	29
Eric	15	15	30
Greg	8	12	20
Means	12.929	14.286	27.214
Standard Deviation:	4.821		
Coefficient Alpha:	.839		

* X_1 - total scores of separate subject units

** X_2 - total scores of interrelated subject units

Table 7

Reliability - Perceived Learning

Students	* X_1	** X_2	Total
Lisa	8	10	18
Scott	8	9	17
Wendy	10	12	22
Mike	11	12	23
Jennifer	12	12	24
Kathy	12	12	24
Dee Dee	12	12	24
Jenny	12	12	24
Stacie	11	12	23
Tommy	12	12	24
Johnny I.	10	11	21
Carol	10	11	21
Eddie	6	5	11
Johnny J.	12	12	24
Margaret	9	12	21
Amanda	10	11	21
Matthew	10	12	22
Charmaine	12	12	24
David	5	9	14
Jeff	12	12	24
Lydia	8	9	17
Geraldine	11	11	22
Robert	12	12	24
Terry	8	10	18
Samantha	12	12	24
Staci	12	12	24
Eric	12	11	23
Greg	7	10	17
Means	10.214	11.107	21.25
Standard Deviation:	3.419		
Coefficient Alpha:	.870		

* X_1 - total scores for separate subject units

** X_2 - total scores for interrelated subject units

Table 8

Reliability - Achievement
* "Our Changing City"

Students	X	X^2
Matthew	51	2601
Carol	50	2500
Greg	49	2401
Eric	49	2401
Jeff	49	2401
Wendy	48	2304
Jenny	48	2304
Robert	48	2304
Kathy	47	2209
Samantha	47	2209
Lisa	47	2209
Charmaine	47	2209
Johnny J.	46	2116
David	45	2025
Amanda	45	2025
Eddie	45	2025
Jennifer	45	2025
Mike	45	2025
Stacie	45	2025
Tommy	44	1936
Scott	42	1764
Staci	41	1681
Johnny I.	40	1600
Margaret	39	1521
Dee Dee	36	1296
Terry	31	961
Lydia	28	784
Geraldine	24	576
Means	43.607	1944.179

Variance: 42.596
Standard Deviation: 6.527
SEM: 2.366 K=51
Kuder-Richardson 21 Reliability Cofficient: .869

* Separate subject unit test

Table 9

Reliability - Achievement
* "Map Skills"

Students	X	X^2
Jeff	48	2304
Kathy	47	2209
Jenny	47	2209
Matthew	45	2025
Carol	44	1936
Mike	44	1936
Tommy	44	1936
Jennifer	43	1849
Staci	43	1849
Johnny I.	42	1764
Amanda	42	1764
Eric	41	1681
Eddie	41	1681
David	40	1600
Samantha	39	1521
Lisa	39	1521
Johnny J.	39	1521
Margaret	38	1444
Charmaine	37	1369
Robert	36	1296
Terry	36	1296
Stacie	34	1156
Greg	32	1024
Wendy	31	961
Dee Dee	27	729
Scott	25	625
Geraldine	16	256
Lydia	14	196
Means	37.643	1487.786

Variance: 70.801
Standard Deviation: 8.414
SEM: 2.726 K=49
Kuder-Richardson 21 Reliability Coefficient: .895

* Separate subject unit test

Table 10

Reliability - Achievement
* "Suburbs"

Students	X	X^2
Lisa	27	729
Mike	27	729
Jenny	27	729
Carol	27	729
Kathy	26	676
Stacie	26	676
Amanda	26	676
Samantha	26	676
Charmaine	26	676
Wendy	26	676
Stacie	26	676
Lisa	26	676
David	25	625
Margaret	25	625
Robert	25	625
Eddie	25	625
Matthew	25	625
Jennifer	25	625
Johnny J.	24	576
Eric	22	484
Dee Dee	21	441
Johnny I.	21	441
Tommy	21	441
Lydia	20	400
Greg	20	400
Scott	13	169
Terry	12	144
Geraldine	7	49
Means	23.107	557.821

Variance: 23.881
Standard Deviation: 4.887
SEM: 1.594 K=27
Kuder-Richardson 21 Reliability Coefficient: .894

* Separate subject unit test

Table 11

Reliability - Achievement
* "Plants"

Students	X	X^2
Jenny	44	1936
Kathy	42	1764
Jeff	42	1764
Mike	41	1681
Johnny I.	41	1681
Johnny J.	40	1600
Eddie	40	1600
Lisa	40	1600
Matthew	39	1521
Tommy	39	1521
Robert	39	1521
Jennifer	39	1521
Wendy	38	1444
Carol	38	1444
Charmaine	38	1444
Staci	37	1369
Amanda	37	1369
Lydia	37	1369
Greg	36	1296
Samantha	36	1296
Eric	36	1296
David	34	1156
Dee Dee	34	1156
Stacie	31	961
Margaret	30	900
Scott	29	841
Geraldine	29	841
Terry	21	441
Means	36.679	1369.036

Variance: 23.718
Standard Deviation: 4.870
SEM: 2.529 K=45
Kuder-Richardson 21 Reliability Coefficient: .730

* Separate subject unit test

Table 12

Reliability - Achievement
* "Solar System"

Students	X	X^2
Matthew	48	2304
Amanda	48	2304
Eddie	48	2304
Jenny	47	2209
Lisa	47	2209
Tommy	47	2209
Johnny J.	47	2209
Jennifer	47	2209
Kathy	46	2116
Staci	46	2116
Dee Dee	46	2116
Wendy	45	2025
Eric	45	2025
Mike	45	2025
Jeff	44	1936
Johnny I.	44	1936
Charmaine	43	1849
Robert	43	1849
Stacie	43	1849
Greg	43	1849
Carol	42	1764
Scott	42	1764
David	41	1681
Terry	39	1521
Margaret	36	1296
Lydia	35	1225
Samantha	34	1156
Geraldine	24	576
Means	43.036	1879.679

Variance: 27.606
Standard Deviation: 5.254
SEM: 1.990 K=48
Kuder-Richardson 21 Reliability Coefficient: .857

* Interrelated subject unit test

Table 13

Reliability - Achievement
* "Living Communities"

Students	X	X^2
Jenny	60	3600
Lisa	59	3481
Jeff	59	3481
Matthew	59	3481
Kathy	59	3481
Eric	59	3481
Margaret	58	3364
Johnny J.	58	3364
Tommy	58	3364
Samantha	58	3364
David	57	3249
Greg	57	3249
Eddie	57	3249
Amanda	56	3136
Mike	56	3136
Staci	55	3025
Jennifer	55	3025
Carol	54	2916
Charmaine	54	2916
Robert	51	2601
Wendy	49	2401
Scott	49	2401
Dee Dee	48	2304
Stacie	47	2209
Johnny I.	47	2209
Terry	42	1764
Lydia	42	1764
Geraldine	36	1296
Means	53.536	2903.964

Variance: 37.892
Standard Deviation: 6.156
SEM: 2.285 K=60
Kuder-Richardson 21 Reliability Coefficient: .862

* Interrelated subject unit test

Table 14

Reliability - Achievement
* "Great Events in History"

Students	X	X^2
Jenny	47	2209
Jeff	46	2116
Johnny I.	46	2116
Kathy	45	2025
Staci	44	1936
Margaret	44	1936
Robert	44	1936
Johnny J.	44	1936
Eric	44	1936
Matthew	43	1849
Stacie	43	1849
Carol	43	1849
Amanda	43	1849
Eddie	43	1849
Jennifer	42	1764
Samantha	42	1764
Mike	42	1764
Lisa	42	1764
Charmaine	41	1681
Dee Dee	40	1600
Wendy	39	1521
David	38	1444
Greg	38	1444
Tommy	37	1369
Scott	29	841
Lydia	26	676
Terry	22	484
Geraldine	20	400
Means	39.893	1639.536

Variance: 48.096
Standard Deviation: 6.935
SEM: 2.262 K=47
Kuder-Richardson 21 Reliability Coefficient: .894

* Interrelated subject unit test

Table 15

Reliability - Achievement
* "Sound"

Students	X	X^2
Staci	39	1521
Stacie	39	1521
Kathy	39	1521
Jenny	39	1521
Johnny J.	38	1444
Wendy	38	1444
Tommy	38	1444
Matthew	38	1444
Amanda	38	1444
Carol	38	1444
Lisa	38	1444
Johnny I.	38	1444
Mike	38	1444
Greg	38	1444
Jeff	38	1444
Robert	36	1296
Eddie	36	1296
Jennifer	36	1296
Charmaine	35	1225
Lydia	35	1225
Eric	34	1156
Scott	34	1156
David	32	1024
Margaret	32	1024
Samantha	31	961
Geraldine	27	729
Dee Dee	25	625
Terry	21	441
Means	35.286	1265.071

Variance: 19.990
Standard Deviation: 4.471
SEM: 1.710 K=39
Kuder-Richardson 21 Reliability Coefficient: .854

* Interrelated subject unit test

Table 16. Relevance - "The Changing City"

Content	Total Number of Items	Learning Outcomes: Identifies areas in city	Sequences steps: trees to lumber	Classifies products of resources	Identifies natural resources	Identifies steel ingredients	Relates problems and solutions	Supports why laws needed	Identifies that countries need laws	Explains way to make city safe	Identifies uses for taxes	Relates workers to jobs	Identifies workers	Identifies reasons for Growth
Cities Growth	5													5
Workers in City Government	12											11	1	
Taxes	2										2			
Government Rules and Laws	4							1	2	1				
City Changes - Problems and Solutions	6						6							
Resources for Building	18		4	7	6	1								
Areas of City	4	4												
	51													

Table 17. Relevance - "Map Skills"

Content	Total Number of Items	Learning Outcomes: Classifies town as suburb	Infers vacation towns	Gives reasons for railroad destination	Applies scale	Understands and uses map key	Names states on border	Applies direction to places	Describes position of equator	Relates North America to northern hemisphere	Relates position of Atlantic	Classifies Pacific as largest	Names 4 oceans	Relates Florida as a peninsula	Identifies peninsula	Identifies island	Relates U.S. as country	Identifies position of U.S.	Identifies continents
Land Masses	13													1	1	1	1	1	8
Oceans	6										1	1	4						
Globe Skills	3								2	1									
Direction Skills	14						3	11											
Map Key	9				5	4													
Uses Information on Map	4	1	2	1															
	49																		

Table 18. Relevance - "Suburbs"

Content	Total Number of Items	Learning Outcomes: Identifies description of parts of house, workers, and machinery	Identifies position of water pipes	Identifies description of suburb	Sequences steps to get water to suburb	Infers reason for position of water pipes	Identifies services	Identifies interest	Gives reason for loan approval
Building of New Suburb	22	12	1	1	7	1			
Banks	5						3	1	1
	27								

Table 19. Relevance - "Plants"

Content	Total Number of Items	Learning Outcomes: Compares properties of all living things	Compares parts of all green plants	Identifies needs	Identifies properties	Predicts where growth possible	Predicts results if roots cut off	Identifies largest living thing	Summarizes how fed	Explains purpose of bulb	Classifies foods from roots	Classifies foods from leaves	Gives reasons why cactus lives with little water	Diagrams plant - labels parts	Concludes and supports possibility of plant growth in special situation	Identifies those which make own food	Identifies growth of mushroom	Identifies lichens and fungi	Identifies beginning of food chain	Infers results if part removed	Predicts Eskimos' diet
Living Things	3	3																			
Green Plants	34		3	6	6	6	4	1	2	1	1	1	1	1	1						
Non-Green Plants	4															1	1	2			
Food Chains	4																		1	2	1
	45																				

Table 20. Relevance - "Solar System"

	Total Number of Items	Learning Outcomes: Names planets	Classifies planets - size, coldest, hottest	Compares orbits	Explains orbit	Infers about other life in solar system	Identifies planets that switched position	Classifies planets by properties	Identifies orbit time	Identifies rotation time	Relates day to rotation	Identifies plans for space colony	Names first man on moon	Names country sending this man	Identifies objects in our solar system	Compares solar system to galaxy	Explains stars	Identifies properties	Explains sun's energy	Identifies properties of comets	Compares meteors and meteorites	Explains meteor	Summarizes knowledge of solar system	Compares universe to galaxy	Infers possibility of life	Judges and supports possibility of life on another planet in galaxy
Planets	26										1	1	2	2	1	1	1	1	1	6	9					
Moon	2														1	1										
Solar System	4																1	3								
Stars	8																		4	3	1					
Comets, Meteors, Meteorites	3																				1	1	1			
Universe	5																							1	1	2	1
	48																									

Table 21. Relevance - "Living Communities"

Content	Total Number of Items	Learning Outcomes: Infers reasons that animals move	Relates animals to environments	Compares and supports no. of animals in environment	Infers reasons for endangerment of animals	Relates environment to number of animals	Summarizes reasons for animals' defenses	Defines endangered species	Matches animals with defenses	Names defenses	Defines community	Identifies animals that live in communities	Describes colony	Defines carnivores, herbivores and amphibians	Classifies carnivores, hervivores and amphibians	Identifies animals which graze	Identifies animal which creates resource for product	Defines nocturnal animals	Classifies nocturnal animals	Identifies links in food chain	Infers results if link is removed
Survival in Environment	27	4	6	1	3	2	2	1	1	2	1	5	1								
Animal Characteristics	27													6	2	3	10	3	1	1	1
Food Chains	6																			2	4
	60																				

Table 22. Relevance - "Great Events in History"

Content	Total Number of Items	Learning Outcomes: Summarizes reasons for colonization	Identifies first English colony	Identifies crops grown in Jamestown	Identifies country ruling colonies	Identifies ships bringing colonists	Infers part of United States settled first	Identifies English taxes on colonists	Identifies country winning war	Defines events	Matches events with people	Identifies people from descriptions	Summarizes events	Describes people	Compares ways of fighting	Matches place with event	Supports importance of Constitution	Distinguishes between Constitution and convention	Identifies people and places with descriptions	Identifies where government gets money	Identifies number of states	Matches term with description	Concludes necessity - laws	Identifies means of communication
Colonization	10	4	1	2	1	1	1																	
Revolutionary War	13							3	1	1	2	1	2	2	1									
United States as a Country	24															2	3	1	12	1	2	1	1	1
	47																							

Table 23. Relevance - "Sound"

Content	Total Number of Items	Learning Outcomes: Identifies what makes sounds	Identifies how man makes sound	Identifies strings which vibrate fastest	Summarize sounds of musical instruments	Identifies strings making highest sounds	Relates vibrations to sounds	Compares distance sound heard to forms of matter	Compares intensity of sound to objects	Identifies how sounds are heard	Describes sound waves	Identifies echo	Compares and summarizes environment for echo	Summarizes speed of light faster than speed of sound	Identifies how bat "sees" in the dark	Describes radar	Describes sonar	Explains difference between noise and music	Classifies objects that reflect or absorb sound	Names noises useful to man
Production of Sound	15	5	3	1	1	1	1	1	2											
Sound Waves	9									2	1	1	1	2						
Uses of Sound	15														1	1	3	1	8	1
	39																			