A STUDY OF OUTCOMES OF ISCS INSTRUCTION ACROSS SOCIOECONOMIC STATUS AND RACIAL GROUPS

by

KEVIN D. FINSON

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Robert K. James
Major Professor

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TABLE OF CONTENTS

Page

Page

APPENDICES Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION TO THE PROBLEM

In today's classroom, the teacher is confronted daily with students of many backgrounds, attitudes, and needs. Perhaps more than ever before, the teacher is placed in the position of determining the needs of each individual student and then teaching to those needs. How the teacher meets these student needs is not only of concern to the teacher and student, but also to the parents and school administrators as well. Administrators are in the position of determining, then adopting, specific programs for use in their school districts. In an attempt to help the teacher meet the needs of their students, administrators have involved teachers in program selection processes. In this way, programs more suitable to the needs of the student, teacher, and locality can be implemented.

Of all the courses taught in today's schools, science is often not regarded as being as important as reading, English, and mathematics. However, it is the author's observation that some administrators are now beginning to realize that science can actively involve not only the science material, but also mathematics, reading, and English skills. For this reason, science is slowly becoming the focus of attention for ways to meet a host of student needs. Since science has become more of a focal point, the search for science programs that meet all these needs is underway.

Student needs are as varied as there are numbers of students. A number of researchers--LaShier, 1972; Champagne, 1972; Matherne, 1977; Rivers, 1977; Kugler, 1975; Frey, 1968; and McDuffie, 1978--have shown

the needs students have with reading. The studies completed by these researchers have shown how certain science curricula have helped student reading skills. Student attitudes toward school and science work have also been studied, and were determined to be a need. Motz, 1968; Lauridsen, 1972; and Mann, 1972, are three researchers who have worked with attitude improvement. Achievement and performance, both needs of students, have been dealt with by the works of Gilpin, 1977; LaShier, 1972; Hale, 1972; and others.

All the studies completed, however, seem to be linked by certain student characteristics: race, IQ, and social status. Grannis, 1975, and Rehberg, 1975, have addressed the problem of socioeconomic status and race. Gabel, 1975, and Rehberg, 1975, have researched academic achievement and attitudes as they compare to SES. Chester, 1972, has done the same thing with reading. Whichever study is cited, SES appears to be a major determining factor of student needs.

A vast amount of research has been done dealing with SES. These studies range from academic achievement of the various socioeconomic classes to locus of control in the various socioeconomic classes. Numerous curricula have been designed in the hopes of providing optimum learning situations for all socioeconomic levels. These curricula are constantly evaluated and revised.

One of the more recent curriculum developments has been the Intermediate Science Curriculum Study (ISCS). This program deals with junior high school sciences, and is new enough that relatively few studies have been completed on it with regard to socioeconomic class.

Significance of the Study

An important aspect of ISCS that had previously not been studied was the program's effect on learning for the various socioeconomic classes. Since many school districts have been implementing the ISCS program in their junior high schools, it would be of importance to them to know if such a program would be beneficial to the majority of their lower SES students.

Since few studies have thus far been done on the applicability of ISCS to all socioeconomic classes, it would seem impossible for administrators to fairly choose between ISCS and other science curricula. There would be no way the administrators could determine which curriculum was most beneficial and effective for their schools without implementing both programs and evaluating them locally.

Numerous studies involving ISCS have been completed which demonstrate the planning put into the program. The program attempts to individualize learning, which enhances self-pacing a great deal. ISCS has also been designed to aid students with reading difficulties. The generalized goal of ISCS was to allow all students to experience essentially the same instruction while at the same time allowing the instruction to fit the needs of the individual. Remedial, as well as extra excursion, activities were built into ISCS to better meet the varying needs of students. A logical choice of science curricula that could meet the needs of various SES groups is ISCS.

Statement of the Problem

The problem of this study was to determine whether the ISCS program could be applied equally to various SES groups. This would involve the

determination of the relationships of ISCS, SES, and racial differences.

Null Hypothesis

The null hypothesis of the study had two parts: that

(1) there is no significant difference in achievement between ISCS and control groups for students with differing SES levels established using the Hollingshead index, and that

(2) there is no significant difference in achievement between ISCS and control groups for whites versus nonwhites.

Definitions of Terms

Socioeconomic status. Socioeconomic status was determined on the basis of three factors: race, occupation, and educational attainment. In the case of the junior high school students, occupation and educational attainment were those of the parents or guardians.

Occupation. Occupation was what one or both parents did for earning wages.

Race. Race was reported as being simply whether an individual was white or nonwhite.

ISCS achievement. Degree of learning was measured according to scores obtained from the ISCS achievement test. Pretest scores were compared to posttest scores and analyzed to determine the degree of learning that occurred.

ISCS. The Intermediate Science Curriculum Study is a junior high school program--developed at Florida State University--designed so as to facilitate individualizing and self-pacing.

Hollingshead index. This is a SES scale based upon an individual's

occupation and educational attainment. Once a person's occupation and education are known, a single numeric value can be derived from the scale. The index divides numeric values into five SES groups depending upon numeric scores.

Limitations of the Study

A number of factors were not controlled in this study, thus placing limits on the interpretation of results. There were seven major limitations.

(1) The numbers of students in each group, or cell, was a problem. Some cells in the analysis had too few students for proper analysis.

(2) The grade levels used between schools varied. The ISCS schools involved seventh graders in the study, whereas the non-ISCS schools involved eighth and some ninth graders.

(3) As with many studies, the cooperation of students in giving valid responses to questionnaire and test items placed a limitation on the study.

(4) The selected schools were suburban schools, thus failing to reflect results of urban and rural student responses.

(5) The schools selected for the study were in geographically different portions of the state. Such differences can affect the outcome of test results. Likewise, the portion of the state included in the study may not have been representative of the remaining areas of the state.

(6) The communities from which the schools were selected were inherently different. Also, the ISCS school was located in a very mobile community, while the non-ISCS schools were in less mobile areas.

(7) The state in which the study was conducted is very conservative

in most things, including education and attitudes. Other attitudes and educational approaches may have provided different results in the study's analysis.

CHAPTER 2

REVIEW OF LITERATURE

The *Intermediate Science Curriculum Study* (ISCS) is a complex program with many far reaching effects and applications. There is much more to this program than one is inclined to believe at first glance. To properly understand the significance of studies completed on ISCS, one needs to be aware of certain background materials. Such materials give information on what ISCS is, what its goals and philosophies are, how it is arranged and organized, and what studies have thus far been made. These studies basically cover the program's effects on and with parents, teachers, and students. Studies involving students focus on many areas: attitudes, social class, race, IQ, achievement and performance, aspirations, attainment, ability and academic attainment, reading improvements in low-ability students, and the traditional versus the ISCS classrooms.

The literature review will first look at the history and organization of ISCS. The goals and directions as well as the objectives of the program are reviewed along with the theory supporting the program. Once the background on ISCS is given, its applications with respect to SES can be reviewed with greater understanding. Literature on SES will, therefore, follow the information on ISCS itself.

What ISCS is: the Program and How it is Arranged

History of ISCS

Prior to 1963, very little work toward a junior high school science curriculum had been done. The high school level and the primary levels were receiving most of the attention. In 1963, a small number of groups

began to focus their attention on the junior high school. Most of these programs only looked at a single grade within the junior high school. One program, ISCS, did not. It began by looking at all three grade levels at one time. The ideas for this ISCS approach were originated by Dr. Ernest Burkman, who directed the development of the program. Dr. Burkman received a great deal of help from colleagues whose input was essential to the program in its early stages: Dr. D. R. Redfield, feedback and evaluation; Dr. W. R. Snyder, teacher education; Dr. S. Darrow, field trials; Dr. J. S. Hathaway, production; and Dr. B. A. Conlan, evaluation. (Kratochvil and Crawford, 1971)

Numerous conferences were held to discuss the directions ISCS should take. Soon, the self-pacing concepts of the program began to emerge. Florida State University initially contributed funding to the program, and the National Science Foundation soon gave its aid. In 1966, the United States Office of Education granted funding to the program. (Kratochvil and Crawford, 1971) The USOE granted $416,000 for the first year, and prepared to provide a total of $1.6 million. (Library Journal, 1967) The program became based on the Florida State University campus, and was considered an activity of the College of Education.

The program underwent numerous field trials, revisions, and further trials. By 1971, ISCS was ready for the market. The product was produced with the following limitations in hopes that it could better fit the needs of the widely varied junior high schools across the country:

(1) Equipment kits had to be complete and usable by a typical class of thirty students.

(2) The activities had to be practical for a class of thirty students

to complete within a forty-five minute time period.

(3) The program had to be usable in an ordinary classroom, even though it may have only one electrical outlet, one sink, and flat-topped tables.

(4) The instructional materials had to fit the provisions of most state textbook adoption criteria.

(5) The program had to be usable by a teacher whose training in science was minimal and who had no specialized training in implementing individualized instruction.

(6) The final package had to be practical from a commercial point of view. (Kratochvil and Crawford, 1971)

Theory Supporting the Program

According to Jean Piaget, children evolve through different definite stages of mental development. At the age when most children are entering the seventh grade, they are classified as concrete operational. These children more readily grasp ideas if they can actually see and manipulate objects. As the children progress through the ninth grade, their mental development progresses toward more abstract reasoning, or formal operations.

The developers of ISCS designed their materials to help the student progress from the concrete operations stage to the formal operations stage. The materials are designed to help the student think more abstractly. For example, in the seventh grade course, the focus is upon questions that involve manipulating simple concrete objects. The ninth grade course, on the other hand, focuses on fairly complex problems and situations. The student is put into problematic situations, and must find rational explanations for them. (Kratochvil and Crawford, 1971) The program's

subject matter is arranged according to Piaget's model. "Physics concepts provide a more concrete, functional base upon which can be added those of chemistry, and later those of biology and earth sciences." (Forty Questions About ISCS, 1975)

Philosophy and Objectives of ISCS

Generally, the program's objectives were aimed at giving the junior high school student a general science education which could be applied to all aspects of life. More specifically, it was hoped that the student would gain a valid understanding of what science is, how scientific knowledge is obtained, and how to apply scientific concepts and skills to help him interpret both natural and technological phenomena as they relate to his environment. (Kratochvil and Crawford, 1971)

The generalized goal of ISCS was to allow all students to experience essentially the same instruction while at the same time allowing the instruction to fit the needs of the individual. Therefore, the individualized approach was implemented. Likewise, self-pacing was needed, since it would further facilitate individualization. The scope and sequence of topics dealt with could also vary, depending upon the individual's needs. (Kratochvil and Crawford, 1971; Forty Questions About ISCS, 1975)

Content and Organization of the Program

"The ISCS curriculum includes the subject matter and the processes of science; both receive an integrated parallel development." (LaShier, 1972)

The concepts in ISCS come out of the different investigations provided. The investigations are designed for students of varying abilities in hopes that all students can grasp the desired concepts. These concepts are presented through four major media: core activities,

excursions, self tests, and checkup frames.

Core activities cover the essential content desired for each grade level. All students do these activities. Excursions are activities with a double nature. They can provide a greater challenge for the higher ability student, and they can provide remedial help for the lower ability student. Many of these are referred to in the materials, and it is the student's option to pass them or to do them. There are about equal amounts of core activities as compared to excursion activities in ISCS materials. Self tests are based upon behavioral objectives, and are taken after each core chapter is completed. These help the student see his own progress, identify his errors, and correct those errors by himself if desired. Kratochvil (1971) states that the developers of ISCS never intended to produce a complete set of behavioral objectives for ISCS materials. Much of the material was intended to be affective, which cannot be stated in behavioral objectives. Performance objectives for each of the three ISCS levels have also been written, but they do not encompass all the cognitive and affective goals the ISCS writers aimed at. (A very comprehensive set of objectives was published by ISCS in 1973.) It should also be noted that self tests were developed as a by-product of the formalization of the behavioral objectives, and feedback from field-trial teachers and students motivated the developers to include self tests in the regular materials. The fourth medium, checkup frames, occurs periodically in the materials. If a student can perform the skills in the frame, he may move on to the next activity. If he cannot perform the skills, he goes to a remedial type excursion activity. (Kratochvil and Crawford, 1971; Forty Questions About ISCS, 1975) Figure 1 diagrammatically shows the

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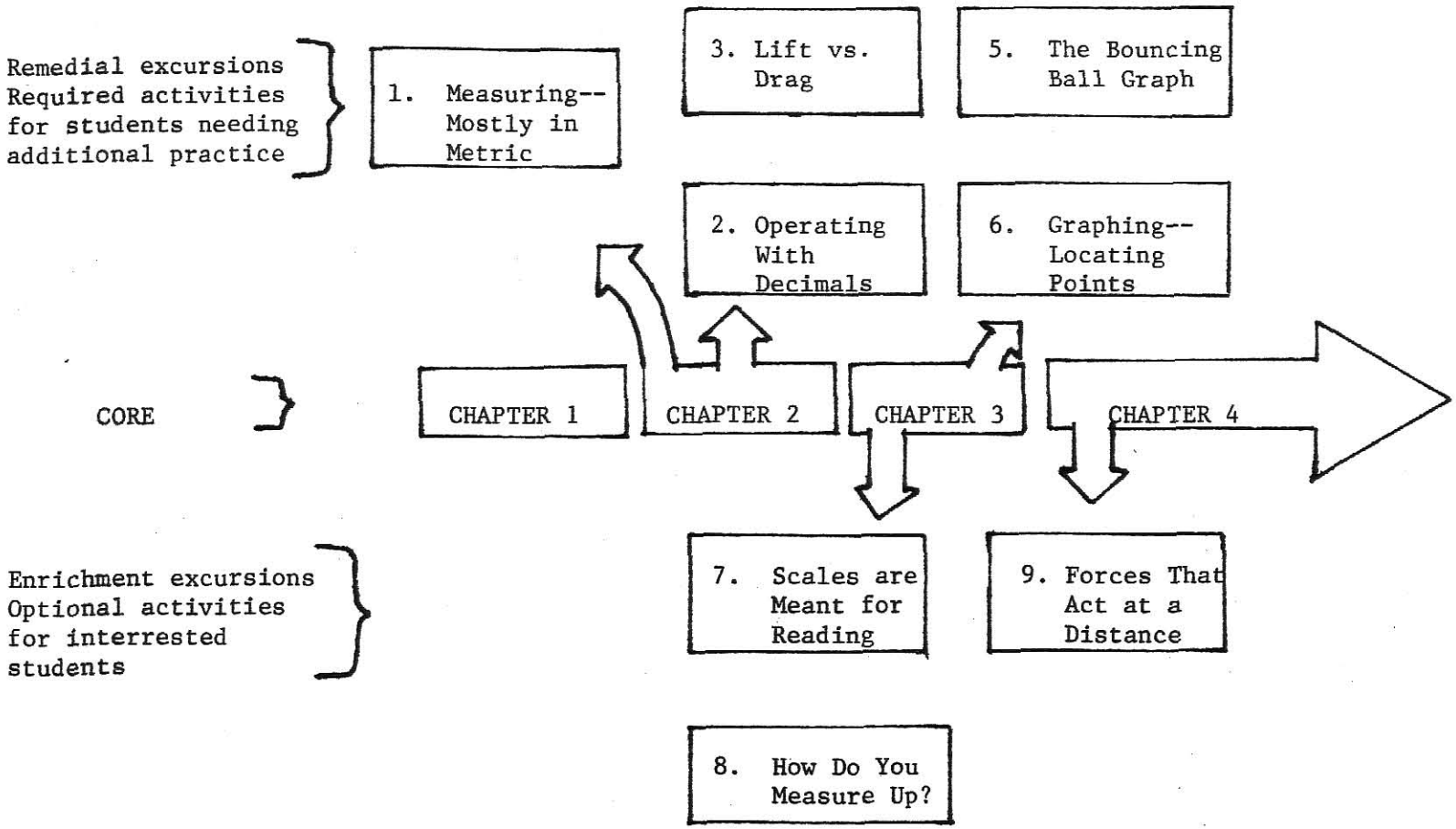

Figure 1

Source: Daniel W. Kratochvil and Jack J. Crawford, "Intermediate Science Curriculum Study Developed by the Florida State University Intermediate Science Curriculum Study Project," November, 1971.

above arrangement of ISCS materials for Chapters one through four of Level I.

The organization of the ISCS materials holds for all three levels: Level I, which is for seventh grade; Level II, for eighth grade; and Level III, for ninth grade. Level I involves the concepts of physics; Level II involves concepts of chemistry; and Level III involves the concepts of biology and the earth sciences.

> The Level I course is concerned with energy, its forms and characteristics, and measurement and operational definitions. The students investigate the conversion of energy from one form to another, making measurements whenever possible. The Level II themes are matter and its composition and model building. Students develop the Level I particle model and then apply it in interpreting physical, chemical, and biological situations in the laboratory and in nature. In the Level III materials, students use the techniques of investigation and experimentation, as well as concepts they have learned, to attack problems in a variety of situations in earth and biological science. (Forty Questions About ISCS, 1975)

Each grade level's materials consist of four texts and their laboratory materials. The main text is a nonexpendible hardbook divided into core and excursion activities. The second text in a nonexpendible hardbook for the teacher, which is simply an annotated student version. The third text is an expendible soft-cover student record book, in which the student answers problems and questions. These record books also contain the student self tests. The fourth text is the teacher's version of the student record book. (Kratochvil and Crawford, 1971)

The format of the materials was decided upon after much field testing. The printed page was decided upon since audiovisuals are quite expensive in comparison. Since the developers of the program recognized the existence of reading difficulties in many students, the language used was simplified and supported with illustrations. (Kratochvil and Crawford, 1971)

The program developers also made an effort not to involve arithmetic skills that were beyond the students' level of comprehension. Along with this, no concept or idea was introduced unless it was reinforced by later use. Finally, simpler concepts were introduced before complex topics and concepts. (Kratochvil and Crawford, 1971)

The ISCS developers assumed several things about students, and attempted to design the program to fit these needs, too. They assumed that a student will try to solve a problem or answer a question if it is presented at the proper level of difficulty. Questions were frequently interspersed throughout the materials, and were written so that they were not transparent, but could still allow the student to feel capable of answering them. This also allowed the developers to include topics that normally are not motivating for students, but which are essential to a science program. (Kratochvil and Crawford, 1971)

The ISCS materials are also known by the commercial name Probing the Natural World. The publisher is the Silver Burdett Company, a division of General Learning Corporation. The developers selected this company in 1969, and had two years earlier selected Damon/Educational Division to produce the laboratory equipment. (Kratochvil and Crawford, 1971)

As a final note, the program has not only been accepted for use in many states in our country, but it has been accepted for use or review in Australia, the Phillippines, Puerto Rico, several South American countries, and the French-speaking portions of Canada. (Ross, 1972)

Studies Concerning ISCS

A fairly large number of studies have been made which attempt to determine the effects of ISCS on teachers, students, and parents. By far,

the most studies concern students; and particularly student reading ability, attitudes, achievement, and performance. All three of the above groups of individuals are important and greatly affect the overall outcome of an ISCS program in a school.

Parents

When ISCS was written, no provisions were made to involve parents in the program. (Kratochvil and Crawford, 1971) It is now becoming more and more apparent that parents can influence a student's progress in school. One study attempted to determine whether this influence would manifest itself significantly in student achievements. In 1974, Bardsley introduced supplemental reports to be given to the parents of ISCS students in a Williamsport, Pennsylvania, junior high school. The reports appeared to produce better communications of student accomplishments, and parents developed a more favorable attitude toward the science program. (Bardsley, 1974) As a result, some improvement was evidenced.

Teachers

The best school program cannot hope to succeed if the teacher is not suitable for the job. The teacher is a very important part of the ISCS program, but more as a guidance and resource person than as a central classroom figure.

To better prepare the teacher for his role in the ISCS classroom, numerous institutes have been held at which teachers could become more familiar with the materials and philosophy of ISCS. Several studies have shown that teachers were more favorably disposed toward the program after attending such institutes. The teachers were more favorable toward discovery, independent study, inquiry, model building, laboratory

investigations, problem solving, science content, science as a way of thinking, and science as a process. (LaShier, 1972; Stevens, et al., 1977) This held true even though teacher knowledge of the processes of science remained the same as for teachers not participating in such institutes. (LaShier, 1972) Teacher attitudes toward reduced use of blackboards, teacher aides, and written objectives for students also increased after ISCS-related experiences. (Classroom Organization, ISCS, 1973; Knight, 1975)

It would appear that an ISCS experience would have a definite advantage if given to preservice teachers. These experiences probably included workshops and teaching of the program. Studies of such experiences with preservice teachers showed increased interests in teaching at the junior high level, and increased concern in student reading problems, and evaluation of their progress. Teacher committment to teaching did not seem to be significantly affected. (Knight, 1975)

The ISCS writers developed a series of teacher preparation modules to facilitate the implementing of the program, and to help teachers new to the program adjust to it. These modules were designed to aid in classroom organization, evaluation and grading, understanding individualized instruction, and similar areas of concern. (Evaluating and Reporting Progress, 1973; Individualizing Objective Testing, 1973; Rationale for Individualization, 1973; Jensen, 1974) Teachers can be effective guides through the ISCS materials by preparing themselves with these modules, even without prior ISCS experiences of any kind. This can be shown in one part of a study which compared the self-perception of individualized

instruction among teachers having one of the following training experiences:

(1) National Science Foundation institute in ISCS

(2) a workshop in ISCS

(3) use of the ISCS Individualized Teacher Preparation modules

(4) no ISCS training whatsoever

Twelve variables were analyzed regarding ISCS philosophy:

(a) student self-pacing

(b) background, interests and ability determining program entry point

(c) availability of remedial work

(d) teacher centered large group instruction

(e) student exploration of his/her interests

(f) sequencing of material

(g) individual differences in ability

(h) inquiry of natural phenomena

(i) the teacher acting as a consultant and advisor

(j) student individualized evaluation.

For each of the teacher types listed, each performed well on all twelve variables except for student self-pacing. The study indicated that a teacher without prior instruction in ISCS could conduct an ISCS class, and possibly as well as a teacher with such instruction. However, these indications were not considered conclusive. (Jensen, 1974) Dodson and Lewis (1973) measured student achievement for students with master ISCS teachers and students with new-to-ISCS teachers. No significant difference between the two groups was found.

In 1970, a study showed that experience in teaching ISCS is significantly related to a teacher's effectiveness, which in turn affects student achievement. How the teacher has the classroom arranged also appeared to be related to teacher effectiveness. Other factors, such as number of years taught, degree earned, and grade level taught did not appear to be related to teacher effectiveness in the ISCS classroom. (Dodson, et al., 1973)

Students

Studies involving students can be divided into three major groups: reading, attitudes, and achievement/performance.

Reading. The materials printed by ISCS have been designed so as to aid the poor reader. Six studies have been made concerning student reading improvements with ISCS. The first study, made in 1971, was to determine whether the use of audio-tapes by ISCS students with low reading ability would enhance their performance on the ISCS achievement tests. When compared to regular ISCS student scores, no significant difference could be found. (LaShier, 1972) A second study made in 1972 confirmed this finding, although it showed a slight gain in reading ability for the middle range ability group as compared to the low range and high range groups. (Champagne, 1972) In 1977, a third study compared reading gains of a ninth grade ISCS group and a non-ISCS science group. No significant gains could be reported for either group in reading ability. (Matherne, 1977)

In contrast to these, two other studies have shown positive gains in reading ability for poor readers. In 1970, Gates used audio-tapes as a supplement to reading in the ISCS Level I materials. He did not rely

entirely upon audio-tapes to present the material, as in the study made by Champagne in 1972. Gates made measurement in areas of

(1) subject preference

(2) ISCS course concepts

(3) understanding of science

(4) reading science vocabulary

(5) reading vocabulary

(6) reading comprehension

(7) reading grade level

A difference in gains significant at the 0.05 level favoring the audio-tape supplemental program was shown. (Gates, 1970) The second study was made in 1977, and utilized ISCS materials as a reading course. Students in this course, as compared to traditional reading course students, made significantly higher gains in mean reading comprehension and vocabulary achievement. It was also shown that the greatest gains were made by students reading below grade level. (Rivers, 1977)

It has also been shown that if poor-reading ISCS students are given oral tests rather than the written tests, they can perform better. (Kugler, 1975) If the Frey method is applied to ISCS materials, it can be shown that Level I ISCS materials are within the seventh grade reading level, and that Level II materials are within the eighth grade reading level. (Frey, 1968)

A seventh study looked at reading plus a number of other factors. This study found significant differences between low and high achievers in ISCS. Comparisons were done between Levels I and II, and indicated that reading was the only factor which differed significantly between

the low achievement group in Level I and those in Level II. Reading was not a factor in the high achievement group, although a need for increased computational skills and math aptitude in order to maintain their levels of achievement was evidenced. In both groups, no significant differences were detected on understanding of science, critical thinking, and student attitudes toward science. (McDuffie, 1978) This was supported by a Florida study finding insignificant correlations between instructional approach and achievement, self concept, and attitude toward science. There was also a lack of significant differences in inquiry skills developed by seventh graders in ISCS and non-ISCS studies. (McDuffie, 1978) In both studies, workstyle seemed to be the prime discriminator between achievement groups. The study mentioned first also indicated that workstyle and emotional attitudes toward science were sharp points of contrast between the groups. (McDuffie, 1978)

Based upon these studies it could be assumed that ISCS does help the poor reader; provided the materials are used as they are or supplemented, rather than replaced by other materials such as audio-tapes.

Attitudes. If a student has the proper attitude toward the task, his performance will likely be enhanced. Numerous ISCS-related studies have shown that the ISCS program not only builds positive attitudes toward science, but it also builds up self-directedness in students, which in turn can bolster attitudes and self concepts.

Rothschild (1969) showed that by using questions of a difficulty level that allowed low ability students to feel capable of answering most or all of them, the students' motivation and attitude toward science increased. Students not in this ISCS program did not show the positive

attitude gains.

Attitude was found to increase positively for students who participated in inquiry science programs--ISCS. The non-ISCS group failed to show the positive gains in attitudes. (Motz, 1968; Lauridsen, 1972; Mann, 1972)

A third study made in Indiana during 1975 divided ISCS students into two groups. One group was self paced, the other had deadlines placed upon them. None of the students had any prior ISCS experience. After the treatment was completed, it was found that attitudes of students in both groups gained positively, with an advantage being indicated for low-ability children who worked with partners in each group. (Gabel and Herron, 1975)

Students have expressed similar positive attitude changes toward science on questionnaires and surveys, especially if they had previously participated in an ISCS classroom. (Dawson, 1972; Gibbs, 1972)

In only one study, made by Martinez-Perez in 1973, did attitudes toward science not have a positive gain, even after participation in ISCS. In this case, however, the mean teacher grading for the ISCS group was significantly lower than for the non-ISCS group. This was at the .001 level of significance. (Martinez-Perez, 1973)

Self-directedness appears to increase in students with the ISCS program. This, as previously stated, can improve self concepts, attitudes, and possibly lead to achievement gains. Two separate studies have shown this increase in self-directedness.

McCurdy (1973) listed ten major goals for individual skills of self-direction that are designed into ISCS materials.

The student will be able to:

(1) operate independently of the teacher

(2) seek answers to questions and problems without assistance

(3) use class time effectively

(4) develop a plan for completing work

(5) use basic study skills

(6) proceed through the activities independently

(7) adapt activities and assignments to needs

(8) work at a pace commensurate with perceived ability

(9) make use of excursions (enrichment or remedial materials)

(10) collect own laboratory materials

McCurdy noted that students in the Level I ISCS all showed gains significant at the .01 level of confidence. Those students who were more successful also perceived themselves as more self-directed than the other students. Level II students seemed to feel more self-directed than Level I students also. (McCurdy, 1973)

In 1970, Kellogg made a study comparing tenth grade science students who had participated in ISCS and who had not. Eight results were found: the ISCS students

(1) could work well in either lab groups or individually

(2) were better prepared in the metric system

(3) were better able to set up experiments

(4) took better care of equipment

(5) were more willing to share equipment

(6) were superior in data reporting, graphing skills, and in making conclusions based on evidence

(7) had better attitudes toward class

(8) did not know as many facts as the non-ISCS students.

Achievement and performance. Perhaps the best way to determine the true value of any curriculum is by measuring the achievement and performance of students in that program. The developers of ISCS and many others are very much concerned in student achievement. Overall, ISCS has seemed to improve student achievement. Possible reasons for the success of ISCS were mentioned in a report by Gabel and Herron to the National Association for Research in Science Teaching:

> One cannot help but wonder why there were differential effects for low, average, and high ability children. From observations of low ability children in ISCS classrooms and from conversations with their teachers, (it was) inferred that these children were not motivated by grades. This suggests why these children achieved better with self pacing. In the deadline classrooms, the low ability child apparently followed his usual routine of doing very little from day to day not caring what grade he received on the chapter test. He was probably used to achieving a low or failing grade. On the other hand, the child who was expected to master the material before he could proceed to the next chapter had some additional motivation--he did not want to be on the same chapter forever. (Gabel and Herron, 1975)

This paper goes on to state that in a self-paced classroom the teacher is more likely to be able to determine who is having difficulty than would be possible if everyone was proceeding together.

Gilpin (1977) has shown that goal setting in the ISCS classroom can raise achievement. It was found that if the teacher confers with a student prior to goal setting by the student--for a particular chapter--then achievement appears to be increased. The goal setting conferences evidently provided strong motivational forces that could be used to raise achievement. The student's results on his work must be supplied to him, however, or no significant goal setting achievement will result.

Studies can be found which indicate that higher-ability students achieve more on achievement tests than do low-ability students. (Bohn, 1967) Numerous studies have shown that the ISCS program helps lower-ability students achieve more. These studies have been made either by comparing the ISCS classroom to the traditional classroom or by comparing different treatments within the ISCS classroom.

In 1969, A. N. Gentry designed a study to detect changes in science achievement, thinking skills, and interest in science among seventh grade students who had been classified according to scholastic ability, socioeconomic class, sex, and whether or not they had Spanish surnames. It was found that students in all classifications gained significantly on the STEP Science Test of achievement after having participated in an ISCS course. It was also found that students of the low socioeconomic group produced significantly greater gains than students of middle or high socioeconomic class. (LaShier, 1972)

Traditional versus ISCS classroom studies. The performance of students who had completed three years of ISCS were compared to other ninth grade students who had no ISCS experience. In this study, Piaget-type tasks were used to determine which students had attained formal operational behavior. Results showed that ISCS does not accelerate the ability of students to perform formal operations to any significant degree over traditional students. (LaShier, 1972)

Piaget-related tasks were used in another study to determine if the students, after completing Level I of ISCS, made any gains in their ability to work with Piaget concepts in a problem-solving interview setting. One pair of tasks consisted of course-related content and the

other pair consisted of neutral tasks--with respect to the ISCS course material. The students in this study performed better on the neutral tasks than on the course-related tasks. This led the researcher to question the appropriateness of ISCS Level I, since it indicated it is not at the correct intellectual Piaget level for the students it is designed for. (Hale, 1972) However, ISCS may be better suited than indicated, since it can be used to guide students from concrete to formal operational stages. At the end of the ISCS sequence--in Level III--the student should just be entering the formal operations stage.

> According to Farrell (1969), the adolescent does not employ formal operational reasoning in all situations. The adolescent, when confronted with a whole new set of materials, may not necessarily utilize formal thinking, he may simply relate them to reality and stop. It must be noted, though, if pressed, the adolescent will be able to transform this reality into propositions which can be acted upon in a formal way. (Hale, 1972)

Hefferman compared ISCS students to non-ISCS students on the basis of their understanding of scientific enterprise, scientists as people, and the methods and aims of science. Both groups had been taught by the same teacher. No significant difference at the .05 level was found between the two groups. (Hefferman, 1973)

In another study, it was hoped that differences in inquiry skills could be found between ISCS students and non-ISCS students, as measured by the Tab Science Test. No differences in seventh or eighth grade levels were found, but the ISCS group was favored in the ninth grade level. It was pointed out by the researcher that the Tab test has a very low reliability, and the results in this study are thus in question. However, it was shown in this study that ISCS students were more efficient than the non-ISCS students. (Stallings III, 1973)

A similar study was made to determine if there was a significant difference in the variable of science achievement, among others, between students in the ISCS program and those in a traditional program. Traditional science course students were found to have gained more factual information than ISCS students, but the ISCS students scored significantly higher in areas of spatial relationships. (Matherne, 1977)

The ISCS philosophy of individualizing instruction was applied to a non-ISCS class, and was then compared to a traditional teacher-centered class. Students' outcomes were not significantly different between the two classes. However, it is important to note that an actual ISCS class was not used. (James, 1970) This may indicate that the materials, philosophy, and individualization and self-pacing of ISCS are more interrelated and are all needed for significant gains in achievement.

Finally, another study's purpose was to compare immediate achievement and delayed retention of children instructed in ISCS type classrooms to those in traditional classrooms. Immediate achievement was more significant in the traditional classroom, but there was no significant difference in retention between the two groups. (Mitchell, 1975)

Achievement within the ISCS classroom. Within one ISCS Level I program, one group of students was given written objectives for the course, and the other group had no objectives. The two groups' performances on the ISCS materials were compared, and no significant difference was found. This was possibly due to the objectives of instruction being implicit in the ISCS questions and activities. (LaShier, 1972)

In another study, ISCS students were divided into two groups. One group used only audio-taped versions of Level II Chapters one through

five, while the other groups only used the printed materials. It was found that the audio-tape group scored higher on chapter tests, self-evaluation tests, and on unit tests. They also completed their work in a shorter time than the non-audio-taped group. (Atkinson, 1972)

A third study compared the performance of students who completed certain remedial and enrichment activities to those student not required to complete the same materials. Level I materials were used. The researcher found

(1) no difference in performance on selected chapter self-test items between the two groups

(2) no difference on selected chapter self-test items between the students who scored high on the tests in both groups

(3) that a larger percentage of students gained competence on the objectives for five of the fifteen excursion used. (Kellogg, 1972)

Computer Assisted Instruction (CAI) has been used in ISCS classrooms. In one study, students using CAI did not do significantly better than students not using CAI. (Dasenbrock, 1970) This would indicate the strengths of the ISCS materials alone.

In 1970, Morris used ISCS to help determine if the frequency of occurrence of concept words in instructional materials would help facilitate the learning of concepts. A pretest-posttest design was employed on ISCS Level I students, which indicated that the concept words were more interrelated to the students after going through ISCS than prior to going throught the program. This was significant at the .0001 level. (Morris, 1970)

A Connecticut junior high school was experiencing lack of motivation and achievement in their ISCS classrooms. To combat this situation, several actions were taken. First, each teacher who was teaching ISCS was to participate in ISCS workshops and in-service training sessions. Second, for students who absolutely could not work in an ISCS type atmosphere, a more structured--and smaller--class was set up. Third, goal-direction techniques were implemented. Final results showed that these modifications increased student achievement on ISCS tests and activities. Student motivation also increased. (Hall, 1977)

The ISCS program developers make certain recommendations to follow when implementing their program. These recommendations include teacher characteristics, pupil achievement, and teacher knowledge of the process of science and the content being taught through ISCS. It was found that if ISCS recommendations concerning teacher characteristics were followed, pupil achievement would increase. The teacher characteristics found to be most significantly related to pupil achievement are:

> (1) behaviors characteristic of the individualized setting (provides remedial instruction in a tutorial mode and supervises and assists pupils in self-evaluation activities)
> (2) indirect behaviors (asks questions)
> (3) non-verbal active behaviors (moves through the class supervising pupil activities rather than sitting alone at desk or preparing equipment)
> (4) instructional behaviors (interacts with pupils to clarify and/or expand their understanding of concepts and/or procedures rather than to discipline or to deal with classroom routines) (Clark, 1975)

Studies Pertaining to the Defined Problem of This Study

As mentioned in the introduction of Chapter 1, SES was not mentioned until the background for ISCS was established.

Social Class, race, and IQ. Numerous reasons can be found explaining why low socioeconomic class students, particularly Blacks, do not perform

as well academically, as a whole, as high socioeconomic class students. Perhaps the most often-noted point is that our educational norms are based on English-speaking middle-class white Americans. The styles of teaching in the schools does not usually aim for non-middle-class groups. A good example can be found in the difficulties native Americans have when faced with typical school programs. (Grannis, 1975) This type of deficiency can be corrected.

One factor that is not as easily corrected for is family income. Besides being a basic factor in determining one's SES, income also tends to affect intelligence ratings. In one study, the correlation between childrens' IQ and family income is about +.43, while that between childrens' family income and race is only about -.34. (M. H. A., H. E. W., 1971) This would tend to indicate that no difference in achievement should be expected on the basis of race alone. Also, social class alone has no significant direct effect upon academic performance. (Rehberg, et al., 1975) However, when socioeconomic class and IQ are taken together, academic performance differences between whites and blacks can be explained. (Kerckhoff, 1975)

Achievement, aspirations, and attainment. Another source of low socioeconomic/high socioeconomic student differences in academic achievement may be found by considering students' aspirations. Minority pupils, except for Orientals, have far less conviction than Whites that they can affect their own environments and futures. (Scott, et al., 1974) If a student can feel like he has some control over his life, his educational aspirations will likely be higher than if he believes he has no such control. Educational aspirations are at least as important as a student's

expectations in explaining his academic achievement. (Kerckhoff, 1975)

> In school achievement, the socioeconomic status of students' families is a powerful source of explanation for whites, but not for blacks. In contrast, early nonacademic school experiences and the desire for educational attainment assume much greater explanatory significance for blacks than whites. Overall, the performances and attainments of whites follow more fully an orderly process reflecting familial support and academic continuity while those of blacks are much more discontinuous and influenced by extrafamilial and non-academic factors during the secondary school years. (Kerckhoff, 1975)

The ISCS program is a very flexible one in the respect that it can be of equal effectiveness to both types of students. ISCS is very activity-oriented, which should serve to benefit Blacks, yet it can also lead students into deeper, more academic studies if needed. This latter alternative would benefit the Whites in the example previously given. Some unique aspects of ISCS are its self-pacing, active involvement of the student with scientific materials, and emphasis upon the learning of scientific processes. (Hale, 1972) ISCS is a hands-on approach which may be of more benefit to the Blacks in the previous example than to the Whites.

Ability and academic attainment. ISCS works for students of differing abilities. Ability is more influential than social class as a predictor of where and how far a student goes during his schooling. (Rehberg, et al., 1975) The ISCS approach tends to enhance a student's abilities for his continued education. This is reinforced by a study which showed that the direct effect of scholastic ability on a student's academic attainment had a correlation of +.21, while that for social class on academic attainment was only +.13. (Rehberg, et al., 1975) It seems that whether a student is located in a college-preparation curriculum or not depends more upon scholastic ability than upon social class origin. (Rehberg,

et al., 1975) ISCS gives students a chance to develop and use their abilities. Even though high socioeconomic students would be likely to continue to advance in their educations, the ISCS-type approach can help low socioeconomic students do the same.

Social class differences in ability appear to be mostly limited to verbal and language skills. Middle-class groups tend to do better with verbal activities than lower-class groups. (McCall, 1971) It has been found that as family size increases, which it tends to do in lower socio-economic classes, the time spent by parents with each individual child will decrease. This possibly affects the child's learning readiness for school. Understanding of ideas and concepts is about the same for students from large families as for students from small families. The difference in the large-family children from the small-family children lies in communication. The large-family children tend to have more difficulty communicating their understanding than the small-family children. (Scott, et al., 1974) In ISCS, students may work with partners. This will help a student improve his communication, and allows him to do so at his own rate. He is not rushed. (Gabel, et al., 1975)

One important aspect of ISCS is self-pacing. This seemed to produce higher learning rates and retention for low-ability students than it did for high-ability students. (Gabel, et al., 1975) Similar results were found when low-ability students worked with partners as opposed to working alone. (Gabel, et al., 1975) When these differences are taken into account, the achievement of students is not significantly affected by socioeconomic class or racial origins. (Rehberg, et al., 1975) ISCS helps to equalize these abilities between students.

One particular study was done involving nine school districts with a high percentage of low-income families.

> When achievement scores of students taught by new Intermediate Science Curriculum Study teachers were compared with scores attained by students of master Intermediate Science Curriculum Study teachers, there was no significant difference between the means. (Dodson, et al., 1973)

This speaks for the high level of development of the ISCS program. It can definitely equalize differences in teaching approaches, and it can improve low-ability students' academic attainment.

Reading improvements in low-ability students. Most research seems to indicate a relationship between low socioeconomic class and reading disability also. (Chester, 1972) In one study, a group of twenty-six Level I ISCS students showed a larger gain in reading ability as measured by the Iowa Skill Reading Comprehension Test than a group of twenty-six students using a non-ISCS text. During the prior year when both groups were using the same science text, their reading gain scores were equivalent. (Riley, et al., 1972) In a similar study, each year for three consecutive years, ISCS students entering the eighth grade were given the Metropolitan Reading Test. Each year, the students entering the eighth grade scored higher on the test than they had at the beginning of the seventh grade. The same students scored higher still when they entered the ninth grade. These ISCS gains exceeded gains shown by a control groups used during each year of the study. (ISCS Newsletter #6, 1970)

In effect, ISCS improves reading ability. Since many more low-socioeconomic students have a reading disability than high-socioeconomic students, it is reasonable to state that ISCS benefited the low-socioeconomic students most.

Generally, ISCS provides avenues for greater academic achievement to the low-socioeconomic student. Those same avenues would likely be open to the high-socioeconomic student whether ISCS was used or not.

CHAPTER 3

METHODS

Method of Sampling

The population in this study was all seventh, eighth, and ninth grade science students in selected public junior high schools in the northeast quarter of Kansas. Prior to selection of science classes, the school districts were divided into two groups: those having and using ISCS and those not using ISCS. Schools using this program were selected from a master list provided to the researcher by the publisher of the program. Selection of schools depended upon two factors. First, whether the school had ISCS or a physical science program which was non-ISCS; and second, the location and accessibility of the schools to the researcher. All ISCS Level I classes in selected schools were included in the study, as were all physical science classes in the non-ISCS schools. (The researcher determined that ISCS Level I and physical science were closely related courses, and were therefore comparable for the study.)

Four schools participated in the study. One school provided all the ISCS classes--seven total classes--and had a total student population of 850. There were three non-ISCS schools--eight total classes--with student populations of 450, 380, and 500 students.

A total of 359 students were initially included in the study. Of this total, 154 were in the ISCS group and 205 were in the non-ISCS group. Incomplete information on the SES questionnaires, absenteeism during pretesting or posttesting, and parental refusal in allowing students to

continue in the study resulted in 124 students being dropped from the initial number. The remaining 235 students completed the study, with 95 being ISCS and 140 being non-ISCS.

Instrumentation

The ISCS science achievement test was constructed from selected items in the student progress self-check booklet, Performance Checks, Level I, Form A, Silver Burdett, 1973. This test was used both as the pretest and posttest. This was a paper and pencil test requiring approximately fifty minutes to complete. All answers were made by the subjects on marks-in, or marks-sense, computer cards, which required the use of number two graphite pencils.

The test items were selected with the intent that they would be covered in most physical science classes. This was an attempt to make the test less specific toward ISCS. The test items were also selected from what was estimated by the researcher to comprise the first semester of Level I ISCS material.

A short questionnaire of the Hollingshead variety was used to determine subjects' socioeconomic class. This was a paper and pencil questionnaire which required approximately two minutes to complete. The data from the questionnaire was compared on the Hollingshead index to yield the SES of the subjects. This index determination is reported to have a correlation between judged class with education and occupation as $R_{1(23)} = .906$. The index scale and index can be found in Social Class and Mental Illness, Hollingshead and Redlich, New York; Wiley, 1958.

Research Design

A nonequivalent control group design utilizing pretests and post-

tests was used. The subjects were in intact groups, the classes, with the non-ISCS classes serving as the control for the study.

Data Collection Methods

At the beginning of the first school term in the fall, during the second week, the test packet (see Appendix A) was sent to all classes in the selected schools. The packet included one instruction page, the Hollingshead socioeconomic status questionnaire, and the ISCS test.

Prior to sending the test packets, the researcher obtained copies of class rosters in order to code the subjects' names. Each subject received his own code number, which was used for identification purposes in the study. Code numbers were printed on each test packet and computer answer card.

The test packets were administered by the classroom teachers during their regularly scheduled science classes on the tenth day of the term. Each subject was given a computer card with his identification number on it. The identification number was the same as that on the test packet each subject received. The classroom teacher was given a list giving the subjects' names and code numbers so that each subject would receive the correct test packet and answer card. The subjects were then instructed to darken only one circle per response item on the answer card. If a subject wished to change an answer, he was instructed to erase the first answer as completely as possible so as to avoid computer misgrading. The subjects were also instructed not to write their names on any of the test materials, answer cards, or questionnaires. These procedures were to help guarantee the subjects' rights of privacy.

When testing was completed, the questionnaires, answer cards, and

coded name lists were returned to the researcher. The researcher then sealed all coded name lists in an envelope to preserve the subjects' privacy. Questionnaires were then analyzed by the researcher with the aid of the Hollingshead index. Tests were graded by computer. The questionnaire data and test score data were combined on a single computer card. All materials were then stored in safe keeping by the researcher until the treatment had been completed.

Normal classroom activity occurred for the remainder of the semester. During the last week of the semester, the ISCS science achievement test was re-administered in the same manner as during the second week of the term. Lists of subjects' names and code numbers were sent to each classroom teacher involved so that each subject would receive the correct test. This was to insure future correlation of students' pretests and posttests. Upon completion of the tests, the classroom teachers sealed the tests, computer answer cards, and coded name lists in envelopes and returned them to the researcher.

Upon receiving all completed testing materials, the researcher destroyed all coded name lists so that only tests, answer cards, and questionnaires remained.

The computer answer cards were then graded by computer so that pretest and posttest scores could be analyzed. The gains in scores for different SES groups could then be compared to posttest-pretest differences.

The Hollingshead index (see Appendix B) assigns a numeric value to socioeconomic class. This is accomplished by using two scales, one for occupation and one for educational attainment. A wide variety of occupations was given, each having a specified numeric value. The occupational number determined from this list is then multiplied by a weighted

factor of 7. This yields the occupational scale value. The educational scale values are based upon the amount of schooling attained. This numeric value is multiplied by a weighted factor of 3, yielding the educational scale value. The occupational and educational scale values are then added together to obtain a single numeric value. This last number is the socioeconomic class number. It is this number that can then be compared to an index in order to derive socioeconomic class. (Since the students are generally not considered as having any occupation, the occupation of their parents was used. In cases where both parents worked, the occupational scores for both parents were averaged to determine a single occupational score for the family. The same basic idea was used for educational attainment scores.)

The Hollingshead index value and the test data could then be analyzed. Following analysis, all name lists, questionnaires, and tests were destroyed.

Data Analysis

For purposes of analysis, all subjects were placed into one of three groups: the upper third of the socioeconomic scores--as determined by the Hollingshead index, the middle third, and the lower third. The upper third was referred to as high, the lower third as low, and the middle third as middle socioeconomic status. Eighty subjects were placed in the high group, seventy-nine in the middle group, and eighty-two in the lower group. Analysis of data was done with a 3 X 2 analysis of variance with unequal n's (3 levels of SES and 2 levels of treatment: ISCS and non-ISCS).

CHAPTER 4

RESULTS

Race

It is normally assumed that groups in a study are equivalent prior to the treatment. Due to the necessity of using intact classes for groups, the researcher used different sized white and nonwhite groups. (See Tables 5 and 6 in Appendix D) Size differences also created difficulties within the nonwhite group, with varying student numbers between the ISCS and non-ISCS treatment groups. These factors caused the results of the race analyses to be uninterpretable.

Pretest

Pretest means and sample sizes are presented in Table 1. Analysis of the pretest data are presented in Table 2. A two dimensional analysis of variance was completed using SES and treatment. Table 2, the summary table, indicates significant differences among SES groups exist. Significant differences are also indicated between treatment groups. Multiple comparisons [Duncan] were run to establish where the significant differences actually occurred.

Table 1

Pretest Group Means for SES and Treatment*

Mean	N	SES	Treatment
14.60	80	High	-
13.25	79	Middle	-
11.83	82	Low	-
14.92	110	-	Control
11.79	131	-	ISCS

*Significant at the .05 level

Table 2

Analysis of Variance Summary Table: Pretest Scores

Source	df	Sum of Squares	Mean Square	F Value	PR>F Significance	R Square
Model	5	1128.68	225.74	9.85	.0001*	1.73
SES	2	-	-	8.47	.0003*	-
Treatment	1	-	-	30.37	.0001*	-
SES & Treatment	2	-	-	2.16	.1177	-
Error	235	5386.10	22.92	-	-	-
Corrected Total	240	6514.78	-	-	-	-

*Significant levels

SES. There was a significant difference between SES groups, with the high group scoring significantly higher on the pretest than the middle group. The middle SES group scored significantly higher than the low group. Therefore, the high SES group scored significantly higher than the low SES group.

Treatment. Significant differences were present between treatment groups. The control group scored significantly higher on the pretest than did the ISCS group.

In SES and treatment, the groups' pretest differences are the result of the need to use intact groups. The nonequivalent groups cause a number of interpretive problems with the experimental design. As noted earlier, it is normally assumed that test groups are equivalent prior to treatment.

Posttest-Pretest Differences

SES groupings and ISCS versus control group means were compared on gain scores using a two dimensional analysis of variance. As in pretest

analysis, race was not included.

Table 3

Posttest-Pretest Differences

SES	Treatment	N	Posttest	Pretest	Test Difference*
High	-	80	18.89	14.60	4.29
Middle	-	79	17.47	13.25	4.22
Low	-	82	16.40	11.82	4.58
-	ISCS	131	17.81	11.79	6.02
-	Control	110	17.38	14.92	2.46

*Significant at the .05 level

The analysis of variance summary table for gain scores, Table 4, indicates that no significant difference in gain scores existed among SES groups. However, a significant difference did exist between treatment groups, favoring the ISCS group. Caution must be used in the interpretation of these results due to the previously mentioned design problems. These problems become most obvious when ISCS and control group posttest scores in Table 3 are studied.

Table 4

Analysis of Variance Summary Table:
Posttest-Pretest Differences

Variable	df	F	PR>F Significance
SES	2	.30	.7447
Treatment	1	17.63	.0001
SES & Treatment	2	2.20	.1128

Further breakdowns of SES are in Table 7, Appendix D.

CHAPTER 5

DISCUSSION

Before beginning discussion of the results, it would be beneficial to review the hypothesis of the study. The hypothesis states that

(1) there is no significant difference in achievement between ISCS and control groups for students with differing SES levels established using the Hollingshead index, and that

(2) there is no significant difference in achievement between ISCS and control groups for whites versus nonwhites.

Race

The fact that intact classes do not provide equal test groups for studies creates problems in the interpretation of test results. Since the groups used in the study were not equal before treatment was given, the results of the analysis are inconclusive. This makes it necessary to retain the second portion of the hypothesis, since this portion was not disproved.

SES

Throughout the study, SES was compared to performance on the tests. As would normally be expected, the upper SES group consistently showed higher test means than either the low SES or middle SES groups. Likewise, the lower SES group showed a lower mean than the middle or upper groups. The results of the pretest (shown in Table 1) support this. Analysis of variance indicated, however, that no significant difference in gain scores existed among SES groups. Since SES was not, in itself, a significant factor, the first portion of the hypothesis should be re-

tained. This conclusion is supported by Rehberg's work in 1975.

When SES and treatment interactions were compared to gain scores, the results appeared to be significant. These results, however, are due to the effects of treatment rather than SES.

Conclusions

Significant differences between treatment groups existed, favoring the ISCS group. (Student familiarity with the questions may have been a factor since test questions were taken from ISCS materials. ISCS students should do better on ISCS materials than non-ISCS students.) Although caution must be used when interpreting these results, they nevertheless show promise that ISCS does improve achievement in science. Further studies may focus on this problem to determine the validity of the idea that ISCS improves science achievement more than other science curricula.

In terms of practicality, the study is inconclusive, but indicates promise that ISCS programs are beneficial to students in schools or communities characterized by low SES populations. Although the same cannot be said for upper SES areas, the lower SES areas are generally those in need of more help to allow their students the achievement and attainment possibilities available to high SES students. ISCS appears to be one possible means of providing an available avenue to these students.

Recommendations

In light of the study's results, the author would recommend that future studies equalize test groups before treatment is given. This

would eliminate the design problems which made interpretation of this study's data impossible. The author also suggests larger numbers of students be used so that each cell in the analysis can provide adequate analysis data. This could help resolve the questions asked about race.

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APPENDIX A

ILLEGIBLE DOCUMENT

THE FOLLOWING DOCUMENT(S) IS OF POOR LEGIBILITY IN THE ORIGINAL

THIS IS THE BEST COPY AVAILABLE

Code # (50)

TESTING PACKET

A person doing research at Kansas State University is studying certain science classes, and has chosen your science class to include in his study. In order for him to complete his study, he is asking for your help. He has made a science test that he wishes you to take. The test will not affect your grade in any way, and only the person doing the research will know your score on the test. You may choose not to do the test. If you choose not to take it, please turn your test materials in to your teacher immediately. If you choose to help the researcher by taking his test, there are three things you need to do. First, fill out the following questionnaire. Second, take the test and do the best you can. Third, give your test to your teacher. The researcher will really appreciate your help with his study.

QUESTIONNAIRE

DO NOT PUT YOUR NAME ON THIS PAPER!!

1. Write down what the adult (parent, guardian, etc.) in your home does for work (please be specific. For example, if your adult works at Goodyear, what does he/she do at Goodyear?).

_____

_____

2. If both adults (parents, guardians, etc.) in your home work, please write what the second adult does for work.

_____

_____

3. Circle the choice below that best tells what your race is:

(A) Black (B) White (C) Other race

4. You now need to mark how much education your adult(s) has had. On the chart below, put an "X" in the box that tells the amount of education the adult has had (there should only be ONE "X" under each adult).

	Adult #1	Adult #2
a. Did not finish Grade School		
b. Finished Grade School		
c. Went to Junior High School or to Middle School		
d. Finished Junior High School or Middle School		
e. Went to High School		
f. Finished (graduated from) High School . .		
g. Went to College or Vocational Technical School		
h. Finished Vocational Technical School . .		
i. Finished (graduated from) College		
j. Went to more school after College		

Code #_

(51)

SCIENCE ACHIEVEMENT TEST

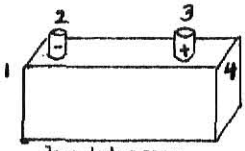
1. Which of the following are forms of energy?
   A) heat and light
   B) potential and kinetic
   C) electrical and chemical
   D) all of the above

2. A car battery is properly connected to an electric battery charger. Choose the letter of the sentence below which describes the energy conversion that takes place within the battery during charging.
   A) electrical energy is changed into kinetic energy
   B) chemical energy is changed into electrical energy
   C) light energy is changed into heat energy
   D) electrical energy is changed into chemical energy

3. A group of objects that directly interact with each other within a system is called a (an)
   A) component
   B) subsystem
   C) altersystem
   D) hypersystem

4. An object that is part of a system is a(an)
   A) component
   B) subsystem
   C) altersystem
   D) hypersystem

5. Study the drawing below to see where you would put test leads to make the light bulb light. Then select the two number pairs that show where the ends of the two leads should be connected.
   A) 2-5, 3-6
   B) 2-8, 3-7
   C) 4-5, 3-8
   D) 1-6, 2-5



battery

bulb

6. Something that changes in an activity or experiment and affects the results of the activity or experiment is called a (an)
   A) example
   B) solution
   C) problem
   D) variable

7. Which of the following is an operational definition?
   A) A ruler is a device for measuring length.
   B) Light is the form of energy which causes the needle of a light meter to move. The amount of needle movement measures the intensity of the light.
   C) Mass is the amount of matter in an object and does not vary from place to place.

8. What is the letter of the phrase below which correctly completes the sentence? "An operational definition includes a description of ___? the thing being defined."
   A) the way to classify
   B) the texture and color of
   C) the way to measure
   D) the shape or odor of

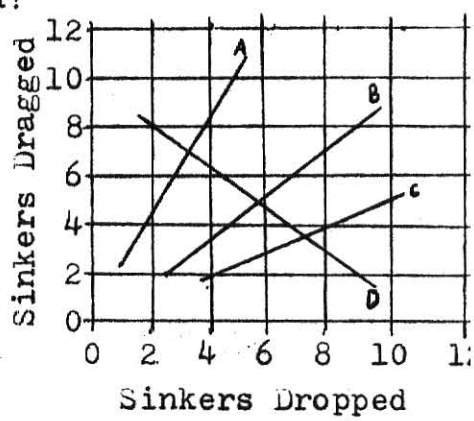
9. Study the table below. Use it to answer this question: The distance in centimeters from hook to pulley when two sinkers were dragged was
   A) 90 cm
   B) 85 cm
   C) 60 cm
   D) 80 cm

Name of Group Member	No. of Sinkers Dragged	No. of Times Dragged	Distance from Hook to Pulley (in cm.)	Total Distance Dragged (cm.)	Total Time for Dragging (in sec.)
Sue	1	70	90	6300	130
Betty	2	60	85	5100	110
Sam	3	50	80	4000	105

10. Study the table above. Use it to answer this question: What was the total distance in centimeters that one sinker was dragged?
   A) 105
   B) 5100
   C) 90
   D) 6300

11. Susan did an experiment to compare weight and drag. She then graphed the data listed in the table below. The table shows the dragging power of the dropping sinkers. Which line drawn on the grid would be the correct best-fit line for Susan's data?
   A) A
   B) B
   C) C
   D) D

Sinkers Dropped	Sinkers Dragged
2	4
3	6
4	8
5	10



12. Nancy brought some marbles to school to weigh on her force measurer. She numbered each one and added them one at a time to a cup hung from the end of the force measurer. Once added, she didn't remove any marbles from the cup. Her data are shown in the table below. What do you conclude about the weights of the marbles Nancy brought to school?
   A) They all had different weights
   B) Marbles 3 and 6 weighed less than the other marbles.
   C) Marbles 1 and 2 weighed more than the others and had the same weight.
   D) Each marble had the same weight.

Number of Last Marble Added	Total Weight of Marbles in Cup (newtons)
1	0.7
2	1.4
3	1.8
4	2.5
5	3.2
6	3.6

13. Which of the following statements is <u>in</u>correct?
   A) 2.9 m = 290 cm
   B) 72 cm = 0.72 m
   C) 8 cm = 80 m

14. Which of the following tells the main advantage of the metric system which makes it useful in measurement problems?
    A) The units of the metric system are related by factors of the number ten, and therefore changing from one unit to another is easier.
    B) It was developed in France, and most of the early scientists were French.
    C) All systems of measurement are of equal value, but scientists needed a common system of units. They happened to choose the metric system.
    D) The meter has a more logical historical basis than the yard.

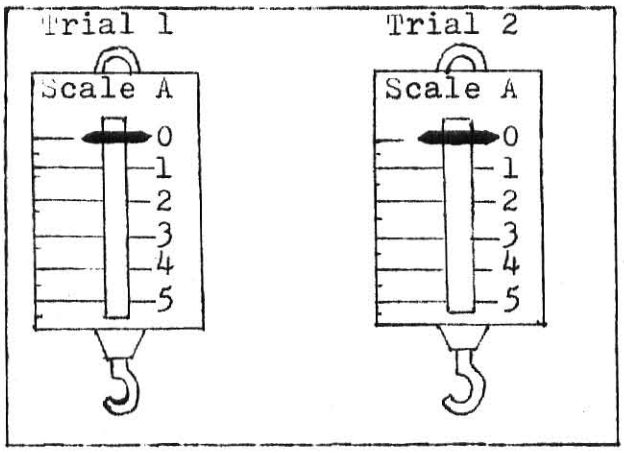
15. Here are diagrams of two measuring instruments. What needs to be added to each so that you could report your measurement without having to show the thermometer or the speedometer?
    A) a calibrated scale with units
    B) a name
    C) a standard unit of measure
    D) a pointer

speedometer

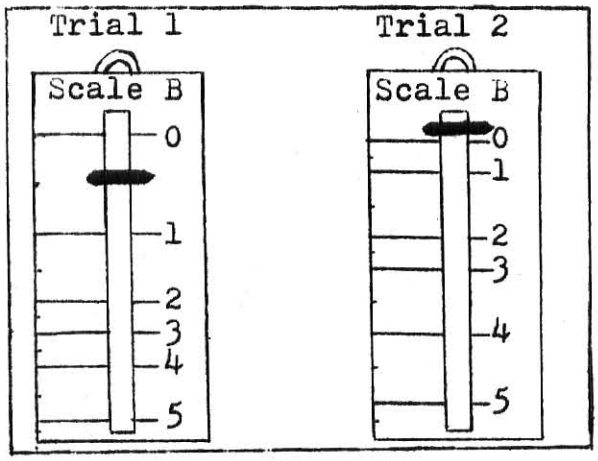
thermometer

16. How can you lift a 40 lb. box from the floor to the table with the least amount of work being done on the box? Select the best answer:
    A) Lift it with your hands.
    B) Push it up an inclined plane.
    C) Use a pulley and a rope.
    D) Any way you do it, the work on the box is the same.

17. Sol was given two old and uncalibrated spring scales, A and B. He calibrated each spring scale two times. The two drawings show the results of his calibrations for each scale. Sol must use one of these two scales in an experiment. The spring scale he should use is
    A) scale A
    B) scale B
    C) either scale A or B will work equally well
    D) neither -- Sol should get a new spring scale

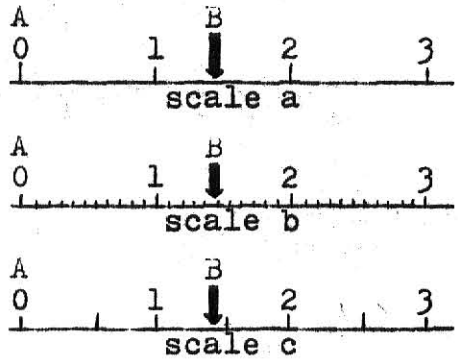


Calibrations for Scale A



Calibrations for Scale B

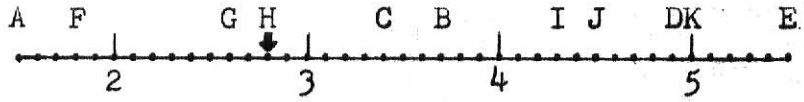
18. From which of the three scales below could you report the most accurate measurement of the distance from A to B ? (54)
    A) scale a
    B) scale b
    C) scale c



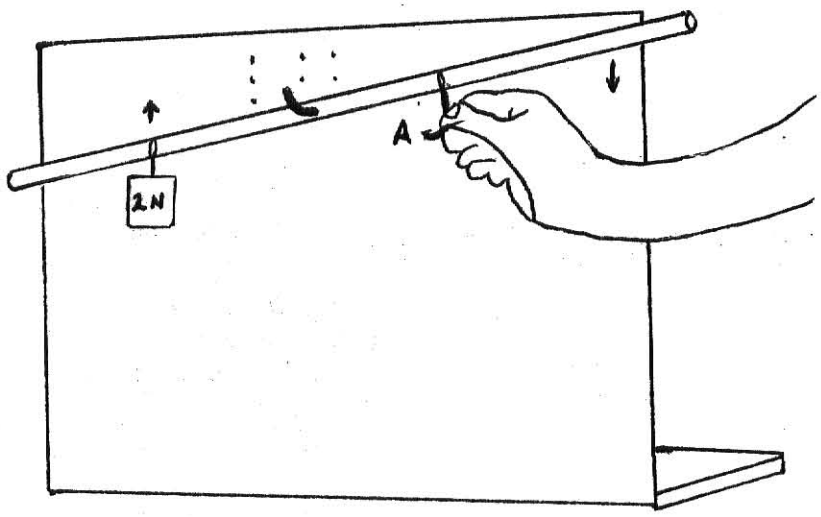
19. The force that makes it impossible for output work to equal input work is
    A) gravity
    B) friction
    C) weight
    D) magnetism

20. Select the phrase that completes the following sentence. "In a system, the object that does work on something else is called the
    A) energy supplier."
    B) input work."
    C) output work."
    D) energy receiver."

21. On the following scale, the reading at H is
    A) 3.0
    B) 2.5
    C) 2.8
    D) 3.2

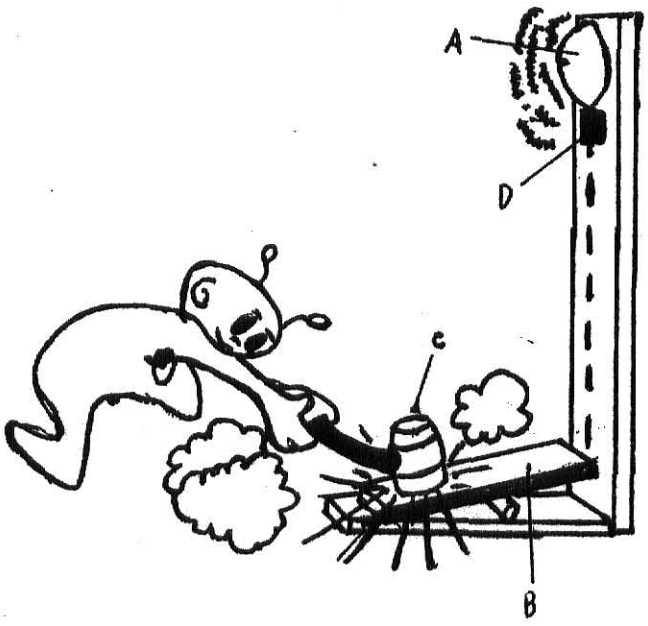


22. Below is a diagram of an equal-arm balance. Jim pulled hook A, lifting the 2N weight 0.4 m. He wondered how much input work he had done on the system. What is the best answer that you could give Jim?
    A) Just a little bit less than 0.8 N-m.
    B) Exactly 0.8 N-m.
    C) Just a little bit more than 0.8 N-m.
    D) It is impossible to say, since no force or distance measurements were made of the input work of the system.



23. The mass of an object is
    A) equal to its weight
    B) the amount of matter it contains
    C) a measure of the space it occupies
    D) the force of gravity acting on the object.

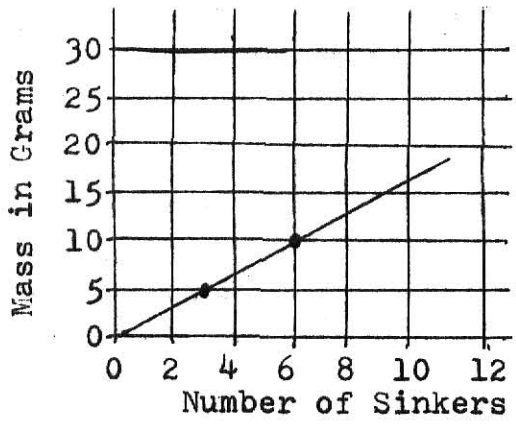
24. Look at the following diagram. The hammer (C) hits the board (B) and drives the weight (D) up to hit the bell (A). The input component is
    A) A
    B) B
    C) C
    D) D



25. Look again at the diagram above. The output component is
    A) A
    B) B
    C) C
    D) D

26. Find the average of this set of numbers: 2.3, 4.5, and 3.8. The average is
    A) 35.3
    B) 0.35
    C) 1.53
    D) 3.53

27. On the graph below, the mass in grams of 9 sinkers is
    A) 20 grams
    B) 15 grams
    C) 10 grams
    D) 25 grams



28. Imagine that a spring is squeezed or a rubber band is stretched. What kind of energy is given to the spring or the rubber band? Select the best answer below.
A) gravitational energy
B) motion energy
C) frictional energy
D) potential energy

29. If you lift a concrete block off the ground to the top of a wall, the kind of energy you give it is
A) gravitational energy
B) motion energy
C) frictional energy
D) potential energy

30. Select the phrase that completes the following sentence: "In a system, the object that has work done on it by something else is called the
A) output work."
B) energy supplier."
C) input work."
D) energy receiver."

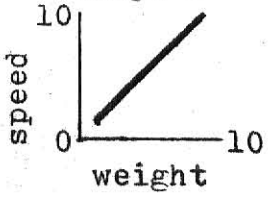
31. Io is the moon of the planet Jupiter. It is larger than earth's moon. The force of gravity on a 1 kg. mass on Io is about 1.78 newtons. On earth, it is about 9.8 newtons. If a golf ball were taken from the earth to Io, its weight would
A) change by increasing
B) remain the same as it was on earth
C) change by decreasing

32. Look at the graphs below. Which graph best shows that when weight increases at a constant rate, speed decreases at a constant rate?
A) graph a
B) graph b
C) graph c

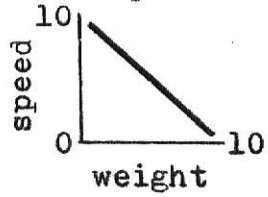
33. Look again at the graphs below. Which graph best shows that when weight increases at a constant rate, speed is not changed?
A) graph a
B) graph b
C) graph c

34. Look again at the graphs below. Which graph best shows that when weight decreases at a constant rate, speed increases at a constant rate?
A) graph a
B) graph b
C) graph c

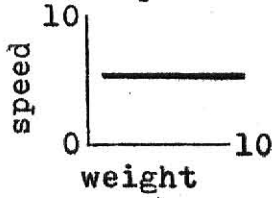
Graph a



Graph b



Graph c



35. Divide 12.34 by 2.1. The answer is
    A) 0.54
    B) 5.40
    C) 54.0
    D) 0.05

36. Multiply 7.32 times 2.4 . The answer is
    A) 175.68
    B) 1756.8
    C) 1.7568
    D) 17.568

37. Add the numbers 4.35, 3.4, and 5.31. The answer is
    A) 130.6
    B) 1.306
    C) 13.06
    D) 1306.0

38. Subtract 4.57 from 8.7 . The answer is
    A) 413
    B) 4.13
    C) 41.3
    D) 0.43

APPENDIX B

Hollingshead's Two Factor Index of Social Position

The two-factor index is composed only of an occupational scale and an educational scale. Knowledge of occupation and education is all that is needed. The occupational scale is a seven-point scale. This index ranks professions into different groups and businesses by their size and value. The educational scale is also divided into seven points. Each of these scales is given a weight. Occupational scores are weighted by a factor of seven, while educational scores are weighted by a factor of four. If, for example, a person had completed a degree at a standard college or university and was now the advertising director of a large business concern, his socioeconomic status would be computed as shown here:

Factor	Scale Score	x	Factor Weight	=	Partial Score
Occupation	2		7		14
Education	2		4		8
	Index of Social Position Score			=	22

Social class scores range from 11 to 77, as shown in the following index:

Class	Range of Scores
I	11-17
II	18-31
III	32-47
IV	48-63
V	64-77

By comparing the individual's social position score to the index, one could see that this person is in social class grouping II, which is upper socioeconomic status. The occupational and educational scales follow.

I. The Occupational Scale

1. Higher Executives of Large Concerns, Proprietors, and Major Professionals

A. Higher Executives (Value of corporation $5000,000 and above as rated by Dun and Bradstreet)

Bank
- Presidents
- Vice-Presidents
- Assistant vice-presidents

Business
- Directors
- Presidents
- Vice-Presidents
- Assistant vice-presidents
- Executive secretaries
- Research directors
- Treasurers

B. Proprietors (Value over $100,000 by Dun and Bradstreet)

Brokers
Contractors
Dairy owners
Farmers
Lumber dealers

C. Major Professionals

Accountants (CPA)
Actuaries
Agronomists
Architects
Artists, portrait
Astronomers
Auditors
Bacteriologists
Chemical engineers
Chemists
Clergymen (professional trained)
Dentists
Economists
Engineers (college graduates)
Foresters
Geologists
Judges (superior courts)
Lawyers
Metallurgists
Military: commissioned officers, major and above
Officials of the executive branch of government, federal, state, local: e.g., Mayor, City Manager, City Plan Director, Internal Revenue Director

Physicians
Physicists, research
Psychologists, practicing
Symphony conductor
Teachers, university, college
Veterinarian, veterinary surgeons

2. Business Managers, Proprietors of Medium-Sized Businesses, and Lesser Professionals
   A. Business Managers in Large Concerns (Value $500,000)
      Advertising directors
      Branch managers
      Brokerage salesmen
      Directors of purchasing
      District managers
      Executive assistants
      Manufacturer's representatives
      Office managers
      Personnel managers
      Police chief; Sheriff
      Postmaster
      Production managers
      Export managers, international concerns
      Farm managers
      Government, officials, minor, e.g., IRS agents
      Sales engineers
      Sales managers, national concern
      Store managers
   B. Proprietors of Medium Businesses (Value #35,000-$100,000)
      Advertising
      Clothing store
      Contractors
      Express company
      Farm owners
      Fruits, wholesale
      Furniture business
      Jewelers
      Poultry business
      Real estate brokers
      Rug business
      Store
      Theater
   C. Lesser Professionals
      Accountants (not CPA)
      Chiropodists
      Chiropractors
      Correction officers
      Director of Community House
      Engineers (not college graduate)
      Finance writers
      Health educators
      Labor relations consultants

Librarians
Military: commissioned officers, lieutenant, captain
Musicians, symphony orchestra
Nurses
Opticians
Optometrists, D. O.
Pharmacists
Public health officers (MPH)
Research assistants, university (full time)
Social workers

3. Administrative Personnel, Owners of Small Businesses, and Minor Professionals
   A. Administrative Personnel
      Advertising agents
      Chief clerks
      Insurance agents
      Managers, departments
      Passenger agents, railroad
      Private secretaries
      Purchasing agents
      Sales representatives
      Section heads, federal, state, and local governmental offices
      Section heads, large businesses and industries
      Service managers
      Shop managers
      Store managers (chain)
      Traffic managers
   B. Small Business Owners ($6,000-$35,000)
      Art gallery
      Auto accessories
      Awnings
      Bakery
      Beauty shop
      Boatyard
      Brokerage, insurance
      Car dealers
      Cattle dealers
      Cigarette machines
      Cleaning shops
      Clothing
      Coal businesses
      Contracting businesses
      Convalescent homes
      Decorating
      Dog supplies
      Dry goods
      Engraving business
      Feed
      Finance companies, local
      Fire extinguishers

Five and dime
Florist
Food equipment
Food products
Foundry
Funeral directors
Music
Package stores (liquor)
Furniture
Garage
Gas station
Glassware
Grocery, general
Hotel proprietors
Jewelry
Machinery brokers
Manufacturing
Monuments
Pain contracting
Poultry
Real estate
Records and radios
Restaurant
Roofing contractor
Shoe
Signs
Tavern
Taxi company
Tire shop
Trucking
Trucks and tractors
Upholstery
Wholesale outlets
Window shades

C. Semiprofessionals
Actors and showmen
Army, master sergeant
Artists, commercial
Appraisers (estimators)
Clergymen (not professionally trained)
Concern managers
Deputy sheriffs
Dispatchers, railroad
Interior decorators
Interpreters, courts
Laboratory assistants
Landscape planners
Morticians
Navy, chief petty officer
Oral hygienists
Physiotherapists
Piano teachers

Publicity and public relations
Radio, TV announcers
Reporters, court
Reporters, newspapers
Surveyors
Title searchers
Tool designers
Travel agents
Yard masters, railroad

D. Farmers
Farm owners ($20,000-$35,000)

4. Clerical and Sales Workers, Technicians, and Owners of Little Businesses (Value under $6,000)

A. Clerical and Sales Workers
Bank clerks and tellers
Bill collectors
Bookkeepers
Business machine operators, offices
Claims examiners
Clerical or stenographic
Conductors, railroad
Factory storekeepers
Factory supervisors
Post Office clerks
Route managers
Sales clerks
Sergeants and petty officers, military services
Shipping clerks
Supervisors, utilities, factories
Supervisors, toll stations

B. Technicians
Dental technicians
Draftsmen
Driving teachers
Expeditor, factory
Experimental tester
Instructors, telephone company, factory
Inspectors, weights, sanitary, railroad, factory
Investigators
Laboratory technicians
Locomotive engineers
Operators, PBX
Proofreaders
Safety supervisors
Supervisors of maintenance
Technical assistants
Telephone company supervisors
Timekeepers
Tower operators, railroad
Truck dispatchers
Window trimmers (stores)

C. Owners of Little Businesses ($3,000-$6,000)
   Flower shop
   Grocery
   Newsstand
   Tailor shop
D. Farmers (owners, value $10,000-$20,000)

5. Skilled Manual Employees
   Auto body repairers
   Bakers
   Barbers
   Blacksmiths
   Bookbinders
   Biolermakers
   Brakemen, railroad
   Brewers
   Bulldozer operators
   Butchers
   Cabinet makers
   Cable splicers
   Carpenters
   Casters (founders)
   Cement finishers
   Cheese makers
   Chefs
   Compositors
   Diemakers
   Diesel engine repair and maintenance (trained)
   Electricians
   Engravers
   Exterminators
   Firemen, city
   Firemen, railroad
   Fitters, gas, steam
   Foremen, construction, dariy
   Gardeners, landscape (trained)
   Glass blowers
   Glaziers
   Gunsmiths
   Guage makers
   Hair stylists
   Heat treaters
   Horticulturists
   Linemen, utility
   Linotype operators
   Lithographers
   Locksmiths
   Loom fixers
   Machinists (trained)
   Maintenance forement
   Linoleum layers (trained)
   Masons
   Masseurs

Mechanics (trained)
Painters
Paperhangers
Patrolmen, railroad
Pattern and model makers
Piano builders
Piano tuners
Plumbers
Policemen, city
Postmen
Printers
Radio, TV maintenance
Repairmen, home appliances
Rope splicers
Sheetmetal workers (trained)
Shipsmiths
Shoe repairmen (trained)
Stationary engineers (licensed)
Stewards, club
Switchmen, railroad
Tailors (trained)
Teletype operators
Tool makers
Track supervisors, railroad
Tractor-trailer transport
Typographers
Upholsters (trained)
Watchmakers
Weavers
Welders
Yard supervisors, railroad
Small farmers (owners: value under $10,000)
Tenants who own farm equipment

6. Machine Operators and Semiskilled Employees
   Aides, hospital
   Apprentices, electricians, printers, steam fitters, toolmakers
   Assembly line workers
   Bartenders
   Bingo tenders
   Bridge tenders
   Building superintendents (construction)
   Bus drivers
   Checkers
   Coin machine fillers
   Cooks, short order
   Deliverymen
   Dressmakers, machine
   Elevator operators
   Enlisted men, military services
   Filers, sanders, buffers

Foundry workers
Garage and gas station attendants
Greenhouse workers
Guards, doorkeepers, watchmen
Hairdressers
Housekeepers
Meat cutters and packers
Meter readers
Operators, factory machines
Oilers, railroad
Practical nurses
Pressers, clothing
Pump operators
Receivers and checkers
Roofers
Setup men, factories
Shapers
Signalmen, railroad
Solderers, factory
Sprayers, paint
Steelworkers (not skilled)
Standers, wire machines
Strippers, rubber factory
Taxi drivers
Testers
Timers
Tire moulders
Trainmen, railroad
Truck drivers, general
Waiters-waitresses ("better places")
Weighers
Welders, spot
Winders, machine
Wine bottlers
Wood workers, machine
Wrappers, stores and factories
Farmers (smaller tenants who own little equipment)

7. Unskilled Employees
Amusement park workers (bowling alleys, pool rooms)
Ash removers
Attendants, parking lots
Cafeteria workers
Car cleaners, railroad
Carriers, coal
Countermen
Dairy workers
Deck hands
Domestics
Farm helpers
Fishermen (clam diggers)
Freight handlers

Garbage collectors
Gravediggers
Hog carriers
Hog killers
Hospital workers, unspecified
Hostlers, railroad
Janitors, sweepers
Laborers, construction
Laborers, unspecified
Laundry workers
Messengers
Platform men, railroad
Peddlers
Porters
Relief, public, private
Roofer's helpers
Shirt folders
Shoe shiners
Sorters, rag and salvage
Stage hands
Stevedores
Stock handlers
Street cleaners
Struckmen, railroad
Unemployed (no occupation)
Unskilled factory workers
Waitresses ("Hash Houses")
Washers, cars
Window cleaners
Woodchoppers
Farmers (sharecroppers)

II. The Educational Scale

The educational scale is premised upon the assumption that men and women who possess similar educations will tend to have similar tastes and similar attitudes, and they will also tend to exhibit similar behavior patterns.

1. Graduate professional training: Persons who completed a recognized professional course that led to the receipt of a graduate degree.

2. Standard college of university graduation: All individuals who had completed a four-year college or university course leading to a recognized college degree. No differentiation was made between state universities or private colleges.

3. Partial college training: Individuals who had completed at least one year but not a full college course were assigned here.

4. High school graduation: All secondary school graduates whether

from a private preparatory school, public high school, trade school, or parochial school were given this score.

5. Partial high school: Individuals who had completed the tenth or eleventh grades, but had not completed high school.

6. Junior high school: Individuals who had completed the seventh grade through the ninth grade.

7. Less than seven years of school: Individuals who had not completed the seventh grade.

Source: August B. Hollingshead, Two Factor Index of Social Position (copyright 1957), privately printed 1965, Yale Station, New Haven, Connecticut. August B. Hollingshead and Frederick C. Redlich, Social Class and Mental Illness (New York: John Wiley, 1958), pp. 387-97.

APPENDIX C

INFORMED CONSENT DOCUMENT Code:_____

You are invited to be a part of a study which will attempt to determine whether or not a particular junior high school science curriculum can be of equal benefit to students of different socio-economic classes. The study will only involve one school semester. At the beginning of this semester, a science test will be given to each participant. Toward the end of the same semester, the same test will be given to each participant. The results of the two tests will then be compared and analyzed in an attempt to determine whether or not the science curriculum did, in fact, benefit students of each socioeconomic class. (The tests used are made from questions designed for the science course.) It is important that you realize that NO INDIVIDUAL'S test scores will be scrutinized alone. The results of tests from all science classes in the study will be studied as a group. Hopefully, the outcome of this study will enable the writers and designers of the science curriculum to improve their product for all students.

If you decide to take part, you are free to withdraw your consent and to discontinue participation at any time. If you choose to do so, please inform me immediately. You can contact me by: Kevin Finson, C/O Dr. R. K. James, College of Education, Dickens 205, Kansas State University, Manhattan, Kansas 66506.

You are making a decision whether or not your child will participate. Your signatures (both yours and your child's) indicate you and the child have decided to participate. (If you decide to participate, please fill out the enclosed questionnaire and return it as soon as possible. Your responses are strictly confidential. All

questionnaires and tests will be destroyed when the study is completed in order to protect your rights of privacy.

Signature of Participant (Child)	Date
Signature of Parent or Guardian	Date

(SAMPLE LETTER)

June 30, 1979

Dr. Kenneth Hauge
Superintendent of Schools
USD #475
P.O. Box 370
Junction City
Kansas 66441

Dear Dr. Hauge,

I am presently working on my thesis for my master's degree at Kansas State University. My advisor is Dr. Robert K. James. In order to complete my thesis, I need to conduct a study with Intermediate Science Curriculum Study (ISCS) classes during the fall semester. I would like to conduct part of my study in USD #475's junior high school.

The study will involve one questionnaire, one pretest, and one posttest. A total of two class periods for each ISCS class will be disrupted by the study's testing. All questionnaires and tests will be coded so that students' names and other information will remain anonymous except to me.

I am enclosing copies of the questionnaire and test which I propose to use. Also enclosed is a brief prospectus of my study. Please look these materials over and let me know if I may conduct my study in your school system this fall.

Thank you very much for your time and help. I appreciate it very much.

Sincerely,

Kevin D. Finson

kdf

(SAMPLE LETTER)

April 4, 1980

Dr. Kenneth Hauge
Superintendent of Schools
USD #475
P.O. Box #370
Junction City
Kansas 66441

Dear Dr. Hauge,

I wish to thank you for allowing me to conduct my thesis study in your school district this past fall. We have finally received the results, of which I am enclosing a copy for you. If you have any questions concerning these results, please feel free to contact me or Dr. R. K. James at the College of Education, Holton Hall, Kansas State University.

Again, thank you so much for your time, help, and cooperation.

Sincerely,

Kevin D. Finson

kdf
enc.

(SAMPLE LETTER)

April 4, 1980

Mr. Dave Lutes
Northern Hills Junior High School
Seaman USD #345
5620 N.W. Topeka
Topeka, Kansas

Dear Mr. Lutes,

I would like to personally thank you for your help and cooperation with administering the tests for my study. I have enclosed a brief outline of the results of the study for you. I have sent a more complete copy to your superintendent if you are interested in more detail.

Again, thank you for your assistance.

Sincerely,

Kevin D. Finson

kdf
enc.

APPENDIX D

Table 5

Means With Race, SES, and Treatment

Race	SES	Treatment	N	Posttest	Pretest	Test Difference
White	High	ISCS	42	18.66	14.36	4.31
White	High	Control	27	19.85	16.15	3.70
White	Middle	ISCS	29	16.65	11.03	5.62
White	Middle	Control	36	17.47	14.86	2.61
White	Low	ISCS	20	16.60	10.45	6.15
White	Low	Control	41	16.68	14.41	2.27
Nonwhite	High	ISCS	9	18.00	11.77	6.22
Nonwhite	High	Control	2	14.50	11.50	3.00
Nonwhite	Middle	ISCS	12	18.66	13.16	5.51
Nonwhite	Middle	Control	2	22.00	17.00	5.00
Nonwhite	Low	ISCS	19	15.37	7.79	7.69
Nonwhite	Low	Control	2	18.50	11.00	7.50

One major problem with the data including race lies in the few number of subjects in some of the cells. Close examination of Table 5 reveals this. Such low subject numbers do not provide as error free an analysis as desired, so the interpretation of these results may lead to erroneous conclusions. Further results are reported in Table 6.

Table 6

Analysis of Pretest, Posttest, and Test Difference With Race

Source	DF	Sum of Squares	Mean Square	F Value	PR>F	R-Square
Pretest						
Model	11	1356.68	123.33	5.48	.0001	.208
Error	229	5158.10	22.52	-	-	-
Corrected Total	240	6514.78	-	-	-	-
Posttest						
Model	12	1834.46	152.87	7.74	.0001	.289
Error	228	4500.37	19.74	-	-	-
Corrected Total	240	6334.83	-	-	-	-
Posttest-Pretest Difference						
Model	11	679.32	61.76	2.49	.0058	.107
Error	229	5684.27	24.82	-	-	-
Corrected Total	240	6363.59	-	-	-	-

Table 7

Means of High and Low SES

SES	Treatment	N	Posttest	Pretest	Test Difference*
High	ISCS	51	18.55	13.90	4.65
High	Control	29	19.48	15.83	3.66
Middle	ISCS	41	17.24	11.66	5.59
Middle	Control	38	17.71	14.97	2.74
Low	ISCS	39	16.00	9.15	6.85
Low	Control	43	16.77	14.26	2.51

*Significant at the .05 level

A STUDY OF OUTCOMES OF ISCS INSTRUCTION ACROSS SOCIOECONOMIC STATUS AND RACIAL GROUPS

by

KEVIN D. FINSON

B. S., Kansas State University, 1975

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1980

ABSTRACT

The problem of the study was to determine the relationships of Intermediate Science Curriculum Study (ISCS), socioeconomic status (SES), and racial differences. The null hypothesis of the study had two parts: that

(1) there is no significant difference in achievement between ISCS and control groups for students with differing SES levels established using the Hollingshead index, and that

(2) there is no significant difference in achievement between ISCS and control groups for whites versus nonwhites. A nonequivalent control group design utilizing pretests and posttests was used. The subjects were in intact groups with unequal n's.

Four suburban junior high schools in northeast Kansas were selected for the study. Ninety-five ISCS students and one hundred forty non-ISCS students participated in the study. Prior to testing, all students were given a Hollingshead index questionnaire to determine their SES. All students were then given a pretest composed of questions from the Performance Checks booklet for Level I, ISCS, semester 1, during the second week of the fall semester. The same test was given as a posttest during the last week of the semester.

The gain scores between pretests and posttests were compared to both SES and race with a 3 X 2 analysis of variance. Analysis was inconclusive as to whether SES and race were significant factors for this study. (The study's targeted level of significance was .05.) Both parts of the null hypothesis were therefore retained.