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ABSTRACT

This study investigated the influence of instrumental music instruction on the academic achievement of fifth grade students. The sample consisted of 270 fifth grade students (135 boys and 135 girls) located in a southwestern Kansas school district in a city of approximately 20,000 people. The independent variables considered were: instrumental music status, gender, race, socioeconomic status, family structure, mother's level of formal education, and length of time in the school district. Specific scores from the Comprehensive Tests of Basic Skills, Fourth Edition, Level 15 were used as dependent variables. Level 14 scores from the test were used as covariate measures. One hundred sixty four subjects self-selected participation in instrumental music instruction (band or orchestra). Seven composite null hypotheses were tested and employed a single factor analysis of covariance. Of the 49 comparisons for main effects, 10 were significant at the .05 level. The significant findings include band participants had statistically higher reading vocabulary and reading total achievement; males receiving instrumental instruction scored higher statistically in reading vocabulary; and instrumental students whose mothers had a post high school education showed statistically higher achievement in the total score. (CK)

THE IMPACT OF INSTRUMENTAL MUSIC INSTRUCTION ON THE ACADEMIC ACHIEVEMENT OF FIFTH GRADE STUDENTS

being

A Thesis Presented to the Graduate Faculty
of the Fort Hays State University in
Partial Fulfillment of the Requirements for
the Degree of Master of Science

by

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Abstract

The purpose of the researcher was to investigate the influence of instrumental music instruction on the academic achievement of fifth grade students. Independent variables were instrumental music status, gender, race, socioeconomic status, family structure (as defined by the school district involved), mother's level of formal education, and length of time in the school district. The following scores from the Comprehensive Tests of Basic Skills, Fourth Edition, Level 15 were used as dependent variables: Reading Comprehension, Reading Vocabulary, Mathematics Computation, Mathematics Concepts and Applications, Reading Total, Mathematics Total, and Total Score. The following scores from the Comprehensive Tests of Basic Skills, Fourth Edition, Level 14 were used as covariate measures: Reading Comprehension, Reading Vocabulary, Mathematics Computation, Mathematics Concepts and Applications, Total Reading, Total Mathematics, and Total Score.

The present research was conducted in a southwestern Kansas school district with an enrollment of approximately 4,500 students. The school district is located in a city of approximately 20,000 people. The sample included all fifth grade students enrolled in the school district during the 1991-92 school year who had scores for both Levels 14 and 15 of the Comprehensive Tests of Basic Skills, Fourth Edition. The total sample included 270 fifth grade

students, 135 males and 135 females. The subjects self-selected participation in instrumental music instruction (band or orchestra) or nonparticipation in instrumental music instruction. Those who chose instrumental music instruction included 69 males and 95 females for a total of 164 students.

Seven composite null hypotheses were tested employing a single-factor analysis of covariance. All comparisons were for main effects. A total of 49 comparisons were made. Of the 49 comparisons, ten were significant at the .05 level. The significant main effects were for the following: participation status for the dependent variables Reading Vocabulary and Reading Total; gender for the dependent variable Reading Vocabulary; race for the dependent variable Mathematics Total; socioeconomic status for the dependent variable Total Score; and mother's level of formal education for the dependent variables Reading Vocabulary, Reading Total, Mathematics Computation, Mathematics Total, and Total Score.

Introduction

Currently many schools are moving to an outcomes based approach to education (Spady & Marshall, 1991). "All students can learn" (Spady & Marshall, 1991, p. 67) has become a familiar school slogan . Children are expected to meet minimum levels of competency. Teachers maintain they will be held responsible if any of their students fail to meet these minimum competencies. As a result, teachers want to be certain that they are given adequate instructional time to meet these expectations. Instrumental music classes, which pull students out of the regular classroom on a daily basis, are sometimes viewed as the culprit if students are not meeting minimum competencies, especially in math and reading (Kvet, 1982/ 1983). Parents share this same view. If the grades of a child participating in instrumental music fall below parental standards, the parents are likely to remove their child from the program (Henry, 1978). At one end of the continuum are those who see instrumental music as a frill to be eliminated if more instructional time is needed. At the other extreme are those that maintain instrumental music instruction has a direct and positive influence on children's achievement in math and reading.

A position paper prepared by the Music Educators

National Conference's National Committee on Instruction stated that

> music can make important contributions to the development of children in areas other than music itself. Some persons are convinced that music can serve as a methodological tool in teaching children academic skills such as reading, language arts, and mathematics; that the study of music can help to make the learning process itself more effective and appealing. (The role, 1977, p. 59)

There are many different opinions about the effects participation in instrumental music has on academic achievement and student development. A group of parents from Groveland, Massachusetts, compiled the following list of educational benefits their children received from participating in the school's music program:

> reading, listening, and speaking skills; computational and analytic skills; overall academic achievement; a positive self-concept; self-expression, imagination, and creativity; psychomotor skills; aesthetic perceptions; self-knowledge and social interaction; sound ideas of conduct and self-discipline; responsible citizenship; and a healthy home life, recreation, and fun. (Weeks, 1983, p. 28)

While these reasons for including music in the public school curriculum may be philosophically satisfying, they

are not easily proveable, measureable, or even defensible in the face of a budget crunch. For this reason, researchers have tried to find a correlation between music education and academic achievement. Others have sought to demonstrate that pulling students out of the regular classroom for instrumental instruction does not have a negative effect on academic achievement.

Logically, a relationship would seem to exist between learning music and learning other academic subjects. Rhythm must be related to mathematics. Music reading must be related to language arts and reading (Wolff, 1979/1980). This seems to be born out by an unexpected side effect of daily music instruction using the Kodaly method of music instruction in the primary schools in Hungary. Marked achievement in other academic areas was noted (Choksy, 1988).

> The Kodaly system is a form of music education for young children, starting at the kindergarten level. The training is based on a carefully worked out sequential curriculum in which folk songs are used to teach the basics of music. Aimed at training all children and not just the musically gifted, it uses such techniques as signs, games, clapping, reading musical notes, rhythmic notation, and, most centrally, singing.

Because of the many-faceted perceptual and

> cognitive training offered in the system, it has long been suspected both by those teaching and those observing this method that it has implications for children's learning abilities in not only musical areas but nonmusical ones as well. (Hurwitz, Wolff, Bortnick, and Kokas, 1975, p.45)

Hurwitz et al (1975) did a study comparing the performances of two matched groups of primary grade children on tasks of spatial and temporal abilities. The experimental group received Kodaly music instruction while the control group did not. The results indicated that the music group performed spatial and temporal tasks more effectively. A second comparison with another control group found the music group performing more effectively on reading tests than other first graders not receiving this instruction. The effect on reading performance was observed beyond the first grade level when the music instruction was continued. The difference at the end of first grade in reading scores on the Metropolitan Achievement Test, Primary I for the music and control groups was significant at the .01 level.

Other studies have been conducted to determine the relationship between music instruction and reading achievement. Movsesian (1967) focused on the influence of teaching music reading skills on reading achievement. He recognized that problems in reading sometimes are the

result of poorly developed perceptual skills. He sought to ascertain if there was a significant transfer of music reading skills to reading vocabulary or reading comprehension. He also looked for a significant transfer of music reading skills toward the elimination of mispronunciation, omissions of words, substitutions of words, repetitions, and inversions in reading orally. His sample consisted of 2 first grade, 2 second grade, and 2 third grade classes. There was an experimental class and a control class for each grade level. Pretests and posttests were used to determine the effectiveness of the treatment. Both experimental and control groups spent an equal amount of time in music instruction. The experimental group music instruction emphasized specific music reading skills. The results of this study led Movsesian to conclude that instruction in music reading skills positively influenced the achievement of basic reading skills for first and second graders, except in the area of oral reading. First graders' gains in reading comprehension were significant at the .001 level. Second graders' gains in both comprehension and vocabulary were significant at the .01 level. Third graders did not show significant gains in comprehension or vocabulary.

Lauder (1976) designed a study to explore the relationship between music and reading achievement of first graders. Six first grades from 3 schools were randomly

selected as the sample. Each school had a control and an experimental group. The control group continued with the regular music classes where the materials were not integrated with the rest of the curriculum. The music classes for the experimental group emphasized materials designed to improve reading skills as well as regular music activities. Material from the students' reading books was integrated with the music educational concepts of Kodaly, Orff, and Dalcroze. The Comprehensive Tests of Basic Skills/S Level A, Form B was used as the pretest in the Fall and CTBS/S Level B, Form S was used as the posttest in the Spring. The dependent variable, reading achievement, was divided into eight areas: Letter Sounds, Word Recognition, Reading Comprehension, Word Recognition II, Total Reading, Language I, Language II, and Total Language. All of these showed some increase but not at a statistically significant level. The letter sounds variable showed a nearly significant F value.

Pelletier (1963) looked for a transfer of learning from instrumental music instruction to language growth. He postulated that study on an instrument would develop auditory discrimination which would positively influence the development of phonetic skills. He used a matched-pairs design in which the experimental group of third graders received instrumental music instruction and the control group did not. He analyzed his results using .10

as the level of significance. He concluded that the study of instrumental music did facilitate the development of reading ability in third grade students. The benefits were greater for students who were lower in initial reading ability. He found no indication that spelling or reading vocabulary were improved by instrumental instruction. The evidence was inconclusive as to whether the benefits were the result of increased auditory discrimination.

Nicholson (1972) sought to determine the extent to which music can improve the development of reading readiness skills in slow learners. She used two groups of 25 students, paired in terms of IQ, reading achievement, sex, age, and socioeconomic status. All had IQ scores in the 80-95 range. The control group was given a well-balanced music curriculum. The experimental group received music instruction designed to increase attention span; facilitate recognition of high and low, loud and soft, heavy and light, fast and slow; facilitate recognition of alphabet letters as they related to musical pitches; and facilitate the recognition of paired alphabet letters that frequently posed problems in discrimination. The experimental group made gains significant at the .001 level in each of these areas. In addition, when the Metropolitan Readiness Test and the Botel Test of Reading Achievement were used as pretest and posttest, the differences between the two groups were significant at the .001 level in favor

of the experimental group. The researcher concluded that music can improve the development of reading readiness skills in slow learners.

Robitaille and O'Neal (1981) conducted a study in all 75 of Albuquerque's elementary schools designed to find the relationship between participation in band or orchestra and academic achievement as measured by the Comprehensive Tests of Basic Skills (CTBS). Those fifth grade students participating in the instrumental music program scored more percentile points in all areas than fifth grade students not participating. This difference was probably influenced by the self-selection process; the better students chose to participate in band and orchestra. The study was repeated when these same students were sixth graders, having completed 2 years of instrumental music instruction, with similar results. The band students scored 10 percentile points higher than the total group of fifth graders in reading and 12 percentile points higher in language. Orchestra students scored 16 percentile points higher than the total group in reading and 20 percentile points higher in language. As a follow-up test, 129 music students were randomly selected and paired with nonmusic students from the same schools who had matching scores on the Short Form Test of Academic Aptitude. When the total CTBS scores of the music students were compared with the total scores of the nonmusic students the difference in raw scores was not

statistically significant. Students who had missed instructional time in their regular classrooms to attend band and orchestra were not at any disadvantage.

Another study which showed that time spent away from the classroom studying instrumental music does not have any negative effect on student achievement, as measured by standardized tests, was conducted by Kvet (1982/1983) in 4 school districts in the midwest. He studied the effects of excusing students for instrumental music on sixth-grade reading, language, and mathematics achievement. He used a single-sample multivariate matched-pairs design. He found that "within the four school districts studied, excusing elementary students from their regular classroom activities for the study of instrumental music, as well as the study of instrumental music in general, has no statistically significant effect on reading, language or mathematics achievement" (Kvet, 1982/1983, p. 212).

Friedman (1960) also studied the effect of missing regular classroom instruction time to study instrumental music on achievement in reading and arithmetic. He used a parallel group procedure. Two groups, one that spent part of the day in instrumental music activities and one that did not, were employed. The control group was selected by matching each child in the instrumental group with another child on the basis of age, intelligence, and sex. The Stanford Achievement Test was used to measure achievement.

The only significant difference observed was in Reading Meaning in favor or the instrumental group No differences were observed in arithmetic reasoning or arithmetic computation. The researcher concluded that participation in instrumental music instruction, even when it meant loss of regular classroom time, did not hinder achievement.

Anello (1972) studied the academic achievement of high school students participating in instrumental music to see if the participation had a negative effect. He used 163 students from 2 high schools who were participating in instrumental music. Using a questionnaire he located a pool of students with no musical background. From this he drew a random sample to match the numbers and sexes of the instrumental students. The grade point averages for mathematics, English, and social science were determined for each student in the study. An intelligence test score for each student was obtained from the test records. These were used in the analysis of covariance to control the effect of intelligence on academic achievement. Analysis of the data showed a significant difference in achievement in mathematics, English, and social science favoring instrumental students; however, when the variable of intelligence was controlled, the difference was not significant.

Instrumental music has sometimes been used as a method for increasing achievement in a specific academic area.

Gordon (1979) studied the use of instrumental music instruction as a motivation for increasing reading behavior. In his study he used an experimental group and a control group. The experimental group received instrumental music instruction only if they reached a predetermined criterion level for correct answers to reading problems each day during two treatment phases. In between the treatment phases they received music instruction for 4 days on a noncontingent basis. The control group received daily instrumental music instruction without regard for their level of reading achievement. The control group showed a steady rate of progress in its daily mean scores. The experimental group showed high scores and low scores corresponding to treatment or removal of treatment. Reading achievement scores increased when instrumental music instruction was used as a motivator. This increase was not maintained when music instruction was not contingent upon reading achievement. Gordon concluded that the motivational value of instrumental music instruction can be used to increase reading achievement.

Another study dealing with music instruction, motivation, and academic achievement was the Music Ability Utilization Program conducted in New York City in the 1960's. The researchers sought "to determine the nature and extent of academic and motivational change in junior high school students who participated in a special program

of training in music" (Olanoff, & Kirschner, 1969, p. 1). The students who participated in this study were identified as having some musical talent, but being low in academic achievement. The rationale behind this study was "that successful school experiences of any kind tend to encourage the student's own expectations of school success in general" (Clanoff, & Kirschner, 1969, p. 2). The project was a 3- year study involving 4 junior high schools. The experimental group was treated by participation in a special music program while the control group continued in the school's normal music program. When all experimental and control groups were compared, no significant differences were found in word knowledge, reading comprehension, arithmetic problem solving and concepts, or social study skills. A significant difference (.05) in reading comprehension favoring the experimental group was found at one school. A significant difference (.05) in arithmetic problem solving and concepts favoring the control group was found at another school. In 2 of 3 schools, significant differences were found in language study skills favoring the control groups. Students participating in the experimental group were interviewed and expressed strong links with school. Teachers and administrators reported better than average behavior for most experimental students. Overall the program did not produce any significant changes in either motivation or

academic achievement (Olanoff, & Kirschner, (1969).

Gregory (1989) designed a musical instruction technique for teaching mathematics. She tested this using a pretest/ posttest control group design with 6 randomly selected third grade classes. The 3 experimental classes were taught using the musical instruction technique by teachers trained by the researcher. The control groups were taught using the traditional method. All students received 1 hour of mathematics instruction daily. Achievement was measured by the Stanford Achievement Test, Primary 2, Form E, for both pretesting and posttesting. Gregory concluded that the technique was effective because the experimental group scored significantly higher (.05) on the posttest. Gender and socioeconomic status did not significantly affect the results.

Wolff (1979/1980) discussed outcomes of education not generally measured in the traditional testing process.

> Long after the theorems learned in a geometry class are forgotten, a person may use the ability for logical thinking, which was developed in the class, to solve problems quite unrelated to mathematics. Or he may retain a lasting appreciation of the aesthetic qualities which are manifest in the discipline. Effects of this nature demonstrate the more subtle differences which education can promote in a human being. (Wolff, 1979/1980, p. 2)

These kind of outcomes are frequently attributed to music instruction. Tim Evanson, a student at Great Falls High School, Great Falls, Montana, expressed his feelings about what public school instrumental instruction meant to him.

> Finally, music develops pride. Not only pride in one's school and for a performance well done, but pride in one's self. This self-esteem shows through not only in music, but at home, at work, and in an individual's treatment of others. Music not only prepares the mind for a career, but it prepares the personality for life as well. (Maynard & Evanson, 1984, p. 52)

"Washington's Fillmore Arts Center demonstrates what a comprehensive arts education program can accomplish" (Mitchell, P., Lesser, H. & Strobias, L., 1988, p. 19). The Fillmore Arts Center provided services for 5 other schools in Washington D.C. These schools included a 5-8 magnet school, a model primary school, and 3 magnet schools for general science, environmental science, and bilingual education. The Fillmore curriculum included five art areas—creative writing, visual arts, music, dance, and drama. Physical education was also taught. Music was taught as an outgrowth of speech and body movement (Mitchell et al, 1988). Those at Fillmore maintained that the arts curriculum provided students with "opportunities to develop personal frames of reference, to interpret other

subjects, to test principles, and to evaluate life experiences" (Mitchell et al, 1988). The benefits of this program were succinctly stated by fifth grader Betsy Hill, "I can be all of me" (Mitchell et al, 1988, p. 23).

Wilson (1985, p. 42) made a statement about the importance of including all kinds of music instruction in the school curriculum.

> A strong case can be made for inclusion of music in any general curriculum because of some special features of the human brain and the muscular system to which it is bonded....What makes us special in the biological sense,...is the unique control we have of our upper limbs and vocal apparatus, and the linkage of these capabilities to a strong urge to communicate to ourselves and to others around us. Making music involves the full exercise of these innate and special human capabilities. And this, I think, is the crux of the education issue. If you seek to encourage young people to develop themselves in a way that fortifies their natural curiosity and leads to a refinement in physical and mental ability, why not provide opportunities suited to the gifts granted by our biological heritage?

Wolff (1979, p. 8) stated that "information regarding the contributions of music education to other aspects of a child's development may shed light on the entire learning

process, and, if such benefits can be established, may provide additional support for music programs." Wolff (1979) studied extra-musical outcomes in children receiving music instruction as compared to children not receiving music instruction. The outcomes tested for were differences in reading and math achievement, perceptual-motor skill development, creative thinking, and musical ability. Forty-nine first grade students were pretested, using the Metropolitan Readiness Test, The Purdue Perceptual-Motor Survey, the Torrance Tests of Creative Thinking, and the Simons Measurements of Music Listening Skills. They were then randomly assigned to experimental or control groups. The experimental group received comprehensive general music instruction daily; the control group received no music instruction. They were posttested using the same tests except the Metropolitan Achievement Test replaced the Metropolitan Readiness Test. The results of this study showed no significant differences in reading scores. High achieving males in the experimental group scored higher in mathematics, as did high achieving females. The researcher noted that the effects of the experimental treatment on mathematics achievement skills were more pronounced for high-achieving students.

A similar phenomenon was noted regarding SAT scores for the years 1987-1989. The highest verbal mean scores and math mean scores were achieved by students who had

participated in high school fine arts study for 4 or more years. Verbal mean scores were numerically higher for students who had participated in high school fine arts study for 2 or more years than for all students. The highest of high-achieving students, as measured by SAT, were those who had consistently participated in high school fine arts study. The number of years spent in fine arts study was self-reported (Steinel, 1990).

The question of whether instruction in music has any kind of effect on academic achievement in mathematics and reading is still open to debate. Some educators maintain that a very impressive improvement in math and reading with a tight correlation with music would be needed to make the expense in terms of time and money worth it. Time and money could be applied more directly to math and reading (Broudy, 1977).

Music educators maintain that music is basic to the total educational process.

> We talk a great deal about the need for mental disciplines, in math and science and in foreign languages. Isn't music a discipline, too? Actually, it's a science, it's mathematical, it's foreign language , and it's an art—all rolled into one. There's one thing that music is not—it is not a "frill." It is not an "extra," to be cut and trimmed when money gets tight. It is an integral part of the

total school program and deserves to be treated as such. (Christian, 1966)

Statement of the Problem

The purpose of the researcher was to investigate the influence of instrumental music instruction on the academic achievement of fifth grade students.

Importance of the Research

Current crises in school budgets plus the growing emphasis on outcomes based education are causing many school districts to re-evaluate the benefits of including instrumental music in the elementary school curriculum. Students, parents, teachers, administrators, and counselors have questions about the effect of participation in instrumental music instruction on academic achievement. Counselors, who are asked to help students make decisions about the inclusion of instrumental music in their schedules, need a research basis from which to work. The literature reviewed indicated some evidence for the claim that increased academic achievement can result from music instruction. At the least, instrumental music instruction, even when it pulls students out of regular classroom activities, does not negatively impact achievement. The majority of the studies were conducted prior to 1983. There is a need to update available information regarding the impact of instrumental music instruction on academic achievement. The researcher found no studies that directly

addressed the relationship between instrumental music students' academic achievement, and the following variables: gender, race, socioeconomic status, family structure, mother's level of formal education, or number of years in the school district.

The results of the present study provided information pertaining to the following questions:

1. Is there an association between instrumental music instruction and academic achievement?
2. Is there an association between instrumental music students' gender, and academic achievement?
3. Is there an association between instrumental music students' race, and academic achievement?
4. Is there an association between instrumental music students' socioeconomic class, and academic achievement?
5. Is there an association between instrumental music students' mother's formal educational level, and academic achievement?
6. Is there an association between instrumental music students' family structure, and academic achievement?
7. Is there an association between instrumental music students' length of time in the school district, and academic achievement?

Composite Null Hypotheses

Each null hypothesis was tested at the .05 level of significance.

1. The differences among the adjusted post mean Comprehensive Tests of Basic Skills (CTBS) scores (pretest CTBS scores as covariate measures) for fifth grade students, according to participation status in instrumental music, will not be statistically significant.
2. The difference between the adjusted post mean CTBS scores for fifth grade students who participate in instrumental music (pretest CTBS scores as covariate measures), according to gender, will not be statistically significant.
3. The differences among the adjusted post mean CTBS scores for fifth grade students who participate in instrumental music (pretest CTBS scores as covariate measures), according to race, will not be statistically significant.
4. The difference between the adjusted post mean CTBS scores for fifth grade students who participate in instrumental music (pretest CTBS scores as covariate measures), according to socioeconomic status, will not be statistically significant.
5. The difference between the adjusted post mean CTBS scores for fifth grade students who participate in

instrumental music (pretest CTBS scores as covariate measures), according to family structure (as defined by school district), will not be statistically significant.

6. The differences among the adjusted post mean CTBS scores for fifth grade students who participate in instrumental music (pretest CTBS scores as covariate measures), according to mother's level of formal education, will not be statistically significant.

7. The difference between the adjusted post mean CTBS scores for fifth grade students who participate in instrumental music (pretest CTBS score as covariate measures), according to years in the school district, will not be statistically significant.

Definition of Variables

Independent Variables

All independent variables were obtained from school records:

1. instrumental music status -
   level 1 = participation in orchestra,
   level 2 = participation in band, and
   level 3 = no participation;
2. gender -
   level 1 = female, and
   level 2 = male

3. race -

   level 1 = White,

   level 2 = Hispanic, and

   level 3 = other;

4. socioeconomic status -

   level 1 = no free/reduced-price lunch, and

   level 2 = free/reduced-price lunch

5. family structure (as defined by the district involved) -

   level 1 = single-parent home, and

   level 2 = two-parent home;

6. mother's level of formal education -

   level 1 = primary (up to 8th grade),

   level 2 = high school diploma,

   level 3 = post high school, and

   level 4 = no information;

7. length of time in school system -

   level 1 = enrolled after beginning of 1989-90 school year, and

   level 2 = enrolled at or before beginning of 1989-90 school year.

Dependent Variables

The Comprehensive Tests of Basic Skills, Fourth Edition, Level 15 was used as the posttest. The scores from four of the test's subscales, two subscale totals, and the total test score were used as the dependent variables:

1. Reading Comprehension -
   number of items = 50, and
   possible points = 50;
2. Reading Vocabulary -
   number of items = 40, and
   possible points = 40;
3. Mathematics Computation -
   number of items = 44, and
   possible points = 44;
4. Mathematics Concepts and Applications -
   number of items = 50, and
   possible points = 50;
5. Reading Total -
   number of items = 90, and
   possible points = 90;
6. Mathematics Total -
   number of items = 94, and
   possible points = 94;
7. Total Score -
   number of items = 408, and
   possible points = 408.

(CTB, 1990)

Covariate Measures

The scores from the Comprehensive Tests of Basic Skills, Fourth Edition, Level 14, were used as the covariate measures:

1. Reading Comprehension -
   number of items = 50, and
   possible points = 50;
2. Reading Vocabulary -
   number of items = 40, and
   possible points = 40;
3. Mathematics Computation -
   number of items = 44, and
   possible points = 44;
4. Mathematics Concepts and Applications -
   number of items = 50, and
   possible points = 50;
5. Reading Total -
   number of items = 90, and
   possible points = 90;
6. Mathematics Total -
   number of items = 94, and
   possible points = 94;
7. Total Score -
   number of items = 408, and
   possible points = 408.

(CTB, 1990)

Limitations

The following were considered limitations of this study:

1. subjects were not randomly selected;

2. all subjects were part of a single school district in southwest Kansas;
3. activities of the control groups, during the time the experimental groups were receiving instrumental instruction, were determined by individual classroom teachers; and
4. the levels of each independent variable were predetermined by available school district data.

Methodology

Setting and Subjects

The present research was conducted in a Southwestern Kansas school district with an enrollment of approximately 4,500 students. The school district is located in a city of approximately 20,000 people. The school district included eight elementary schools.

The sample included all fifth graders enrolled in the district during the 1991-92 school year who had Comprehensive Tests of Basic Skills scores for both levels 14 and 15. The total sample included 270 fifth grade students, 135 females and 135 males. The subjects self-selected participation in instrumental music instruction (band or orchestra) or nonparticipation in instrumental music instruction. Those who chose instrumental music instruction included 69 males and 95 females for a total of 164 students.

Instrument

The Comprehensive Tests of Basic Skills (CTBS), Fourth Edition Levels 14 and 15, were employed as the instruments. Subscale scores for Reading Vocabulary, Reading Comprehension, Mathematics Computation, Mathematics Concepts and Applications, Reading Total, Mathematics Total, and Total Test score, were used. The CTBS is a multiple-item paper-pencil standardized achievement test battery. There are eleven levels of this test which assess achievement from kindergarten through the twelfth grade. The teachers in the school district systematically administer this test to grades 1 through 11, in April of each school year. Level 14 was administered to the sample during 1991 when they were fourth graders and Level 15 was administered to the sample in 1992 when they were fifth graders.

The following demographic information was obtained from the school district's permanent records: participation status in instrumental music, gender, race, socioeconomic status, family structure, mother's level of formal education, and number of years in the school district.

Design

A single factor pretest/posttest design was employed for the composite null hypotheses. The following independent variables were investigated: participation status in instrumental music, gender, race, socio-economic

status, family structure, mother's level of formal education, and length of time in the school system. The dependent variables were The Comprehensive Tests of Basic Skills, Fourth Edition, Level 15, subscale scores: Reading Comprehension, Reading Vocabulary, Mathematics Computation, Mathematics Concepts and Applications, Reading Total, Mathematics Total, and Total Score.

The covariant measures were the following subscale scores from The Comprehensive Tests of Basic Skills, Fourth Edition, Level 14: Reading Comprehension, Reading Vocabulary, Mathematics Computation, Mathematics Concepts and Applications, Reading Total, Mathematics Total, and Total Score.

Seven composite null hypotheses were tested. The following designs were employed:

composite null hypothesis number one, a pretest/ posttest 3 groups design;

composite null hypothesis number two, a pretest/ posttest 2 groups design;

composite null hypothesis number three, a pretest/ posttest 2 groups design;

composite null hypothesis number four, a pretest/ posttest 3 groups design;

composite null hypothesis number five, a pretest/ posttest 2 groups design;

composite null hypothesis number six, a pretest/

posttest 4 groups design;

composite null hypothesis number seven, a pretest/posttest 2 groups design.

McMillan and Schumacher (1989) identified 10 threats to internal validity. The 10 threats to internal validity were dealt with in the following ways:

1. history - was managed by the pretest/posttest design,
2. selection - was managed by the pretest/posttest design,
3. statistical regression - did not pertain because the sample was not composed of extreme cases,
4. testing - did not pertain because the instruments were administered according to standardized conditions,
5. instrumentation - did not pertain because a standardized instrument was used,
6. mortality - was managed by using only those subjects who completed both pretest and posttest,
7. maturation - was managed by the control group.
8. diffusion of treatment - did not pertain because the present study was ex post facto,
9. experimenter bias - did not pertain because the present study was ex post facto, and
10. statistical conclusions - two mathematical conclusions were violated, random sampling and

equal numbers in cells. The general linear model was employed to correct for the lack of equal numbers of subjects in cells, and the researcher did not project interpretations beyond the statistical procedures used.

McMillan and Shumacher (1989) addressed two threats to external validity. The two threats to external validty were dealt with in the following ways:

1. population external validity - samples were not random; therefore, results should be generalized to similar groups only, and
2. ecological external validity - demographic data and test scores were obtained from the district's permanent records.

Data Collection Procedure

The researcher contacted the assistant superintendent of schools and the elementary principal in charge of computer storage of student permanent records to determine the availability and accessibility of needed data. The researcher then wrote the assistant superintendent requesting permission to use the available data. Permission was granted. The 1991-92 fifth grade students were chosen as the sample. The covariate measure had been collected from them, as part of the district's annual standardized testing, in April of 1991. The posttest was administered, as part of the district's annual standardized

testing, in April of 1992. Student demographic data were already stored in the district computer. The researcher requested and received a printout of the covariate measure and posttest results and the student demographic data.

Research Procedure

The following steps were implemented:

1. research topic was selected,
2. computer search,
3. Music Index search,
4. literature was reviewed,
5. permission to use CTBS scores was obtained,
6. permission to use student demographic data was obtained,
7. proposal was written,
8. proposal was defended,
9. data were retrieved from district computer storage,
10. data were analyzed,
11. final report was written,
12. final report was defended, and
13. final report was edited.

Data Analysis

The following data were compiled:

1. appropriate descriptive statistics,
2. single-factor analysis of covariance, and
3. least sum of squares test of means.

Results

The purpose of the researcher was to investigate the influence of instrumental music instruction on the academic achievement of fifth grade students. Independent variables were instrumental music status, gender, race, socioeconomic status, family structure (as defined by the district involved), mother's level of formal education, and length of time in the school system. The scores from the Comprehensive Tests of Basic Skills, Fourth Edition, Level 15 were used as dependent variables: Reading Comprehension, Reading Vocabulary, Mathematics Computation, Mathematics Concepts and Applications, Reading Total, Mathematics Total, and Total Score. The scores from the Comprehensive Tests of Basic Skill, Fourth Edition, Level 14 were used as covariate measures: Reading Comprehension, Reading Vocabulary, Mathematics Computation, Mathematics Concepts and Applications, Reading Total, Mathematics Total, and Total Score. The researcher tested seven composite null hypotheses at the .05 level of significance using the following designs:

composite null hypothesis number one, a pretest/ posttest 3 groups design;

composite null hypothesis number two, a pretest/ posttest 2 groups design;

composite null hypothesis number three, a pretest/ posttest 2 groups design;

composite null hypothesis number four, a pretest/ posttest 3 groups design;

composite null hypothesis number five, a pretest/ posttest 2 groups design;

composite null hypothesis number six, a pretest/ posttest 4 groups design;

composite null hypothesis number seven, a pretest/ posttest 2 groups design.

The null hypotheses were tested using a single-factor analysis of covariance. The results section was organized according to composite null hypothesis for ease of reference. Information pertaining to each composite null hypothesis was presented in a common format for ease of comparison.

It was hypothesized in composite null hypothesis number one that the differences among the adjusted post mean Comprehensive Tests of Basic Skills (CTBS) scores (pretest CTBS scores as covariate measures) for fifth grade students, according to participation status in instrumental music, would not be statistically significant. Information pertaining to composite null hypothesis number one was presented in Table 1. The following information was cited in Table 1: variable, group sizes, covariate score means, covariate score standard deviations, posttest score means, posttest score standard deviations, adjusted posttest score means, F values, and p levels.

Table 1

A Comparison of Adjusted Posttest Mean Comprehensive Tests of Basic Skills Scores (CTBS Level 14 Covariate Measures) According to Participation Status in Instrumental Music Employing a Single-factor Analysis of Covariance

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Reading Comprehension				
Participation Status								
Orchestra	44	39.9	6.68	38.1	8.05	36.1		
Band	120	38.5	9.37	37.7	8.15	36.6	1.32	.2701
No Participation	106	33.7	9.84	33.1	9.39	35.2		
				Homogeneity of Regression				
							0.69	.5036
				Reading Vocabulary				
Participation Status								
Orchestra	44	30.2	5.66	28.6	5.82	26.0[a]		
Band	120	28.9	6.06	29.3	6.90	28.7[b]	7.20	.0009
No Participation	106	26.4	6.22	24.9	6.64	26.3[a]		
				Homogeneity of Regression				
							0.15	.8644

(continued)

(Table 1 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Reading Total				
Participation Status								
Orchestra	44	70.1	10.76	66.8	13.00	62.6		
Band	120	67.6	14.28	66.9	14.00	64.8[a]	3.09	.0470
No Participation	106	60.1	14.90	58.1	14.79	62.1[b]		
				Homogeneity of Regression				
							1.91	.1501
				Mathematics Computation				
Participation Status								
Orchestra	44	37.0	5.18	34.8	5.65	32.8		
Band	120	33.5	8.21	33.1	6.27	33.0	0.57	.5660
No Participation	106	31.4	8.15	31.4	6.59	32.3		
				Homogeneity of Regression				
							0.39	.6756
				Mathematics Concepts and Applications				
Participation Status								
Orchestra	44	35.6	7.59	34.6	8.34	33.0		
Band	120	35.1	8.43	34.5	8.25	33.2	0.31	.7364
No Participation	106	30.3	9.37	30.5	8.31	32.6		
				Homogeneity of Regression				
							0.83	.4363

(continued)

(Table 1 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Mathematics Total				
Participation Status								
Orchestra	44	72.4	11.90	69.4	12.90	65.3		
Band	120	68.5	15.17	67.5	13.24	66.0	0.42	.6584
No Participation	106	61.7	16.16	61.8	13.52	65.1		
				Homogeneity of Regression				
							1.50	.2241
				Total Scores				
Participation Status								
Orchestra	44	205.3	33.03	200.0	35.21	187.9		
Band	120	196.4	41.56	197.7	36.08	192.6	2.14	.1201
No Participation	106	175.6	41.38	197.2	35.43	188.1		
				Homogeneity of Regression				
							3.03	.0502

[ab] Difference statistically significant at the .05 level according to the least sum of squares mean test.

Two of the 7 p values were statistically significant at the .05 level; therefore, the hypotheses for these comparisons were rejected. The significant comparisons were for the independent variable, participaton status, and the dependent variables, Reading Vocabulary and Reading Total. The results cited in Table 1 indicated the following:

1. participants in band had statistically higher achievement in Reading Vocabulary than participants in

orchestra or in the control group, and

2. participants in band had statistically higher achievement in Reading Total than participants in the control group.

The assumption for homogeneity of regression was met for all comparisons except Total Test score.

It was hypothesized in composite null hypothesis number two that the difference between the adjusted post mean CTBS scores for fifth grade students participating in instumental music (pretest CTBS scores as covariate measures), according to gender, would not be statistically significant. Information pertaining to composite null hypothesis number two was presented in table 2. The following information was cited in Table 2: variable, group sizes, covariate score means, covariate score standard deviations, posttest score means, posttest score standard deviations, adjusted posttest score means, F values, and p levels.

Table 2

A Comparison of Adjusted Posttest Mean Comprehensive Tests of Basic Skills Scores (CTBS Level 14 Covariate Measures) of Students Receiving Instrumental Music Instruction According to Gender Employing a Single-factor Analysis of Covariance

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Reading Comprehension				
Gender								
Female	95	39.1	8.17	38.0	8.06	37.9		
							0.02	.8964
Male	69	38.7	9.50	37.6	8.21	37.8		
				Homogeneity of Regression				
							0.10	.7482
				Reading Vocabulary				
Gender								
Female	95	29.7	5.98	28.8	6.42	28.5[a]		
							4.27	.0403
Male	69	28.7	5.94	29.6	6.91	30.0[b]		
				Homogeneity of Regression				
							0.04	.8457

(continued)

(Table 2 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Reading Total				
Gender								
Female	95	68.9	12.83	66.8	13.12	66.3		
							1.39	.2396
Male	69	67.4	14.30	66.9	14.55	67.6		
				Homogeneity of Regression				
							0.01	.9217
				Mathematics Computation				
Gender								
Female	95	35.6	6.91	34.5	5.75	33.8		
							0.77	.3801
Male	69	32.8	8.42	32.3	6.46	33.2		
				Homogeneity of Regression				
							0.16	.6906
				Mathematics Concepts and Applications				
Gender								
Female	95	35.5	8.16	34.4	7.99	34.5		
							0.00	.9775
Male	69	35.4	8.29	34.7	8.66	34.6		
				Homogeneity of Regression				
							0.03	.8628
				Mathematics Total				
Gender								
Female	95	70.5	13.93	68.9	12.55	68.1		
							0.06	.8093
Male	69	68.0	14.83	66.8	13.91	67.8		
				Homogeneity of Regression				
							0.07	.7956

(continued)

(Table 2 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Total Scores				
Gender								
Female	95	202.3	38.27	200.4	34.28	197.5		
							0.50	.4823
Male	69	194.0	41.06	195.4	37.76	199.4		
				Homogeneity of Regression				
							0.13	.7161

[ab] Difference statistically significant at the .05 level according to the least sum of squares mean test.

One of the 7 p values was statistically significant at the .05 level; therefore, the hypothesis for this comparison was rejected. The significant comparison was for the independent variable, gender, and the dependent variable, Reading Vocabulary. The results cited in Table 2 indicated that males receiving instrumental music instruction scored significantly higher in Reading Vocabulary than females receiving instrumental music instruction. The assumption of homogeneity of regression was met for all comparisons.

It was hypothesized in composite null hypothesis number three that the differences among the adjusted post mean CTBS scores for fifth grade students participating in instrumental music (pretest CTBS scores as covariate measures), according to race, would not be statistically

significant. Information pertaining to composite null hypothesis number three was presented in table 3. The following information was cited in Table 3: variable, group sizes, covariate score means, covariate score standard deviations, posttest score means, posttest score standard deviations, adjusted posttest score means, F values, and p levels.

Table 3

A Comparison of Adjusted Posttest Mean Comprehensive Tests of Basic Skills Scores (CTBS Level 14 Covariate Measures) of Students Receiving Instrumental Music Instruction According to Race Employing a Single-factor Analysis of Covariance

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Reading Comprehension				
Race								
White	140	39.0	8.85	38.1	8.31	38.0		
Hispanic	19	36.9	7.94	35.5	6.64	36.9	0.36	.6968
Other	5	43.6	4.72	40.4	6.11	37.2		
				Homogeneity of Regression				
							2.32	.1013
				Reading Vocabulary				
Race								
White	140	29.5	6.02	29.4	6.58	29.3		
Hispanic	19	27.3	5.57	26.7	7.38	28.2	0.76	.4701
Other	5	31.8	4.60	29.4	2.61	27.5		
				Homogeneity of Regression				
							0.47	.6290
				Reading Total				
Race								
White	140	68.5	13.63	67.4	14.00	67.1		
Hispanic	19	64.2	12.44	62.2	12.16	65.7	0.78	.4579
Other	5	75.4	8.26	69.8	8.64	63.6		
				Homogeneity of Regression				
							0.76	.4683

(continued)

(Table 3 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
Mathematics Computation								
Race								
White	140	34.0	8.01	33.6	6.19	33.8		
Hispanic	19	36.5	5.40	33.1	6.28	32.0	1.41	.2474
Other	5	37.0	4.00	34.0	5.10	32.6		
Homogeneity of Regression								
							0.35	.7081
Mathematics Concepts and Applications								
Race								
White	140	35..	8.29	35.2	8.16	34.9		
Hispanic	19	32.7	6.86	30.5	8.31	32.4	1.76	.1750
Other	5	32.0	9.14	31.4	6.80	33.8		
Homogeneity of Regression								
							0.81	.4473
Mathematics Total								
Race								
White	140	69.6	15.03	68.7	13.36	68.6[a]		
Hispanic	19	69.2	10.33	63.6	11.76	63.9[b]	3.25	.0413
Other	5	69.0	12.49	65.4	9.71	65.7		
Homogeneity of Regression								
							0.12	.8837
Total Scores								
Race								
White	140	199.4	40.77	199.8	36.71	199.3		
Hispanic	19	191.2	32.13	186.8	29.57	192.9	2.02	.1361
Other	5	212.4	29.18	200.6	24.65	189.7		
Homogeneity of Regression								
							0.31	.7303

[ab] Difference statistically significant at the .05 level according to the least sum of squares mean test.

One of the 7 p values was statistically significant at the .05 level; therefore, the hypothesis for this comparison was rejected. The significant comparison was for the independent variable, race, and the dependent variable, Mathematics Total. The information cited in Table 3 indicated that White students receiving instrumental music instruction scored significantly higher achievement in Mathematics Total than Hispanic students receiving instrumental music instruction. The assumption of homogeneity of regression was met for all comparisons.

It was hypothesized in composite null hypothesis number four that the difference between the adjusted post mean CTBS scores for fifth grade students participating in instrumental music (pretest CTBS scores as covariate measures), according to socioeconomic status would not be statistically significant. Information pertaining to composite null hypothesis number four was presented in Table 4. The following information was cited in Table 4: variable, group sizes, covariate score means, covariate score standard deviations, posttest score means, posttest score standard deviations, adjusted posttest score means, F values, and p levels.

Table 4

A Comparison of Adjusted Posttest Mean Comprehensive Tests of Basic Skills Scores (CTBS Level 14 Covariate Measures) of Students Receiving Instrumental Music Instruction According to Socioeconomic Status Employing a Single-factor Analysis of Covariance

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
			Reading Comprehension					
Socioeconomic Status								
No Free/Reduced price lunch	116	39.6	8.77	38.7	7.97	38.2	2.02	.1573
Free/Reduced price lunch	48	37.2	8.50	35.8	8.12	36.9		
			Homogeneity of Regression				0.01	.9203
			Reading Vocabulary					
Socioeconomic Status								
No Free/Reduced price lunch	116	29.8	5.88	29.9	6.66	29.5	3.03	.0835
Free/Reduced price lunch	48	28.1	6.06	27.2	6.17	28.1		
			Homogeneity of Regression				0.72	.3983

(continued)

(Table 4 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Reading Total				
Socioeconomic Status								
No Free/Reduced price lunch	116	69.5	13.48	68.4	13.79	67.4		
							2.34	.1284
Free/Reduced price lunch	48	65.3	13.02	62.9	12.79	65.5		
				Homogeneity of Regression				
							0.04	.8358
				Mathematics Computation				
Socioeconomic Status								
No Free/Reduced price lunch	116	34.4	7.93	33.7	5.81	33.7		
							0.23	.6323
Free/Reduced price lunch	48	34.4	7.15	33.3	6.91	33.3		
				Homogeneity of Regression				
							1.84	.1765
				Mathematics Concepts and Applications				
Socioeconomic Status								
No Free/Reduced price lunch	116	36.0	8.18	35.6	8.00	34.9		
							2.55	.1119
Free/Reduced price lunch	48	33.4	8.00	32.1	8.42	33.5		
				Homogeneity of Regression				
							0.65	.4212

(continued)

(Table 4 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Mathematics Total				
Socioeconomic Status								
No Free/Reduced price lunch	116	70.2	14.80	69.1	12.64	68.5		
							1.90	.1704
Free/Reduced price lunch	48	67.8	13.49	65.4	14.06	66.7		
				Homogeneity of Regression				
							1.94	.1657
				Total Scores				
Socioeconomic Status								
No Free/Reduced price lunch	116	201.8	39.93	202.3	34.97	199.9[a]		
							4.05	.0457
Free/Reduced price lunch	48	191.6	38.08	188.5	36.10	194.3[b]		
				Homogeneity of Regression				
							1.22	.2715

[ab] Difference statistically significant at the .05 level according to the least sum of squares mean test.

One of the 7 p values was statistically significant at the .05 level; therefore, the hypothesis for this comparison was rejected. The significant comparison was for the independent variable, socioeconomic status, and the dependent variable, Total Score. The results cited in Table 4 indicated that participants in instrumental music who did not receive free/reduced price lunch had statistically higher achievement in Total Score than participants who did receive free/reduced price lunch. The

assumption for homogeneity of regression was met for all comparisons.

It was hypothesized in composite null hypothesis number five that the difference between the adjusted post mean CTBS scores for fifth grade students participating in instumental music (pretest CTBS scores as covariate measures), according to family structure (as defined by school district), would not be statistically significant. Information pertaining to composite null hypothesis number five was presented in table 5. The following information was cited in Table 5: variable, group sizes, covariate score means, covariate score standard deviations, posttest score means, posttest score standard deviations, adjusted posttest score means, F values, and p levels.

Table 5

A Comparison of Adjusted Posttest Mean Comprehensive Tests of Basic Skills Scores (CTBS Level 14 Covariate Measures) of Students Receiving Instrumental Music Instruction According to Family Structure Employing a Single-factor Analysis of Covariance

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
			Reading Comprehension					
Family Structure								
Single-parent home	35	34.6	9.27	34.5	7.12	37.3	0.47	.4938
Two-parent home	129	40.1	8.22	38.8	8.10	38.0		
			Homogeneity of Regression				2.96	.0872
			Reading Vocabulary					
Family Structure								
Single-parent home	35	28.1	6.63	27.4	7.66	28.3	1.36	.2454
Two-parent home	129	29.6	5.75	29.6	6.26	29.4		
			Homogeneity of Regression				0.44	.5099

(continued)

(Table 5 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
Reading Total								
Family Structure								
Single-parent home	35	62.6	14.30	61.6	12.96	66.5	1.10	.7516
Two-parent home	129	69.8	12.84	68.2	13.60	66.9		
Homogeneity of Regression							0.64	.4240
Mathematics Computation								
Family Structure								
Single-parent home	35	33.7	8.01	32.4	6.29	32.7	1.50	.2226
Two-parent home	129	34.6	7.62	33.9	6.08	33.8		
Homogeneity of Regression							0.02	.9003
Mathematics Concepts and Applications								
Family Structure								
Single-parent home	35	33.0	8.00	32.6	8.69	34.3	0.08	.7799
Two-parent home	129	35.8	8.17	35.1	8.08	34.6		
Homogeneity of Regression							0.28	.5953
Mathematics Total								
Family Structure								
Single-parent home	35	66.7	14.45	65.0	13.27	67.0	0.69	.4062
Two-parent home	129	70.3	14.40	68.8	13.04	68.3		
Homogeneity of Regression							0.02	.8901

(continued)

(Table 5 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Total Scores				
Family Structure								
Single-parent home	35	185.1	41.05	185.3	34.98	196.2	1.72	.3965
Two-parent home	129	202.5	38.48	201.8	35.27	198.9		
				Homogeneity of Regression				
							0.83	.3647

None of the 7 p values were statistically significant at the α.05 level; therefore, the hypotheses for these comparisons were retained. The results cited in Table 5 indicated no association between the independent variable, family structure, and any dependent variable. The assumption for homogeneity of regression was met for all comparisons.

It was hypothesized in composite null hypothesis number six that the differences among the adjusted postmean CTBS scores for fifth grade students participating in instrumental music (pretest CTBS scores as covariate measures), according to mother's level of formal education, would not be statistically significant. Information pertaining to composite null hypothesis number six was presented in Table 6. The following information was cited in Table 6: variable, group sizes, covariate score means,

covariate score standard deviations, posttest score means, posttest score standard deviations, adjusted posttest score means, *F* values, and *p* levels.

Table 6

A Comparison of Adjusted Posttest Mean Comprehensive Tests of Basic Skills Scores (CTBS Level 14 Covariate Measures) of Students Receiving Instrumental Music Instruction According to Mother's Level of Formal Education Employing a Single-factor Analysis of Covariance

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
			Reading Comprehension					
Mother's Level of formal education								
Primary	9	38.0	6.08	33.8	6.00	34.4		
High School diploma	53	37.1	8.69	35.7	8.21	36.9		
Post High School	96	39.9	9.06	39.2	7.99	38.5	2.53	.0593
No information	6	39.8	5.04	40.5	6.63	39.9		
			Homogeneity of Regression				0.72	.5441
			Reading Vocabulary					
Mother's Level of formal education								
Primary	9	28.2	4.12	26.1	3.72	26.9[a]		
High School diploma	53	27.5	5.63	25.9	6.37	27.2[a]		
Post High School	96	30.4	6.19	31.1	6.19	30.3[b]	5.77	.0009
No information	6	28.7	3.39	29.7	7.42	30.1		
			Homogeneity of Regression				0.80	.4973

(continued)

(Table 6 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Reading Total				
Mother's Level of formal education								
Primary	9	66.2	8.44	59.9	8.62	61.6[ac]		
High School diploma	53	64.6	13.46	61.2	14.42	64.3[c]	6.00	.0007
Post High School	96	70.5	13.75	70.4	12.56	68.5[b]		
No information	6	68.5	7.66	70.2	13.14	70.0[bc]		
				Homogeneity of Regression			1.71	.1666
				Mathematics Computation				
Mother's Level of formal education								
Primary	9	34.1	5.90	33.3	6.78	33.5		
High School diploma	53	33.7	7.76	31.6	6.45	31.9[a]	4.29	.0061
Post High School	96	34.7	7.97	34.7	5.81	34.6[b]		
No information	6	36.2	5.19	32.8	3.37	31.9		
				Homogeneity of Regression			0.48	.6965
				Mathematics Concepts and Applications				
Mother's Level of formal education								
Primary	9	32.4	5.41	30.9	8.37	33.0		
High School diploma	53	32.8	8.72	32.2	8.44	34.0	0.68	.5652
Post High School	96	36.9	7.68	36.3	7.83	35.0		
No information	6	33.2	9.56	33.0	7.24	34.5		
				Homogeneity of Regression			0.52	.6684

(continued)

(Table 6 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
				Mathematics Total				
Mother's Level of formal education								
Primary	9	66.6	9.81	64.2	12.90	66.3		
High School diploma	53	66.5	15.46	63.3	13.25	65.4[a]		
							3.64	.0141
Post High School	96	71.4	14.17	71.1	12.59	69.7[b]		
No information	6	69.3	12.48	65.8	9.04	66.0		
				Homogeneity of Regression				
							0.10	.9614
				Total Scores				
Mother's Level of formal education								
Primary	9	189.7	23.55	181.2	27.34	188.3[a]		
High School diploma	53	189.4	40.57	184.8	34.95	192.1[a]		
							6.26	.0005
Post High School	96	204.6	39.98	207.1	34.60	202.6[b]		
No information	6	203.2	29.95	202.7	32.43	199.3		
				Homogeneity of Regression				
							0.43	.7323

[abc] Difference statistically significant at .05 level according to the least sum of squares mean test.

Five of the 7 p values were statistically significant at the .05 level; therefore, the hypotheses for these comparisons were rejected. The significant comparisons were for the independent variable, mother's level of formal education, and the dependent variables Reading Vocabulary, Reading Total, Mathematics Computation, Mathematics Total,

and Total Score. The results cited in Table 6 indicated the following:

1. instrumental students whose mothers had a post high school education scored statistically higher achievement in Reading Vocabulary than those whose mothers had a primary or high school education;

2. instrumental students whose mothers had a post high school education scored statistically higher achievement in Reading Total than those whose mothers had a primary or high school education, and students for whom information about mother's level of formal education was unavailable scored statistically higher achievement in Reading Total than those whose mothers had a primary education;

3. instrumental students whose mothers had a post high school education scored statistically higher achievement in Mathematics Computation than those whose mothers had a high school education;

4. instrumental students whose mothers had a post high school education scored statistically higher achievement in Mathematics Total than those whose mothers had a high school education; and

5. instrumental students whose mothers had a post high school education scored statistically higher achievement in Total Score than those whose mothers had a primary or high school education.

The assumption of homogeneity of regression was met for all

comparisons.

It was hypothesized in composite null hypothesis number seven that the difference between the adjusted post mean CTBS scores for fifth grade students participating in instumental music (pretest CTBS scores as covariate measures), according to length of time in the school district, would not be statistically significant. Information pertaining to composite null hypothesis number seven was presented in table 7. The following information was cited in Table 7: variable, group sizes, covariate score means, covariate score standard deviations, posttest score means, posttest score standard deviations, adjusted posttest score means, F values, and p levels.

Table 7

A Comparison of Adjusted Posttest Mean Comprehensive Tests of Basic Skills Scores (CTBS Level 14 Covariate Measures) of Students Receiving Instrumental Music Instruction According to Length of Time in School District Employing a Single-factor Analysis of Covariance

Variable	*n*	Covariate *M*	Covariate *s*	Posttest *M*	Posttest *s*	Adjusted posttest *M*	*F* value	*p* level
			Reading Comprehension					
Length of Time in School District								
Enrolled after beginning of 1989-90 school year	11	38.3	10.16	37.4	9.74	37.8	0.00	.9840
Enrolled at or before beginning of 1989-90 school year	153	39.0	8.66	37.9	8.01	37.8		
			Homogeneity of Regression				0.71	.4011
			Reading Vocabulary					
Length of Time in School District								
Enrolled after beginning of 1989-90 school year	11	30.3	6.13	29.7	7.21	29.0	0.01	.9107
Enrolled at or before beginning of 1989-90 school year	153	29.2	5.96	29.1	6.60	29.1		
			Homogeneity of Regression				0.37	.5465

(continued

(Table 7 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
			Reading Total					
Length of Time in School District								
Enrolled after beginning of 1989-90 school year	11	68.5	15.95	67.1	15.75	66.8	0.00	.9972
Enrolled at or before beginning of 1989-90 school year	153	68.2	13.31	66.8	13.60	66.8		
			Homogeneity of Regression				0.12	.7308
			Mathematics Computation					
Length of Time in School District								
Enrolled after beginning of 1989-90 school year	11	35.1	7.67	33.2	5.58	32.8	0.31	.5794
Enrolled at or before beginning of 1989-90 school year	153	34.4	7.72	33.6	6.19	33.6		
			Homogeneity of Regression				0.20	.6581
			Mathematics Concepts and Applications					
Length of Time in School District								
Enrolled after beginning of 1989-90 school year	11	36.7	7.60	34.2	10.16	33.0	0.98	.3231
Enrolled at or before beginning of 1989-90 school year	153	35.1	8.25	34.6	8.14	34.7		
			Homogeneity of Regression				0.91	.3422

(continued)

(Table 7 continued)

Variable	n	Covariate M	Covariate s	Posttest M	Posttest s	Adjusted posttest M	F value	p level
			Mathematics Total					
Length of Time in School District								
Enrolled after beginning of 1989-90 school year	11	71.8	14.00	67.4	14.85	65.7	0.99	.3220
Enrolled at or before beginning of 1989-90 school year	153	69.3	14.50	68.0	13.06	68.2		
			Homogeneity of Regression				0.77	.3822
			Total Scores					
Length of Time in School District								
Enrolled after beginning of 1989-90 school year	11	199.7	44.63	197.4	41.10	196.6	0.12	.7258
Enrolled at or before beginning of 1989-90 school year	153	198.7	39.33	198.4	35.49	198.4		
			Homogeneity of Regression				0.28	.6000

None of the 7 p values were statistically significant at the .05 level; therefore, the hypotheses for these comparison were retained. The results cited in Table 7 indicated no association between the independent variable, length of time in the school district, and any dependent variable. The assumption of homogeneity of regression was met for all comparisons.

Discussion

The purpose of the researcher was to investigate the influence of instrumental music instruction on the academic achievement of fifth grade students. Independent variables were instrumental music status, gender, race, socioeconomic status, family structure (as defined by the school district involved), mother's level of formal education, and length of time in the school district. The following scores from the Comprehensive Tests of Basic Skills, Fourth Edition, Level 15 were used as dependent variables: Reading Comprehension, Reading Vocabulary, Mathematics Computation, Mathematics Concepts and Applications, Reading Total, Mathematics Total, and Total Score. The following scores from the Comprehensive Tests of Basic Skills, Fourth Edition, Level 14 were used as covariate measures: Reading Comprehension, Reading Vocabulary, Mathematics Computation, Mathematics Concepts and Applications, Total Reading, Total Mathematics, and Total Score.

The present research was conducted in a southwestern Kansas school district with an enrollment of approximately 4,500 students. The school district is located in a city of approximately 20,000 people. The sample included all fifth grade students enrolled in the school district during the 1991-92 school year who had scores for both Level 14 and Level 15 of the Comprehensive Tests of Basic Skills, Fourth Edition. The total sample included 270 fifth grade

students, 135 males and 135 females. The subjects self-selected participation in instrumental music instruction (band or orchestra) or nonparticipation in instrumental music instruction. Those who chose instrumental music instruction included 69 males and 95 females for a total of 164 students.

Seven composite null hypotheses were tested employing a single-factor analysis of covariance. All comparisons were for main effects. A total of 49 comparisons were made. Of the 49 comparisons, ten were significant at the .05 level. The following ten comparisons were significant:

1. participation status in instrumental music and Reading Vocabulary;

2. participation status in instrumental music and Reading Total;

3. gender of instrumental students and Reading Vocabulary;

4. race of instrumental students and Mathematics Total;

5. socioeconomic status of instrumental students and Total Score;

6. instrumental students' mother's level of formal education and Reading Vocabulary;

7. instrumental students' mother's level of formal education and Reading Total;

8. instrumental students' mother's level of formal

education and Mathematics Computation;

9. instrumental students' mother's level of formal education and Mathematics Total; and

10. instrumental students' mother's level of formal education and Total Score.

These comparisons indicated the following:

1. participants in band had statistically higher achievement in Reading Vocabulary than either participants in orchestra or in the control group;

2. participants in band had statistically higher achievement in Reading Total than participants in the control group;

3. males receiving instrumental music instruction scored statistically higher achievement in Reading Vocabulary than females receiving instrumental music instruction;

4. White students receiving instrumental music instruction scored statistically higher achievement in Mathematics Total than Hispanic students or students from other races receiving instrumental music instruction;

5. instrumental students who did not receive free/ reduced price lunch scored statistically higher achievement in Total Score than those who did receive free/reduced price lunch;

6. instrumental students whose mothers had a post high school education scored statistically higher achievement in

Reading Vocabulary than those whose mothers had a primary or high school education;

7. instrumental students whose mothers had a post high school education scored statistically higher achievement in Reading Total than those whose mothers had a primary or high school education, and students for whom information about mother's level of formal education was unavailable scored statistically higher achievement in Reading Total than those whose mothers had a primary education;

8. instrumental students whose mothers had a post high school education scored statistically higher achievement in Mathematics Computation than those whose mothers had a high school education;

9. instrumental students whose mothers had a post high school education scored statistically higher achievement in Mathematics Total than those whose mothers had a high school education; and

10. instrumental students whose mothers had a post high school education showed statistically higher achievement in Total Score than whose whose mothers had a primary or high school education.

The results of this study, which indicated significant differences in achievement in Reading Achievement and Reading Total favoring band students, failed to support the findings of Robitaille and O'Neale (1981) or Kvet (1982/83) that the study of instrumental music was not statistically

associated with achievement in reading. The results of the study supported their findings, along with those of Friedman (1960), that the study of instrumental music was not statistically associated with achievement in mathematics. The results of this study also supported the findings of these researchers that excusing elementary students from regular classroom activities to study instrumental music does not negatively affect achievement in mathematics or reading. The results of this study supported the findings of Friedman (1960) that instrumental study does significantly affect reading achievement. The results of this study supported the findings of Movsesian (1967) that the study of music reading skills positively influenced achievement in reading vocabulary, but did not support his findings that reading comprehension was positively influenced.

The results of the present study appeared to support the following generalizations:

1. an association between participation in band and achievement in Reading Vocabulary and Reading Total;

2. an association between the gender of instrumental students and achievement in Reading Vocabulary;

3. an association between the race of instrumental students and achievement in Mathematics Total;

4. an association between the socioeconomic status of instrumental students and achievement in Total Score;

5. an association between instrumental student's mother's level of formal education and achievement in Reading Vocabulary and Reading Total;

6. an association between instrumental student's mother's level of formal education and achievement in Mathematics Computation and Mathematics Total; and

7. an association between instrumental student's mother's level of formal education and achievement in Total Scores.

The results of the present study appeared to support the implication that time out of the regular classroom for instrumental music instruction does not negatively affect academic achievement. The results of this study did not support the premise that instrumental instruction should be removed from the elementary curriculum because of its negative affect on academic achievement.

The results of the present study appeared to support the following recommendations:

1. the study should be replicated with random sampling;

2. the study should be replicated employing a factoral design;

3. the study should be replicated in other school districts; and

4. the study should be replicated at other grade levels.

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Appendix A

Letter

Susannah Dryden
106 West Mulberry
Dodge City, Kansas 67801

June 12, 1992

Dr. Rod Allen
Assistant Superintendent
USD 443
1000 Second Avenue
Dodge City, Kansas 67801

Dear Dr. Allen:

I am writing to request permission to access information about students who were in the 1991-92 fifth grade class for use in my master's thesis at Fort Hays State University. My topic concerns the effect of participation in instrumental music on CTBS scores. I would need to know each student's fourth grade and fifth grade CTBS scores. I would also like to determine if instrumental music in combination with one of the following variables, changes the effect. These variables include sex, race, socioeconomic level, mother's educational level, family structure, and length of time in USD 443. I have discussed this with Alan Cunningham, and he assures me that this information could be made available to me without violating student confidentiality. I can assign identification numbers to the data, rather than using names. I will greatly appreciate your cooperation in making this study possible. I will gladly share the results of this study with USD 443. Thank you for your help.

Sincerely,

Susannah Dryden

6-15-92
Susannah,
Your proposal seems to be well within the parameters we discussed in May. Please work closely with Alan in protecting student's confidentiality and any possible concomitant collection of additional info. for USD 443 purposes. The district would like a copy of your results.
R Allen

U.S.D. 443
JUN 15 1992

cc. Alan C

Appendix B

Instrumental Music (Band): Schedule, Materials, and Outcomes

Instrumental Music (Band): Schedule, Materials, and Outcomes

Band classes are scheduled daily for a 25-30 minute time period. All band students meet together 3 times weekly. Each student participates in band instruction on 1 of the 2 remaining days for small group and/or individualized instruction.

The following materials are used as a basis for band instruction:

1. Ployhar, J. D. (1977). Band Today. Melville, N.Y.: Belwin Mills; and
2. Ployhar, J. D. (1977). Technique Today. Melville, N.Y.: Belwin Mills.

Band instruction follows an outcomes based approach. Below is an outline of the fifth grade outcomes for band:

FIFTH GRADE WIND AND PERCUSSION OUTCOMES

The students will . . . .

I. Develop an aesthetic awareness, sensitivity, and enjoyment for (instrumental) music.

II. Demonstrate the musical skills with an instrument through:

A. Rhythm:
Demonstrate a steady beat using physical movements while reading music in a variety of patterns and meters at each student's appropriate level.

B. Pitch:
Demonstrate a knowledge of fingerings at appropriate level music.

Demonstrate a characteristic tone on each instrument properly using the following physical skills:
1. Wind
2. Wind Pressure

3. Tongue
4. Lip
5. Lip Tension
6. Right Hand
7. Left Hand

C. Articulation:
Demonstrate knowledge and ability to begin (attack)and end (release) a note by reading the printed music at the student's appropriate level.

D. Dynamics:
Demonstrate the knowledge and ability to play a tone and/or musical passages at different dynamic (loudness) levels from very soft to very loud at student's appropriate level.

E. Tempo:
Apply knowledge of simple tempo markings to music and to follow the beat of the conductor in an ensemble appropriate to the student's level.

F. Musical Expression:
Interpret and recreate printed music at the student's appropriate level using the above fundamentals in melodic phrases that exhibit feelings of tension - release, active to rest, and consonant to dissonant.

Demonstrate a sense of style in the interpretation of jazz, march, classical (orchestral), and contemporary pop/rock music.

G. Stage Presence:
Demonstrate an aesthetic awareness for and an appreciation of the culminating performance of a piece(s) of music through the mediums of solos, small ensembles, and large ensembles.

To develop a student's inward feeling for the creative and self-expressive opportunities found in the successful performance of music.

Appendix C

Instrumental Music (Orchestra): Schedule, Materials, and Outcomes

Instrumental Music (Orchestra): Schedule, Materials, and Outcomes

Orchestra classes are scheduled daily for 25 - 30 minutes. All orchestra students meet with their classes every day.

The following materials are the basis for orchestra class instruction:

1. Anderson, G. & Frost, R. (1985). All for Strings, Book 1. San Diego, CA: Neil A. KJOS Music Company.
2. Supplementary grade 1 orchestra arrangements.

Orchestra Instruction follows an outcomes based approach. Below is an outline of the expected outcomes for fifth grade orchestra:

OBJECTIVES FOR ORCHESTRA, 5th Grade

By the end of the 5th grade, the student will demonstrate to the teacher's satisfaction the following through oral, written, or manual testing:

I. Instrument
   - A. Identification of parts of instrument and bow
   - B. Verbalize rules for care of a string instrument
   - C. Correct left hand position
   - D. Correct bow hand position

II. Tone Production
   - A. Quarter note bow speed
   - B. Half note bow speed
   - C. Whole note bow speed

III. Musical Terms and Notation
   - A. Lines and spaces of the staff
   - B. Ledger lines
   - C. Whole note and rest
   - D. Half note and rest
   - E. Quarter note and rest
   - F. Eighth note and rest
   - G. Dotted half note
   - H. Bar lines
   - I. Measures

J. Treble clef, Alto clef, Bass clef (as applicable to instrument)
K. Repeat signs
L. Double bars
M. First and second endings
N. D. C.
O. D. S.
P. Fine
Q. 2/4, 3/4, 4/4 meters
R. Pizzicato
S. Arco
T. Fermata
U. Sharps
V. Flats
W. Naturals
X. Staccato

IV. Fingerings
A. C string - 1st position, key of C
B. G string - 1st position, keys of C & G
C. D string - 1st position, keys of C, G, and D
D. A string - 1st position, keys of C, G, and D
E. E string - 1st position, keys of G and D
F. Basses - 2nd position

V. Bowing Skills
A. Down Bow
B. Up Bow
C. Slurs - 2 per bow

VI. Intonation
A. Correct finger placement using dots as guides

VII. Ensemble Playing
A. Rounds
B. Two-part playing
C. Three-part playing