A STUDY OF THE EFFECT OF SCHOOL-SPONSORED, EXTRA-CURRICULAR ACTIVITIES ON HIGH SCHOOL STUDENTS' CUMULATIVE GRADE POINT AVERAGE, SAT SCORE, ACT SCORE, AND CORE CURRICULUM SUBJECT GRADE POINT AVERAGE

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This study investigated the effect of school-sponsored, extra-curricular activities on academic achievement for students at a private school in north central Texas. Students selected for this study were graduates from the classes of 1996, 1997, 1998, 1999, and 2000. With a minimum participation of two years during grades nine through twelve, students were categorized into subgroups of activities. After eliminating students who participated in more than one of the extra-curricular activities of music, drama, visual arts, and athletics, three hundred sixty-one students were represented. The identity of students was encoded and information was recorded for gender, school-sponsored, extra-curricular activities, cumulative grade point averages, SAT Scores, ACT Scores, and cumulative grade point averages in core curriculum subjects.

A two-way ANOVA test with a two-by-five factorial design was completed for research questions one through four. A one-way ANOVA with a one-by-five factorial design was completed for research question five. When a significant *F* was found, Scheffe and LSD post hoc tests were completed to determine pair wise interaction. Statistical differences did exist when comparing school-sponsored, extra-curricular activities and cumulative grade point averages with musicians having a significantly higher cumulative grade point average, SAT scores, and ACT scores than athletes. A significant difference was found among the activity subgroups regarding the cumulative

grade point averages in the core curriculum subjects of foreign language, history/English (an interdisciplinary subject at the studied school), mathematics, and science with musicians scoring significantly higher than athletes in all subjects.

It is recommended that further studies be conducted to investigate the impact of activities on student achievement. Studies might include larger and different populations, the impact of participation at a younger age, and the impact of other activities on student achievement.

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CHAPTER 1

INTRODUCTION

Education in the area of the arts has often been regarded as "extras," and when administrators look for ways to trim the annual budget, the arts typically received the biggest cut in the curriculum. When educators look to strengthen core academic subjects, the arts receive little credit in developing the competency of student skills in the traditional academic subjects such as math, science, English, history, and foreign language. Arguments for budget cuts to the arts have forced the disciplines of music, visual art, dance, and dramatic arts to provide a convincing and thorough justification for their place within the school curriculum.

Malouf (1998) quoted the director of college counseling at St. Marks School, a most prestigious college preparatory program in Dallas, Texas, as saying,

> "It turns out that kids who are involved in extra-curricular activities are more likely to be successful students. They're generally motivated to do the schoolwork that allows them to keep doing the activities that they love. Outside pressure may result in burnout. But self-pressure they can endure" (p. 44).

Historically, motivation plays a key role in the academic success of each student. Dewey (1913) writes,

> "Persons, children or adults, are interested in what they

> can do successfully, in what they approach with confidence and engage in with a sense of accomplishment. Such happiness or interest is not self-conscious or selfish; it is a sign of developing power and of absorption in what is being done" (p. 35).

The interest for this study developed from the following personal observations:

1) As a faculty participant at more than twenty high school graduation ceremonies, observations of a pattern emerged. Valedictorians and salutatorians were usually musicians.

2) House Bill 588 mandated from the Texas legislature dictated that the top ten percent of each graduation class in Texas would automatically be admitted to state colleges and the top eleven to twenty-five percent with the required SAT or ACT score would also be automatic admits. A second observation was that among the students considered for automatic admission to a state college (i.e. the top ten percent and top eleven to twenty-five percent), musicians and fine arts participants were consistently prominent in class rank.

3) A third observation was made at the annual meetings of The College Board in 1998 and 1999. Each year, The College Board recognizes the top AP Scholars from across the United States. This honor is achieved through perfect scores on the AP examinations, and the students honored are not set in number and vary from six to twelve

students each year. Consistently, the majority of AP Scholars honored have been musicians and participants in other fine arts.

Students who do not participate in school-sponsored, extra-curricular activities often cite the desire to spend more time on academic work and believe that the school-sponsored, extra-curricular activities involve too much time, placing a strain on time that could be devoted to academic work. This study was designed to determine whether a tenuous cause-effect relationship could be established between participation/non-participation in school-sponsored, extra-curricular activities and academic achievement at a private school in north central Texas. The study included the activities of music, dramatic arts, visual arts, athletics, and non-participation (i.e. choosing not to participate in school-sponsored, extra-curricular activities). The component of dance, albeit an art form, was not included in this study as dance was not a school-sponsored, extra-curricular activity at the school in this study. The school-sponsored, athletic extra-curricular activities in this study included football, volleyball, soccer, wrestling, baseball, softball, basketball, tennis, golf, and swimming. The aforementioned fine arts and athletics were the only school-sponsored activities offered at the school.

Purpose of the Study

The purpose of this study was to determine whether a cause-effect relationship existed between participation/non-participation in school-sponsored, extra-curricular activities (fine arts and athletics) and the academic development of students beginning with grade nine and concluding with grade twelve at a private north central Texas school. The study compared subgroups of the graduates, comparing the SAT scores, ACT scores,

and cumulative grade point averages of student participants or non-participants in school-sponsored, extra-curricular activities (fine arts and athletics). In addition to males and females, the graduates were divided into the following five subgroups:

1) Musicians (vocal and instrumental),
2) Thespians,
3) Visual artists,
4) Athletes (students who participate in varsity sports), and
5) Non-Participants (students who do not participate in school-sponsored, extra-curricular activities).

It should be noted that, at this particular school, dance was not offered, and the fine arts opportunities at the school were limited to vocal and instrumental music, visual arts, and dramatic arts. It should also be noted that the only school-sponsored, extra-curricular activities offered are fine arts and athletics. The school did not sponsor any clubs that would be considered extra-curricular activities. The criteria for membership in each of the aforementioned school-sponsored, extra-curricular groups was a minimum level of participation in that group for at least two of the four high school years in grades nine through twelve. A total population of four hundred and forty-nine students met the criteria for inclusion in this study. After eliminating students who cross participate, i.e. those who participate in two or more of the subgroups, a total of three hundred sixty-one student records were included in the study. Eliminating students who participate in multiple activities helped to preserve the integrity of the subgroups.

This study attempted to determine whether a cause-effect relationship existed between participation in school-sponsored, extra-curricular activities and cumulative grade point averages earned, SAT scores, and ACT scores for students at a private school in north central Texas. The study offered important information to administrators, instructors, parents, and students. For administrators, the findings of this study may influence future school budgets and curriculum development. For instructors, this research could help to create an awareness of the important impact of extra-curricular activities on classroom achievement may help to create a more positive learning environment. If the cause-effect relationship is established, educators may then plan for the integration of the arts into the classroom activities and no longer consider these activities as exclusively extra-curricular. For students and parents, the findings of this study may assist in the comprehensive planning of courses to take or which extra-curricular activities to engage in during grades nine through twelve. Eisner (2000) offered the following suggestion for reshaping the curriculum.

> "The times seem receptive to the possibilities of the arts as a way not only to enrich human experience in its own right, but also to promote the development of what might be too narrowly called 'mental skills'" (p.4).

Eisner continued to state that past standards for the arts within the school curriculum have been problematic largely due to the fact that educators outside of the arts areas formulated the policies. He suggested that since formal curriculum planning had incorporated

everything else without resounding success, that it may be time to give arts educators an opportunity to produce a curriculum that would include the infusion of the arts.

Many theories revolve around the impact of the arts, specifically music, to the development of intellectual achievement. However, very little previous research actually verified those theories for students in grades nine through twelve. This study has the potential to add significantly to the current literature by determining whether a cause-effect relationship can be established between participation or non-participation in school-sponsored, extra-curricular fine arts activities or athletic activities and academic achievement. The study could potentially impact the core curriculum by contributing to the research evidence supporting the inclusion or continuation of the arts as and important part of the school curriculum.

Research Questions

The study investigated five research questions as follows:

1) What is the effect of participation or non-participation in school-sponsored, extra-curricular activities (i.e. music, drama, visual arts, and athletics) on the high school cumulative grade point average?
2) What is the effect of participation or non-participation in school-sponsored, extra-curricular activities (i.e. music, drama, visual arts, and athletics) on high school SAT scores?
3) What is the effect of participation or non-participation in school-sponsored, extra-curricular activities (i.e. music, drama, visual arts, and athletics) on the high school ACT scores?

4) Does the gender of participants in school-sponsored, extra-curricular activities (i.e. music, drama, visual arts, and athletics) and of non-participants make a difference in their cumulative grade point averages, SAT scores, and ACT scores?

5) What is the effect of participation or non-participation in school-sponsored, extra-curricular activities (i.e. music, drama, visual arts, and athletics) on cumulative subject grade point averages earned in computer science, foreign language, history/English (an interdisciplinary course at the school studied), mathematics, and science?

Significance of the Study

This study has the potential to add to the existing literature. Several research studies have been completed on younger students and the influence of activities, especially music, to the growth and development of the child. Very little research has been conducted on students at the high school age level regarding their choices of school-sponsored, extra-curricular activities as it relates to academic growth and achievement.

Limitations of the Study

The study was limited by the parameters of school-sponsored high school extra-curricular activity participation at a private school in north central Texas. At the school included in this study, the school-sponsored fine arts activities included band, choir,

chorale, theater arts, and visual arts. While dance was recognized as a fine art, it was not a school-sponsored activity and was, therefore, not included in this study.

The study was also limited due to its causal-comparative nature. The alleged cause had previously occurred, and students were not randomly assigned to subgroups. Thus, it was possible that the subgroups differed in some significant way other than the independent variable of music, drama, visual arts, athletics, and non-participants.

This study was limited to students at one school. Thus, the findings of this study may not transfer beyond the local setting. All students at the school progressed through a curriculum with the following common features:

1) A minimum of two years of foreign language.
2) Four years of English and history.
3) Four years of mathematics with a range from algebra I through calculus BC (the highest level of calculus offered during high school).
4) Three laboratory sciences consisting of biology, physics, and chemistry.
5) Computer science is not a requirement for graduation; therefore, it is considered an optional course.

Delimitations of the Study

The study did not consider whether a student had participated in the fine arts and athletic activities prior to the ninth grade year of high school. While it was possible that an athlete may have also participated in fine arts at an earlier age, it was equally possible for a fine arts person to have been in competitive athletics at an earlier age. However, the question under study is the impact of school-sponsored, extra-curricular activities on

achievement during high school (grades nine through twelve), and due to the sanction and uniform regulations of high school participation throughout the state of Texas, the study was limited to participation during grades nine through twelve only.

When calculating the grade point average, no consideration or weight was allowed for course work designated as honors level or Advanced Placement level in foreign language, English/history (an interdisciplinary course at this school), mathematics, science, and computer science. Participation in honors and/or Advanced Placement course work was not controlled for in this study when calculating the cumulative grade point average. For example, a mathematics student could have taken any of the mathematics courses beginning with algebra I and including geometry, algebra II, pre-calculus, calculus AB, and calculus BC.

Basic Assumptions of the Study

One assumption was that the school-sponsored, extra-curricular activities available to the students described in this study were consistent. A second assumption was that school-sponsored, extra-curricular activities defined as music, dramatic arts, visual arts, and athletics were the only available activities and that no other participation in these activities outside of school-sponsored, activities occurred. A third assumption was that participation in fine arts and athletics prior to grade nine did not significantly impact the data presented. While athletes may have participated in one of the fine arts areas, it is also possible that the fine arts students may have participated in athletics and that the non-participants could have participated in either or both school-sponsored, extra-curricular activities. However, since the question under study was the impact of such

activities on cumulate grade point averages and test score achievement during grades nine through twelve, participation or lack of participation was limited to only grade levels nine through twelve.

Definition of Terms

ACT - The ACT is a standardized test used to determine the aptitude for college level work by an individual. The ACT is administered nationally by the American Center of Testing. Scores may range from 0 to 36, with 36 being a perfect score.

Arts - The subjects of music (both vocal and instrumental), visual art, and dramatic arts. Dance is also considered an art form. However, because it was not offered at the school in this study, it was not included when referring to the arts.

Brain-based learning - The theory that students learn in different ways and that instruction should be presented in a variety of ways in order to reach every student in the classroom.

Brain plasticity - The ability of the brain to create connections, which becomes a multiplicative process of one connection creating two, two creating four, four creating eight, etc.

The College Board - A private company; publisher of the PSAT, SAT, and Advanced Placement Tests and facilitator of academic achievement programs throughout the curriculum, including a program to integrate arts into the high school curriculum.

Constructivism - A learning theory whereby classroom learning is presented in a variety of ways in order to help students make connections from past knowledge to the newly presented material.

Cumulative grade point average - The cumulative grade point average was determined by a numerical average of all grades earned in course work from the ninth grade through the twelfth grade. The calculation used for GPA at the studied school was on a 4.0 scale with a marking of "A" equal to 4.0. The school recognizes truly outstanding work by awarded an "A+" and the student is given .3 bonus point for the mark of "A+". The grading system is outlined in Table 1.

Table 1: Grade Point Calculation

Percent	Letter Grade	Grade Points
100-98	A+	4.3
97-93	A	4.0
92-90	A-	3.7
89-87	B+	3.3
86-83	B	3.0
82-80	B-	2.7
79-77	C+	2.3
76-73	C	2.0

(TCA, 1996 - 2000, 6)

Extra-curricular activities - Student participation in school activities in the areas of music, drama, visual arts, and athletics. These extra-curricular activities were the only school-sponsored, extra- curricular activities available at this private school in north central Texas. Therefore, they are the only extra-curricular activities included in this study.

Fine arts - The areas of music, dramatic arts, dance, and visual arts. For the purpose of this study, dance was not included as it is not a school-sponsored activity at the school.

Gestalt theory - A German psychology theory whereby the whole is presumed to be greater than the sum of its parts.

Grade point average (a.k.a. GPA) - Refers to the students' respective cumulative grade point average, which was determined for each student by a numerical average of all grades earned in course work from the ninth grade year until graduation.

Iowa Test of Basic Skills (a.k.a. ITBS) - A national standardized achievement test.

Mozart effect - A theory that addresses the importance of music in brain development.

Multiple intelligences - A theory of learning that addresses dominance for learning, including abilities in music, athletics, mathematics, sciences, etc.

NCAA - The National Collegiate Athletic Association; the gatekeeper for college athletic eligibility.

Non-participant - Students who do not participate in the school-sponsored, extra-curricular activities of music, drama, visual arts, or athletics for a minimum of two years during grades nine through twelve at the population studied.

Participant (in school-sponsored, extra-curricular activities) - Students who are involved in school-sponsored, extra-curricular activities for a minimum of two years during grades nine through twelve.

SAT - A standardized test to determine the aptitude of an individual for academic success

at college level work. The SAT is administered nationally by The College Board. Scores may range from 0 to 1600, with 1600 being a perfect score.

Spatial-temporal reasoning - The ability to reason in space and through time, which is especially useful in areas such as language, math, and science.

Thespians - Students who participate in a minimum of two years of dramatic arts during grades nine through twelve.

CHAPTER 2

REVIEW OF THE LITERATURE

The Importance of the Arts

When educators look to strengthen core academic subjects, the arts have received little credit in developing the competency of student skills in the traditional academic subjects such as math, science, English, history, and foreign language. Aschbacher (1996) wrote,

> "Infusing art into the curriculum provides students with therapy and motivation. It also gives students important tools for learning from, and communicating with, their world. Most important, it nurtures a sense of confidence..." (p. 40).

The study presented by Hanshumaker (1980) promoted the theory that development exists as a process whereby there are windows in the development of the brain that educators can use to improve the potential mental capacity. More specifically, as a child grows and develops, the stimulus that is received by the brain actually impacts how the brain develops. Learning to play a musical instrument develops interaction between both the right and left sides of the brain. Hanshumaker's study included a random sample of second grade elementary students from four different schools. His conclusion was that

music further improves the coordination of hands, eyes, ears, and exposes creative emotion.

The Gemeinhardt Company, a maker of musical instruments, conducted a study in 1980 of band parents, non-band parents, band students, non-band students, and drop-out band students. Using a survey instrument, the conclusions regarding the value of band participation was reported as follows: ninety-one percent of the band parents, ninety percent of the drop-out band parents, seventy-nine percent of the non-band students, and eighty-two percent of the band students were in agreement that participation in band builds self-esteem, self-confidence, and a sense of accomplishment (Mickela, 2000). This sense of achievement promotes a positive lifestyle and self-fulfillment.

Chapman (1998) offered a possible connection between art and learning. His theory of studying the discipline of art, stated that art helped students learn to view artworks in an analytical way rather than an emotional way. Thus, the analytical skills developed in art instruction which train the student to mentally unwrap and interpret art are then transferred to other disciplines as logical thinking skills and a higher order of problem solving promoting a sense of maturation to a responsible lifestyle.

The Getty Foundation sponsored the North Texas Institute for Educators on the Visual Arts as one of six such programs designed to train educators in applications for integrating the arts into the traditional curriculum. Each institute provided the educational expertise, organizational structure, and resources for networking opportunities that might facilitate a sweeping change in arts education. The institute, which provided opportunities

for a new focus on academic achievement through innovative teaching, considered the arts as a comprehensive whole and as part of the mainstream curriculum. The arts stimulate creativity and promote critical thinking skills, transcending to a variety of core subjects.

Gorden Shaw, professor at the University of California, Irvine, concluded from his neuroscience research that the arts teach spatial-temporal reasoning. With the ability to reason through space and time, students may begin to see the whole puzzle rather than the pieces, and according to the Gestalt Theory, the whole is considered to be greater than the sum of its parts. The ability to develop keen spatial-temporal reasoning may help the students to perform well in subjects such as math, science, and engineering. Shaw states that when students learn to play the piano, they begin thinking ahead in patterns. The ability to think ahead in patterns requires the same thinking process used in critical thinking skills, which are vital to subject areas such as math, science, and foreign language (Rubiner 1997).

The science of neurobiology is still at the dawn of its existence in determining experiences that impact the brain and how it is wired. Before an infant can utter a word, there are sounds. Plato stated, “Music is a more potent instrument than any other form of education” (Hancock, 1996, p. 58). As described in Hancock (1996), the results of a convincing study conducted on preschoolers involved one group that took piano lessons and sang daily. One group studied piano and sang, while the other group did not. At the end of the study, the three-year-olds who studied music were puzzle masters. On spatial intelligence tests, which involve the ability to visualize the world accurately, these

students scored eighty percent higher than the three-year-olds who were not exposed to music. However, even more compelling results, as described by Wilcox (2000), demonstrated similar improvements for students who were considered disadvantaged. The obvious conclusion is that music can be a great tool to level the playing field or if removed from the curriculum to then economically divide it.

In general, curriculum specialists view art and science as polar opposites. Root-Bernstein (1997), a Professor of Physiology at Michigan State University, suggested that they are not. He stated that the sciences are viewed as objective, intellectual, analytical, reproducible, and useful, while the arts are viewed as subjective, sensual, empathic, unique, and frivolous. He also believes that scientists use the arts as scientific tools to gain insights into scientific discoveries. Historical evidence indicates that the sciences and technology flourish only in the presence of the arts and that societies without emphasis on the arts are lacking in the technological and scientific arenas. Scientists and engineers find it necessary to use the skills often learned from the arts, which include the following abilities: to observe acutely; to think spatially and kinesthetically; to identify essential components of a complicated whole; to recognize and invent patterns; to gain a feeling of being empathy; and to visually, verbally, and mathematically communicate the results of thinking. The paradigm is that millions of education dollars are spent on the sciences, while all the arts combined receive less than any one single science in terms of curriculum support. The spatial-temporal approach enhanced by the study of music can easily be generalized to other disciplines within the curriculum. For example, math and Science concepts are made easier when proportions and fractions (products of spatial-

temporal reasoning) are comprehended as a by-product of music study (Graziano, 1999).

At the John Eliot Elementary School in Needham, Massachusetts, music fills the day. After recess, the teacher may play a piece that contains sixty beats a minute to bring the students back into a more calm sense of being. When they study the solar system, Gustav Holst's, "The Planets" can be heard. When the Boston Tea Party was the lesson topic, students composed their own songs and poetry about the historical event. As a result, when the John Eliot students took their state achievement test which has a possible score of 1600, no student at John Eliot scored less than 1570 for their respective grade level (Foreman, 1997).

Brain-based education follows a constructivist learning model. Therefore, brain-based learning is active learning as demonstrated in the paragraph above about the John Eliot School. Students receive input from a variety of senses, and the constructivist classroom educator should present the materials to be mastered in a variety of ways to create a learning environment designed to reach many different learners. Bruer (1999) wrote that teachers should teach meaning and understanding, not just facts. To teach in a constructivist way suggests that the teacher creates a low-threat, high-challenge atmosphere whereby the students enjoy complex experiences. Bruer suggested that this environment is not limited to the brain-based learning theory but is created out of understanding of cognitive and developmental psychology. However, when one applied the two theories together, developmental psychology provided the "software" for the "hardware" of the neurological functions. In other words, brain-based learning attempted to see the parts within the whole, realizing that the Gestalt Theory applies as the whole

becomes greater than the sum of its parts. The application to this research is that (a) learning is not isolated non-art subject matter and (b) the arts, in fact, may contribute greatly to the education of the whole student as students study core curriculum subject matter throughout the formal education curriculum.

Educating the whole student includes a curriculum rich in the arts. Cortines (1999) wrote,

> "Educators say they want materials and activities that are 'constructivist' that is, concrete and hands-on. They seek materials that are multi modal, multi cultural, appealing and challenging to the classroom's diverse range of learners. They look for activities that provide not just one means of assessment but multiple ways to track and evaluate a student's progress. They want materials that promote critical thinking. They look for activities that are interdisciplinary. Research confirms what we always knew intuitively: the arts teach all of us -- students and teachers alike -- innovation, novelty, and creativity. We learn to be wondrous" (p. 6).

The school offering a wide range of speech, drama, broadcasting, creative writing, art, photography, and music courses is said to have a wide impact on traditional subjects within the curriculum. Cortines (1999) contended that the arts

> "...teach students where to look and what to look for in gathering support for an idea. They also help students learn

> to give, to accept, and to follow constructive criticism; listen courteously and critically as others speak; become more logical, more direct, and more creative in organizing thoughts for presentation; learn to control the fear of speaking or performing before an audience, and, as a result, become a more confident person" (p. 61).

Longley (1999) also made a case for arts literacy by suggesting that the arts are advantageous in developing the "four C's" of education: communication, culture, cognition, and creativity. In his view, these four goals are not met merely with a few after school activities, albeit that is often the case. Longley suggested that these four goals, communication, culture, cognition, and creativity, deserved a place in the front of the curriculum integrated into every learning opportunity. Educators of the arts must be vocal and visual in expressing the importance of the arts as a means to stretch far beyond passive learning.

From Athletics to Academia

To determine the possible influence of participation in athletics on academic achievement, statistics from the National Collegiate Athletic Association are relevant. For college admissions personnel, the most difficult and guarded decisions made for admission to the college or university are the admits of student athletes. Jean H. Fetter, former dean of undergraduate admissions at Stanford University, states, "When the Stanford team does well, the coach gets a lot of credit; when the team performs badly, the undergraduate admissions is held responsible" (*Congressional Quarterly*, 1996, p. 6).

One wonders whether the current standards set by the National Collegiate Athletic Association (NCAA) are actually quite generous and whether the NCAA places the value of participation above that of academic achievement. For Division I and II schools, a student must have and maintain a grade point average of 2.0 or a "C" average. In addition, athletes must score a minimum of 700 on the SAT test or a 17 on the ACT test. This criterion is far below average for general college admission. Does this imply that the athletes are not capable of scoring within the range of normal college admission standards? The NCAA has actually proposed standards that would eliminate the SAT or standardized testing as a requirement for athletic competition. Part of the students' academic record is standardized testing and one assumes that athletes have the ability equal to that of any other student to meet the set standards of admission. The *NCAA Register* recorded that from August 1996 through March 1997 the NCAA received and processed two hundred forty-six requests by athletes to waive the minimal requirements to enter a Division I or II college or university. Of the two hundred forty-six requests, one hundred eight (forty-four percent) were granted waivers (NCAA, 1997).

Vilelle (1996) accused the NCAA of hurting the athletic careers of three football players because they were not academically eligible to enroll at the University of Missouri and were, therefore, unable to practice with the football team. The problem of eligibility of athletes is a problem consistent nationwide at colleges and universities, and it may be possible that athletes can also be academic achievers if given the opportunity or incentive to do so. Unless the bar for academic achievement as a requirement to participate in

intercollegiate athletics is maintained, the prestige of earning a college diploma may suffer a great loss on the field and athletic court.

Texas A & M University (1997) produced a document outlining the policies for admitting athletes to the university. The admission process for an athlete fell into four categories: 1) Top ten percent of any Texas graduating class was an automatic admit under House Bill 588; 2) Early Action, whereby a student met the minimum standard admission requirements; 3) Review, whereby some requirements were waived; and 4) Other, whereby most of the standard requirements were waived (p. 5). One can only guess what message "Review" and "Other" must send to high school athletes regarding their academic achievement. Is it not possible to be both a scholar and an athlete?

Artists and Scholars

Art can be more than a painting on an easel or clay on a wheel. Integrating art and art appreciation into the curriculum can be a natural process. Gardner (2000) contended that facts memorized become mere bits and pieces of knowledge. Meaning occurs only when facts are combined into significant patterns. Gardner stated, "Think of facts as Christmas tree ornaments without the tree" (p. 5). To pull the facts together into something meaningful, Gardner suggested that the school curriculum embrace education for understanding which develops students' understanding of truth, beauty, and goodness. To understand the world is to understand Mozart or Picasso. To have knowledge about the Holocaust is to have insight about Kosovo. To understand biology is to understand computer viruses and so forth. Art can bring a visual discipline into the classroom and, in a matter of moments, transform understanding. Factual learning by itself is disjointed.

While it is not necessary to transform the curriculum and remove factual learning, it is possible to enhance the curriculum and provide multiple entry points for in-depth learning. The College Board continues to facilitate workshop programs for educators designed to integrate the arts into the high school curriculum. Relatively simplistic ideas and adjustments to presentations can turn a factual lesson into a meaningful one. Nelson (1998) gave an example of a 1998 workshop for three hundred forty high schools across the United States that created a focal point of infusing the arts into English, math, science, and social studies when an appropriate fit was possible. The institute featured two simplistic approaches: 1) begin each lesson with a work of art; and 2) create a theme for the presentation. The work of art could be a painting, sculpture, or perhaps (on a larger scale) an example of architecture, or a specific setting such as a garden, or scenic view. Through the use of art, students found learning more stimulating rather than cataloging facts. In this century of technology and multimedia, there is little excuse for the absence of creating a rich environment in which learning can be achieved through many of the five senses.

Anderson (1995) wrote, "In most cultures, through time, art has not been for art's sake, but for life's sake" (p. 10). In the field of history, it should be noted that in early Western civilization the arts as individual disciplines did not exist. Specifically, music was not isolated from dance and painting rather the arts were considered to be a "whole". A 1991 project called FLARE, which was developed in part by the California Institute of Technology, designed an art project to develop the mastery of language and visual arts as well as an understanding of diverse cultures through the integration of art into the school

core curriculum. Aschbacher (1996) stated that FLARE was not an add-on or frill to the curriculum, but it had the potential to be a stimulus for learning and communication of rather complex concepts. Programs such as FLARE introduce students to the world of art and artists while encouraging involvement and active participation in visual arts.

To Be or Not To Be

The grandest stage in the world is life, and everyone is a player or actor. The classroom becomes a live stage. Some scenes are high drama, while others appear mundane. Drama does indeed take place in everyday life. Manzo (1997) stated that humanities and the arts are the contenders for school reform. For example, public speaking is a necessary part of life. Speech and debate training, considered part of the dramatic arts, remain necessary skills for success at the collegiate level and in the work force. While innate to some, these are skills which can be acquired. Despite the lack of funding for programs and special classes in the dramatic arts, it is possible and relatively simple to integrate public speaking and debate into the classroom with any subject throughout the curriculum. For example, almost any subject can provide opportunities for dyads, triads, and Socratic style teaching whereby students communicate and ponder (debate) the discovered material and subject matter. Public speaking and dramatic arts, therefore, become important in the development of the whole person. Self-esteem and achievement may therefore be significantly impacted by participation in dramatic arts.

Barrett (1997) completed a survey of art college CEOs, and found that their number one need for curricular change was a well-rounded high school curriculum. The presence of dramatic arts in no way dilutes the academic content of a strong curriculum.

Jensen (1998) stated that if classroom dramas, open discussions, writing, and music are introduced within the first few minutes of class, they can effectively level the playing field for student achievement by taping into multiple interests. These short bursts of learning become crucial to building a powerful memory bank. Meaningless information will be discarded, while important information will become encoded. Wolfe (1998) wrote that scientists have become aware that the brain absorbs the environment and then reassembles the observations to make connections to enhance life. If speaking were genetic, then a child raised in isolation would develop the ability to communicate verbally on his/her own. Therefore, the brain is not fixed when it comes to verbal communication and speech is an activity which can be learned. Active participation in dramatic arts as well as observation generates a rich environment and serves as a conduit to make the connections between knowledge and understanding.

Biernat (1989) researched studies continue to show that participation in extra-curricular activities is beneficial to students. Success at the college level can be predicted more accurately by looking at student activity involvement than by the SAT or ACT scores. Students who participate in dramatic arts have special value in the admissions decisions at colleges and universities. Fred Hargadon, former Dean of Admissions at Stanford University, and the current Dean at Princeton University, states,

> "We look for students who have taken part in orchestra, symphonic band, chorus and drama. It shows a level of energy and an ability to organize time...It shows that they can carry a full academic load and learn something else.

These students know how to get involved and that's the kind of college student that we want to have" (Mickela, 2000, p. 3).

The Mozart Effect

The sounds we make from the beginning of life come from our human instrument. Unless one is born with a hearing impairment, sound is a part of our life and culture from the first breath until the last. Granted, not all music is created equal, but beauty is truly in the ears of the listener. A tone is to an orchestral piece what a word is to a novel, and there is a wide range of "in between". Shaw (2000) revolutionized the listening industry in the mid nineties with his "Mozart Effect" (p. 205). The "Mozart Effect" theory centered on music listening and stated that if infants listen to Mozart, they will have more profound development. Despite this half-truth, half-myth, there is some science to the theory. Carol Krumhansl, of Cornell University, stated that babies as young as four months can understand music structure (Foreman, 1997). Krumhansl's experiments included placing a baby in a dark room. When a light was turned on, the baby would turn toward it. As soon as the baby turned to the light, music would come on and stay on until the baby turned his/her head away. Babies quickly associated the light with music. When the babies heard a Mozart minuet just as Mozart wrote them, they remain focused until the cadence ended. However, when the minuet was slowed down and the notes disjointed, the babies looked the other way. Krumhansl's conclusion was that it really didn't matter if the music was Mozart, any traditional classical music which provided structure and cadence was pleasing to an infant and helped them to concentrate and focus for longer periods of time thus increasing the attention span.

Wenger (1990) reported that neuroscientists believe that when musicians exercise the cortical neurons while playing music that the potential exists to improve mental functioning. Specifically, mathematics, spatial reasoning skills, and critical reasoning skills seem to improve. Cheek (1999) presented a study that investigated the relationship between music training and mathematics achievement. One hundred thirteen students participated with all students receiving music training at school. Thirty-six students also had private music lessons while seventy seven did not have private instruction. All students had taken the Iowa Test of Basic Skills (ITBS) the previous year. No significant difference was found between the ITBS math scores of females and males. Twenty of the thirty-six students who received private lessons had taken lessons for two or more years, and the researchers concluded that students with two or more years of private lessons had a significantly higher mean mathematics score over the students who did not have private lessons.

Schlaug, a Beth Israel Deaconess Medical Center neurologist (and also an accomplished organist), stated that there is growing evidence of a "critical period" for learning. Schlaug's research concluded that the first seven years of life is the "window" for brain development. Schlaug says of perfect pitch, "If you don't get exposed to music before age seven, it will not develop" (Foreman, 1997, p. 1). Schlaug discovered that for musicians who begin playing before the age of seven, the corpus callosum is bigger than for those who began after the age of seven. The corpus callosum is the structure that links both sides of the brain, enabling one to transfer from one side to the other very quickly.

There is much to be learned from music. Most tasks are carried out on one side or the other of the brain; however, in the musical student, both sides of the brain were equally strong. Pet scans revealed that music is the only discipline that uses both sides of the brain at the same time. The implications for brain plasticity are strong. If synapses are created in a multiplicative factor (one makes two, two makes four, four makes eight, etc.), then using both sides of the brain at the same time has the potential to create more plasticity and thus more synapses. Goetinck (1998) wrote that scientists now have the ability to look inside of the brain and what they have discovered is that when a musician is playing music, both sides of the brain are activated. Researchers at the University of Texas Health Science Center at San Antonio also have evidence that music is the only discipline that involves both sides of the brain at the same time.

A simple melody can evoke the most tender feelings, while the intricacies of melody and harmonic progressions can stir a crowd to a cause. Shaw (2000) stated that music provides opportunities for understanding and developing higher brain function. Shaw theorized that from birth a repertoire of inherent spatial-temporal firing patterns is born. These patterns evolve through listening, playing, and singing.

Neuroscientist Frances Rauscher (1997) of the University of Wisconsin, Oshkosh, completed studies involving a child's spatial intelligence. The findings indicated that music instruction does indeed have a long term and perhaps permanent effect on spatial intelligence. Comparing nineteen pre-school classes with music lessons to fourteen pre-school classes without enhanced music programs, Rauscher discovered that the young

musicians experienced a forty-six percent boost in spatial IQ, while the students without the music programs experienced only a six percent improvement in spatial IQ.

Brewer (1991) brought to life the rhythms of learning. Because the voice is in part a human instrument, children are said to be to be aware of sounds in their environment. Rhythmic skills are entwined with gross motor skills, and melodic skills are dependent on the musical elements heard through a child's auditory perception. While listening to music requires only the passive appreciation of the listener, playing music is an involved activity. As a student learns to play music, multiple independent strands of knowledge in two separate tasks are developed. These strands are spatial and musical. In the discipline of music, these strands become clustered together, making music a discipline that uses both sides of the brain at the same time (Grandin, 1998). Skills involved in playing music include: gross and fine motor skills, listening skills, mathematical skills, interpreting a symbolic language, and social skills. Once again, the importance of brain plasticity becomes evident. If the synapse connections occur in a multiplicative factor, then music can create a multitude of synapses by playing a simple tune. If this statement is true and the compounding effects of the synaptic connections do occur, then the logical conclusion is that playing music is advantageous to learning. Wilcox (2000) concluded that music study over a long period of time changes the brain and contributes to the function of the brain.

Kantrowitz (1997) stated that after years of the arts receiving budget cuts, music and art are now making a comeback in public schools. Statistics for Bugg Elementary in North Carolina were given as one of twenty-seven schools experimenting with ways to

integrate the arts into the basic curriculum in order to improve basic skills. This four-year pilot program began in 1995 and was designed to determine if the arts could impact scores in reading and math. The result was that attendance was up and behavior programs were down. In music, students learn math by studying rhythm, and interpersonal skills are improved through participation in band and orchestra. Kantrowitz warned that leaving the arts out of the curriculum could force a cultural caste system, whereby only the rich students will receive music training.

Morrison (2000) stated that the 1997 SAT data released from the College Board demonstrated that students who participate in the arts score at a higher level on the SAT than students who do not. The improvement increases with years of participation. What is interesting about the data from the College Board is that numerical averages typically go down when the groups size increases. While music performance records the largest number of test takers, the numerical score remains significantly higher than for the other groups. The 1997 data is recorded in Table 2:1 as follows:

Table 2: SAT Averages from The College Board

Course Work	SAT Takers	Verbal	Math
Acting or Play Production	225,914	545	532
Art History	219,488	519	518
Dance	125,687	514	507
Drama	146,555	534	521
Music History	164,749	539	534
Music Performance	391,505	529	529
Photography or Film	158,085	525	523

Studio Art and Design	224,254	525	527
No Fine Arts	190,137	477	492

(Morrison, 1997, p. 1).

The Magic Formula

Gardner (1999) wrote about the best schools in the world. He describes the Reggio schools in Italy as "...ample buildings, open, streaming with light; potted plants and inviting chairs and couches strategically placed, adding color and comfort to the surroundings in each room" (p. 87). He continued to describe secluded alcoves and a common space where all could meet. He described the atmosphere as respectful. Students spend weeks or months in thematic interests. The Reggio team is secure in their mode of operation.

In Japan, continues Gardner, the first priority for primary schools is to ensure that the students are comfortable at school and that they can interact civilly and productively with others. In Chinese primary schools, students create ink-and-brush paintings. What Gardner describes from other cultures is a sense of calm, a sense of respect, and a value placed on the discipline of creating beauty through visuals, movement, and sound.

Armstrong (1994) addressed the impact of students in the classroom who consistently demonstrated strengths in several areas of studies and the resulting impact on the school curriculum. Howard Gardner, the creator of the theory of multiple intelligences, believed that it was paramount that educators recognize and nurture the wide variety of intelligence displayed by individuals. Gardner's theory consists of seven intelligences: linguistic; logical-mathematical; spatial; bodily-kinesthetic; musical;

interpersonal; and intrapersonal. Individuals possess all of these intelligences, and one, two, or three will be dominate for each person. Armstrong states,

> "In most American schools today, programs that concentrate on the neglected intelligence (musical, spatial, bodily-kinesthetic, interpersonal and intrapersonal) tend to be considered 'frill' subjects or at least subjects peripheral to the 'core' academic courses" (p. 108).

Reimer (1999) stated that if spatial-temporal reasoning is critical for math, science, and reasoning, then music education should be part of the school curriculum for the development of the students' brains. As with all of the arts, music is first about creating. When considering the curriculum, the key factor for the arts is balance. Educators should be encouraged to continue to learn about, apply, and promote the benefits of involvement in the arts as a part of the school curriculum.

Grandin (1998) stated that there are two types of reasoning: spatial-temporal and language-analytic. Both are crutial for thinking, reasoning, and creating. Music involves the pattern development concept, the ability to recognize, as well as the spatial-temporal reasoning, the ability to create, maintain, transforem and relate complex images. Weinberger (1998) stated that the brainpower of youth represent the greatest resource of the United States. With the whole cerebral cortex active during music performance, even the most basic level of providing music opportunities is important to child development. Music promotes social development while enhancing cognitive abilities. Music has many

benefits including language acquisition and intellectual development. Behaviorally, music creates a spirit of involvement and students resulting in rare absenteeism.

The Role of Gender

The gender gap, exhibited in student achievement during the early years of standardized testing, is now becoming narrow. According to Francis (2000), research of the early years of standardized testing indicated that the sciences were often masculine domain while fine arts were considered feminine domain. In short, girls excel in arts, while boys excel in math and science. However, Francis cites a change in this trend at the secondary level and credits this change to the National Curriculum Education Act of 1988. The result of the last decade (1990s) is that females have made great strides and are now performing equal to or marginally better than males in the sciences and math.

This study provides data documenting for both males and females the role of school-sponsored, extra-curricular activities to academic achievement at a private school in north central Texas. This study attempts to determine if the arts do indeed appear to impact the learning environment in a positive way or if, in fact, they should be considered as "frills" and should continue to receive low budget priority in the school curriculum. Each year, the College Board, announces the National AP (Advanced Placement) Scholar Awards for students who have completed the highest marks on the greatest number of AP exams. In 1998, the College Board recognized seven scholars with this distinction. Four of the seven were instrumental musicians. In 1999, the College Board chose to recognize six AP scholars, four of whom were instrumental musicians (College Board 1998 & 1999).

The arts have been an integral part of human development since the existence of primitive humankind. The first instruments were hollowed from reeds and have developed to sophisticated instruments of sound. Drama and visual arts were important to the early Greek and Roman cultures. The philosopher Plato regarded the arts and essential to a complete education. The Renaissance ushered in a bold new era for the arts. Penetrating colors were applied to the canvas; notation for music was developed; architecture became a true art form; and literature became a virtue. It may be time for the arts to regain their prominence within the school curriculum and work side by side with the core curriculum to develop individuals to their full potential.

Governor Thomas Kean of New Jersey, was quoted "Art is the ultimate ambassador." The arts offer validity that genius is not racial biased. Art education was formalized with the federal Goals 2000 legislation which proposes national curriculum standards for the arts within the school curriculum (Bresler, 2000). If academic achievement is impacted by student participation in the arts, the school curriculum should reflect the arts as a necessary component.

This study developed out of personal observations and the advent of brain-based science. With theories such as The Mozart Effect, and recent studies involving brain functioning, the research developed as a study of the school curriculum and the impact of school-sponsored, extra-curricular activities on student achievement regarding cumulative grade point averages and college entrance tests. While several research studies have addressed the impact of the arts on early child development, this paper addresses the

academic growth and development during the high school years, grades nine through twelve, at a private school in north central Texas.

CHAPTER THREE

METHODOLOGY

This research offers significant insight to the study of the school curriculum and school-sponsored, extra-curricular activities during the high school years, specifically, grades nine through twelve. This research determined whether a tenuous, cause-effect relationship existed between school-sponsored, extra-curricular activities and cumulative grade point averages, SAT scores, and ACT scores for students in grades nine through twelve at a private school in north central Texas. The groups studied were the classes of 1996, 1997, 1998, 1999, and 2000. Although many variables may influence the grades earned and the scores achieved, this study addressed the possible effect of music (both vocal and instrumental), dramatic arts, visual arts, and athletics on the dependent variables identified as cumulative grade point averages, SAT scores, and ACT scores.

The Population

The population for this study consisted of students from a private school in north central Texas. Four hundred forty-nine cases were presented for study representing five graduating classes: the class of 1996, the class of 1997, the class of 1998, the class of 1999, and the class of 2000. The school had a total population of approximately four hundred fifty students in grades nine through twelve during each academic year

represented. Grade level distribution was normal with each grade level beginning with approximately one hundred twenty-five students in the fall of each academic year. The gender ratio within each class is relatively equal by the design of the admissions program of the school.

The curriculum design in the school studied was college preparatory, with approximately ninety-seven percent of the graduates continuing formal education at a four-year institution. The subgroups included in this study appeared to be similar in size and course work leading to the preparation of college entrance tests. All students were required to take four years of English and social studies, three years of mathematics beginning with algebra I, three years of laboratory science, and two years of foreign language. Most students completed three years of foreign language. The curriculum remained constant, without major changes, during the academic years included in this study. The ethnic population of the school was ninety-two percent White, one percent African American, three percent Hispanic, and four percent Asian. Approximately thirty percent of the total school population received some type of tuition assistance to attend the school.

Four hundred forty-nine students were originally included in this study. Elimination of students who cross participated (i.e. those students who participated in both athletics and fine arts) left a total of three hundred sixty-one student records included in the study. Representation in the study included one hundred seven fine arts students,

one hundred forty-three athletes, and one hundred eleven non-participants. One hundred eighty-six were females and one hundred seventy-five were males.

Research Design

After investigating the possibilities for student involvement in school-sponsored, extra-curricular activities at a private school in north central Texas, it was determined that students had a choice of music, drama, visual arts, athletics, or not to participate in school-sponsored, extra-curricular activities. The criteria for inclusion in the study was a minimum of two years of attendance at the school during grades nine through twelve and graduation from the school, which is a requirement for students to have a cumulative grade point average at the studied school. Data was recorded for each graduate of the classes of 1996, 1997, 1998, 1999, and 2000 at the studied school.

A two-by-five factorial design was used for research questions one, two, three, and four. A one-by-five factorial design was used for research question five.

Data Collection

Graduates from the classes of 1996, 1997, 1998, 1999, and 2000 were assigned an encoded number to protect their identity. The study involved collection of the following data for each student:

1) Cumulative grade point average,
2) SAT score,
3) ACT score,
4) Cumulative grade point average in computer science,
5) Cumulative grade point average in foreign language,

6) Cumulative grade point average in history/English (an interdisciplinary subject at this school),

7) Cumulative grade point average in mathematics,

8) Cumulative grade point average in science,

9) Identification of male/female, and

10) Identification of student participation in school-sponsored, extra-curricular activities.

Criteria for being placed in one of the study subgroups was a minimum of two years of participation during grades nine through twelve. The subgroups included in this study were:

1. Music,
2. Drama,
3. Visual Arts,
4. Athletes, and
5. Non-participants (i.e. students who did not participate in these extra-curricular activities for a minimum of two years in grades nine through twelve).

Data Analysis

The group size studied consisted of three hundred sixty-one students, with one hundred seventy-five males and one hundred eighty-six females. A two-by-five factorial design was used for research questions one, two, three, and four. The two-way ANOVA was selected because it is efficient, controls for variation, tests for interaction, and

increases the power while maintaining the Type I error rate at the pre-established level of $p = .05$ (Hinkle, 1994). The two-way ANOVA was used to determine whether gender or participation/non-participation in the studied school-sponsored, extra-curricular activities effects student achievement on cumulative grade point averages, SAT scores, and ACT scores for high school students during grades nine through twelve at a private school in north central Texas. The ANOVA was calculated at the significance level of $p = .05$.

When a significant F ratio was found in the ANOVA, post hoc multiple comparisons were completed to determine which pairs of means differed significantly. Post hoc multiple-comparison tests maintain the Type I error rate at alpha when a multiple comparisons are made among sample means (Hinkle, 1994). When a significant F was found to be present, the Scheffe post hoc test was completed on all research calculations. The Scheffe was selected because it is the most versatile and at the same time the most conservative post hoc multiple comparison procedure (Hinkle, 1994). If a significant F was found to be present and the Scheffe post hoc test did not indicate a significant difference, the LSD (Least Significant Difference) post hoc test was applied. The LSD is less robust than the Scheffe.

A one-way ANOVA with a one-by-five factorial design was used to test for research question five. ANOVA was also used for the last research question for its ability to reduce the error rate while testing for interaction and at the same time increasing the power. The ANOVA for research question five was also calculated at the significance level of $p = .05$.

The Bonferroni was applied for adjustments of multiple comparisons for all of the research calculations. The Bonferroni adjustment procedure adjusts downward in the case of multiple comparisons to rule out the chance of incorrectly declaring a difference among the multiple comparisons.

For all of the above statements, the treatments had already occurred, and the independent variable (participation in the school-sponsored, extra-curricular activities of music, drama, visual arts, athletics or non-participation in school-sponsored, extra-curricular activities) was not manipulated by the researcher. The dependent variables for research questions one through four were cumulative GPA, SAT score, and ACT score. The dependent variables for research question five were the cumulative subject grade point averages in computer science, foreign language, history/English (an interdisciplinary subject at this school), mathematics, and science.

CHAPTER 4

ANALYSIS OF THE DATA

The results of the information obtained from the data gathered and tests completed for this study are reported in this chapter. The data was collected from school records for graduates from the classes of 1996, 1997, 1998, 1999, and 2000 from a private school in north central Texas. The data gathered included the participation of school-sponsored, extra-curricular activities, cumulative grade point averages, SAT scores, ACT scores, gender, and cumulative subject grade point averages for core curriculum subjects of computer science, foreign language, history/English, mathematics, and science. The school-sponsored, extra-curricular activities represented in this study include music, theater arts, visual arts, and athletics. These are the only school-sponsored, extra-curricular activities available to students at the school represented in this study. The criteria for inclusion into the study was a minimum of two years of participation in the above school-sponsored, extra-curricular activities during grades nine through twelve. In this study, four hundred forty-nine students initially met the criteria for participation in school-sponsored, extra-curricular activities for a minimum of two years during grades nine through twelve.

The researcher sought to determine whether a tenuous cause-effect relationship existed between participation in school-sponsored, extra-curricular activities (fine arts and athletics) and the academic achievement of the student beginning with grade nine and

concluding with grade twelve at a private school in north central Texas. The study compared the subgroups of the graduates, comparing the cumulative grade point averages, SAT scores, ACT scores, and core curriculum cumulative subject grade point averages of student participants and non-participants (students who did not participate in school-sponsored, extra-curricular activities). In addition to identification of gender, the graduates were divided into the following five groups:

1) Musicians (vocal and instrumental),
2) Thespians,
3) Visual Artists,
4) Athletes, and
5) Non-participants (students who do not participate in school-sponsored, extra-curricular activities).

Two main effects were tested: row differences (male and female); and column differences (musicians, thespians, visual artists, athletes, and non-participants). Tests for interaction were also completed. A two-way ANOVA was used with a two-by-five factorial design for research questions one, two, three, and four. The two-way ANOVA is efficient, controls for variation, tests for interaction, and increases the power while maintaining the Type I error rate at the pre-established level of $\underline{p} = .05$ (Hinkle, 1994). The two-way ANOVA was used to determine the presence of the following:

1) main effect for extra-curricular activities;
2) main effect of gender; and
3) interaction effect.

The ANOVA determined whether gender or participation/non-participation in various school-sponsored, extra-curricular activities had an effect on student achievement with respect to their cumulative grade point averages, SAT scores, and ACT scores for high school students during grades nine through twelve at a private school in north central Texas. The ANOVA was calculated at the significance level of $p = .05$.

When a significant F ratio was found in the ANOVA, post hoc multiple comparisons were completed to determine which pairs of means differed significantly. Post hoc multiple comparison tests maintain the Type I error rate at alpha when multiple comparisons are made among sample means (Hinkle, 1994). The Scheffe post hoc test was completed on all research calculations when a significant F was found to be present. The Scheffe was selected because it is the most versatile and at the same time the most conservative post hoc multiple comparison procedure (Hinkle, 1994). When a significant F was found and the Scheffe post hoc procedure did not reveal interaction, the LSD (Least Significant Difference) post hoc test was completed. The LSD is a post hoc multiple comparison that is less robust than the Scheffe.

The Bonferroni was applied for adjustments of multiple comparisons for all of the research calculations. The Bonferroni adjustment procedure adjusts downward in the case of multiple comparisons to rule out the chance of incorrectly declaring a difference among the multiple comparisons.

A one-way ANOVA with a one-by-five factorial design was used to test research question five. The one-way test was used for its ability to reduce the error rate while testing for interaction and at the same time increasing the power. The ANOVA for

research question five was also calculated at the significant level of $p = .05$.

Data Analysis for Research Question One

What effect does participation or non-participation in school-sponsored, extra-curricular activities (i.e., music, drama, visual arts, and athletics) have on high school cumulative grade point averages? A null hypothesis relating to research question one is as follows: there is no difference in cumulative grade point averages among students who participate in music, drama, visual arts, athletics, and students who do not participate in these school-sponsored, extra-curricular activities at a private school in north central Texas. The cumulative grade point average means were calculated for each of the activity subgroups and are listed below in Table 3. The cumulative grade point average was calculated on a 4.0 scale. Sixty-six musicians had a cumulative grade point average of 3.61, with a standard deviation of .5532. Eighteen students who participated in dramatic arts had a cumulative grade point average of 3.50, with a standard deviation of .5979. Twenty-three visual arts students had a cumulative grade point average of 3.37, with a standard deviation of .6939. One hundred forty-three athletes had a cumulative grade point average of 3.26, with a standard deviation of .5434, while one hundred eleven non-participants had a cumulative grade point average of 3.38, with a standard deviation of .6184. The subgroup cumulative grade point averages are represented in Table 3.

Table 3: Cumulative Grade Point Averages for the Subgroups

Group	Mean	Std. Deviation	N
Music	3.61	.5532	66
Dramatic Arts	3.50	.5979	18
Visual Arts	3.37	.6939	23
Athletes	3.26	.5434	143
Non-participants	3.38	.6184	111

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subject effects for cumulative grade point average, the gender sum of squares was 2.196, with 1 degree of freedom. The mean square was also 2.196, with a calculated *F* of 6.682 and a significance of .010. The group sum of squares was 3.367 with 4 degrees of freedom. The group mean square was .842 resulting in an *F* of 2.562. A significance of .038 was found to be present. The interaction between gender and group sum of squares was 1.861, with 4 degrees of freedom. The mean square for interaction was .456, with a calculated *F* of 1.416 and a significance of .228. The error sum of squares for between subject effects was 115.335, with 351 degrees of freedom and a mean square of .329. The corrected total was 126.329, with 360 degrees of freedom.

The between-subjects effects indicated a significant difference was present in gender and group activity. The between-subjects effects are outlined in Table 4.

Table 4: Dependent Variable: GPA; Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Gender	2.196	1	2.196	6.682	.010
Group	3.367	4	.842	2.562	.038
Interaction	1.861	4	.465	1.416	.228
Error	115.335	351	.329		
Corrected Total	126.329	360			

The statistic for ANOVA is the *F* ratio, which is defined as the degrees of freedom associated with the two variance estimates (Hinkle, 1994). The *F* reports the effect of group means. The *F* for cumulative grade point averages across the subgroups was equal to 2.562. This test is based on the linearly independent pairwise comparisons among the estimated marginal means. A significant difference resulted in the main effect of membership in group activity (i.e. music, drama, visual arts, athletics, and non-participant). With $p = .05$, the null hypothesis for research question one was rejected at the significant result of .038 for cumulative grade point averages of the subgroups of musicians, thespians, visual artists, athletes, and non-participants.

The Scheffe post hoc procedure was then applied to determine the significance of group differences. The post hoc results indicated that a significant difference was present between the subgroups of musicians and athletes at a significance level of .003.

Pairwise comparisons were applied to the data with the Bonferroni adjustment for multiple comparisons also applied. The result indicated that a significance occurred between musicians and athletes at the .029 level of significance. Based upon estimated marginal means, the difference was significant at the .05 level.

Data Analysis for Research Question Two

What effect does participation or non-participation in school-sponsored, extra-curricular activities (i.e. music, drama, visual arts, and athletics) have on high school SAT scores? A null hypotheses relating to research question two is as follows: there is no difference in SAT scores among students who participate in music, drama, visual arts, athletics, and students who do not participate in these school-sponsored, extra-curricular activities at a private school in north central Texas. The SAT score average for sixty-five musicians was 1196, with a standard deviation of 151.72. For eighteen students in dramatic arts, the SAT score average was 1168, with a standard deviation of 118.63. Twenty-two visual arts students had an SAT average of 1128, with a standard deviation of 161.68. One hundred forty athletes had as SAT average of 1117, with a standard deviation of 132.12, while one hundred and eight non-participants had an SAT average of 1122, with a standard deviation of 139.16. The activity subgroup SAT means are represented in Table 5.

Table 5: SAT Score Averages for the Subgroups

Group	Mean	Std. Deviation	N
Music	1196	151.72	65
Dramatic Arts	1168	118.63	18
Visual Arts	1128	161.68	22
Athletes	1117	132.12	140
Non-participants	1122	139.16	108

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subjects effect, the gender sum of squares was 51145.148, with 1 degree of freedom. The mean square for gender was also 51145.148, with a calculated *F* of 2.652. The significance for gender was found to be .104. The group sum of squares was 308345.329, with 4 degrees of freedom. The mean square was 77086.332, resulting in an *F* of 3.998. A significance of .003 was found to be present. The interaction between gender and group sum of squares was 52509.973, with 4 degrees of freedom and a mean square of 13127.493. The calculated *F* was found to be .681, with a significance of .606. The error sum of squares for between-subject effects was 6613689.125, with 343 degrees of freedom. The mean square was 19281.892. The

between-subjects effects indicated that a difference was present in group. The between-subjects effects for SAT score means are outlined in Table 6.

Table 6: Dependent Variable: SAT; Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Gender	51145.148	1	51145.148	2.652	.104
Group	308345.329	4	77086.332	3.998	.003
Interaction	52509.973	4	13127.493	.681	.606
Error	6613689.125	343	19281.892		
Corrected Total	7087958.640	352			

The statistic for ANOVA is the *F* ratio, which is defined as the degrees of freedom associated with the two variance estimates (Hinkle, 1994). The *F* tests the effect of group means. The *F* for SAT score averages across the activity subgroups was equal to 3.998. This test is based on the linearity of independent pairwise comparisons among the estimated marginal means. A significant difference resulted in the main effect of membership in group activity. With $p = .05$, the null for research question two was rejected at the significance result of .003 for SAT score averages.

Pairwise comparisons were applied to the data with the Bonferroni adjustment for multiple comparisons also applied. The result indicated that a significance occurred between musicians and athletes at the .001 level of significance. Based upon estimated marginal means, the mean difference was significant at the .05 level.

The Scheffe post hoc procedure was then applied to determine the group

significance of group differences. A significant difference was present between the musicians and non-participants at the significance of .023, and the null hypothesis was rejected.

Data Analysis for Research Question Three

What effect does participation or non-participation in school-sponsored, extra-curricular activities (i.e. music, drama, visual arts, and athletics) have on high school ACT scores? A null hypothesis relating to research question four is as follows: there is no difference in ACT score averages among students who participate in music, drama, visual arts, athletics, and students who do not participate in these school-sponsored, extra-curricular activities at a private school in north central Texas. The subgroup ACT score means were calculated and outlined in Table 4.5. Fifty-six musicians had an ACT average of 25, with a standard deviation of 3.78. Sixteen thespians had an ACT average of 26, with a standard deviation of 2.41. Twenty visual artists had an ACT average of 23, with a standard deviation of 3.33, while one hundred twenty-five athletes had an ACT average of 23, with a standard deviation of 4.01. Ninety-nine non-participants had an ACT average of 24, with a standard deviation of 3.72. The mean ACT scores are outlined in Table 7.

Table 7: ACT Score Averages for the Subgroups

Group	Mean	Std. Deviation	N
Music	25	3.78	56
Dramatic Arts	26	2.41	16

Visual Arts	23	3.33	20
Athletes	23	4.01	125
Non-participants	24	3.72	99

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subjects effects, the gender sum of squares was 1.387, with 1 degree of freedom. The mean square was also 1.387, with a calculated *F* of .096 and a significance of .757. The group sum of square was 158.269, with 4 degrees of freedom. The man square was 39.567, resulting in an *F* of 2.742. A significance of .029 was found to be present. The interaction between gender and group sum of squares was 27.451, with 4 degrees of freedom. The mean square for interaction was 6.863, with a calculated *F* of .476 and a significance of .754. The error sum of squares for between-subjects effects was 4416.263, with 306 degrees of freedom and a mean square of 14.432. The between-subjects effects are outlined in Table 8.

Table 8: Dependent Variable: ACT Scores; Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Group	158.269	4	39.567	2.742	.029
Interaction	27.451	4	6.863	.476	.754

Error	4416.263	306	14.432		
Corrected Total	4609.038	315			

The statistic for ANOVA is the *F* ratio is defined as the degrees of freedom associated with the two variance estimates (Hinkle, 1994). The *F* tests the effect of group means. The *F* for ACT score averages across the subgroups was equal to 2.742. This test is based on the linearity of pairwise comparisons among the estimated marginal means. A significant difference resulted in the main effect of membership in group activity. With a calculated *p* = .05, the null was rejected at the significant result of .029 for ACT score averages.

Pairwise comparisons were applied to the data with the Bonferroni adjustment for multiple comparisons also applied. The result of the pairwise comparisons did not indicate that a significance occurred between any of the activity subgroups.

The Scheffe post hoc results indicated that a significant difference was not present among the subgroups. Because the ANOVA had indicated a group significance of .029, the LSD (Least Significant Difference) was applied. The LSD, also a post hoc comparison but less robust than the Scheffe, indicated that interaction was significant between musicians and two groups, athletes and non-participants. The significance between musicians and athletes using the LSD was .009, while the significance between musicians and non-participants was .050. The LSD also indicated a significance between thespians and athletes at the .017 level and between thespians and non-participants at the .045 level of significance.

Data Analysis for Research Question Four

Does the gender of participants in school-sponsored, extra-curricular activities (i.e. music, drama, visual arts, and athletics) and non-participants make a difference in their cumulative grade point averages, SAT scores, and ACT scores? A null hypothesis relating to research question four is as follows: there is no difference between males and females who participate in music, drama, visual arts, athletics, and non-participants regarding their respective cumulative grade point averages, SAT scores averages, and ACT score averages at a private school in north central Texas.

Gender and GPA

The two main effects, gender and subgroup activities were calculated to determine if a difference in cumulative grade point averages existed between males and females who participated in music, drama, visual arts, athletics, and non-participants at a private school in north central Texas. One hundred and seventy five males had a cumulative grade point average of 3.255, with a standard deviation of .5805, while one hundred eighty-six females had a cumulative grade point average of 3.492, with a .5818 standard deviation. Thirty-nine female musicians had a mean cumulative grade point average of 3.63, with a standard deviation of .5371, while twenty-seven male musicians had a cumulative grade point average of 3.57, with a standard deviation of .5839. Eleven female drama students had a cumulative grade point average of 3.58, with a standard deviation of .6253, while seven male drama students had a cumulative grade point average of 3.37, with a standard deviation of .5734. Fourteen female visual artists had a cumulative grade point average of 3.53, with a standard deviation of .6241 while nine

male visual artists had a cumulative grade point average of 3.12, with a standard deviation of .7579. Forty-two female athletes had a cumulative grade point average 3.51, with a standard deviation of .4905, while one hundred and one male athletes had a cumulative grade point average of 3.15 with a standard deviation of .5300. Eighty non-participant females had a cumulative grade point average of 3.39, with a standard deviation of .6281, while thirty-one male non-participants had a cumulative grad point average of 3.34, with a standard deviation of .5805. One hundred eighty-six females had a cumulative grade point average of 3.49, with a standard deviation of .5818, and one hundred seventy-five males had a cumulative grade point average of 3.26, with a standard deviation of .5805. The male and female cumulative grade point averages are outlined in Table 9.

Table 9: Male and Female Cumulative Grade Point Averages

Sex	Group	Mean	Std. Deviation	N
Female	Music	3.63	.5371	39
	Drama	3.58	.6253	11
	Visual Arts	3.53	.6241	14
	Athlete	3.51	.4905	42
	Non-Participant	3.39	.6281	80
	Total	3.49	.5818	186
Male	Music	3.57	.5839	27
	Drama	3.37	.5734	7

Visual Arts	3.12	.7579	9
Athlete	3.14	.5300	101
Non-Participant	3.34	.6013	31
Total	3.26	.5805	175

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subject effects, the gender sum of squares was 2.196, with 1 degree of freedom. The mean square was also 2.196, with a calculated *F* of 6.682 and a significance of .010. The group sum of squares was 3.367, with 4 degrees of freedom. The group mean square was .842, resulting in an *F* of 2.562. A significance of .038 was found to be present. The interaction between gender and group sum of squares was 1.861, with 4 degrees of freedom. The mean square for interaction was .456, with a calculated *F* of 1.416 and a significance of .228. The error sum of squares for between subject effects was 115.335, with 351 degrees of freedom and a mean square of .329. The corrected Total was 126.329, with 360 degrees of freedom. The between-subjects effects indicated no interaction existed between gender and activity; however, a significant difference was present in both gender and group. The between-subjects effects are outlined in Table 10.

Table 10: Dependent Variable: GPA; Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Gender	2.196	1	2.196	6.682	.010
Group	3.367	4	.842	2.562	.038
Interaction	1.861	4	.465	1.416	.228
Error	115.335	351	.329		
Corrected Total	126.329	360			

The calculated *F* for interaction of gender and group was 1.416, with a significance of .228. Interaction did not indicate a difference between gender and group. For gender and the SAT score, the calculated *F* of 6.682 was significant at .010. The null hypothesis was rejected and a significant difference was found to be present in the main effect for gender regarding the cumulative grade point average.

Gender and SAT

The two main effects of gender and subgroup activity scores were calculated to determine if a difference in SAT scores existed between males and females who participated in music, drama, visual arts, athletics, and non-participants at a private school in north central Texas. One hundred seventy- one males had an SAT score average of 1148, with a standard deviation of 136.71, while one hundred eighty-two females had an average score of 1125, with a standard deviation of 146.15. Thirty-nine female musicians had a mean SAT average of 1193, with a standard deviation of 152, while twenty-six male musicians had an average of 1200, with a standard deviation of 154.01. Eleven

female drama students had an average SAT score of 1167, with a standard deviation of 125.11, while seven male drama students had an average of 1170, with a standard deviation of 117.33. Thirteen female visual artists had an SAT average of 1100, with a standard deviation of 157.93, while nine male visual artists had an average of 1168, with a standard deviation of 167.99. Forty-one female athletes had an SAT average 1100, with a standard deviation of 132.78 while ninety-nine male athletes had an SAT average of 1123, with a standard deviation of 131.95. Seventy-eight non-participant females had an average of 1103, with a standard deviation of 142.11, while thirty male non-participants had an average of 1173, with a standard deviation of 119.02. One hundred eighty-two females had an SAT score average of 1125, with a standard deviation of 146.15, and one hundred seventy-one males had an average of 1148, with a standard deviation of 136.71. The male and female SAT score averages are outlined in Table 11.

Table 11: Male and Female SAT Score Averages

Sex	Group	Mean	Std. Deviation	N
Female	Music	1193	152.11	39
	Drama	1167	125.15	11
	Visual Arts	1100	157.93	13
	Athlete	1100	132.78	41
	Non-Participant	1102	142.11	78
	Total	1125	146.15	182
Male	Music	1200	154.01	26

Drama	1170	117.33	7
Visual Arts	1168	167.99	9
Athlete	1123	131.95	99
Non-Participant	1173	119.02	30
Total	1148	136.71	171

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subject effects, the gender sum of squares was 51145.148, with 1 degree of freedom. The mean square was also 51145.148, with a calculated *F* of 2.652 and a significance of .104. The group sum of squares was 308345.329, with 4 degrees of freedom. The group mean square was 77086.332, resulting in an *F* of 3.998. A significance of .003 was found to be present. The interaction between gender and group sum of squares was 52509.973, with 4 degrees of freedom. The mean square for interaction was 13127.493, with a calculated *F* of .681 and a significance of .606. The error sum of squares for between subject effects was 6613689.125, with 343 degrees of freedom and a mean square of 19281.892. The corrected Total was 7087958.640, with 352 degrees of freedom. The between-subjects effects are outlined in Table 12.

Table 12: Dependent Variable: GPA; Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Gender	51145.148	1	51145.148	2.652	.104
Group	308345.329	4	77086.332	3.998	.003
Interaction	1.861	4	13127.493	.681	.606
Error	115.335	351	19281.892		
Corrected Total	7087958.640	352			

The calculated *F* for interaction of gender and group was .681, with a significance of .606. Interaction did not indicate a significant difference between gender and group. The calculated *F* for gender and the SAT average was 2.652 with a significance of .104. The null hypothesis was accepted with no significant interaction present between gender and the group and no significant main effect for gender on the ACT means.

Gender and ACT

The two main effects of gender and subgroup activity scores were calculated to determine if a difference in ACT scores existed between males and females who participate in music, drama, visual arts, athletics, and non-participants at a private school in north central Texas. One hundred sixty-six females had an ACT score average of 24, with a standard deviation of 3.60 while one hundred fifty males had an average score of 24, with a standard deviation of 4.08. Thirty-two female musicians had a mean ACT of 25, with a standard deviation of 3.78, while twenty-four male musicians had an average of 24, with a standard deviation of 3.88. Ten female drama students had an average ACT

score of 25, with a standard deviation of 2.74, while six male drama students had an average of 27, with a standard deviation of 1.64. Twelve female visual artists had an ACT average of 24, with a standard deviation of 2.71, while eight male visual artists had an average of 23, with a standard deviation of 4.29. Forty-one female athletes had an ACT average 23, with a standard deviation of 3.34, while eighty-four male athletes had an ACT average of 23, with a standard deviation of 4.31. Seventy-one non-participant females had an average of 23, with a standard deviation of 3.74, while twenty-eight male non-participants had an average of 24 with a standard deviation of 4.08. One hundred sixty-six females had an ACT score average of 24, with a standard deviation of 3.60, and one hundred fifty males had an average of 24, with a standard deviation of 4.08. The male and female ACT score averages are outlined in Table 13.

Table 13: Male and Female ACT Score Averages

Sex	Group	Mean	Std. Deviation	N
Female	Music	25	3.78	32
	Drama	25	2.74	10
	Visual Arts	24	2.71	12
	Athlete	23	3.34	41
	Non-Participant	23	3.74	71
	Total	24	3.60	166
Male	Music	23	3.88	24
	Drama	27	1.64	6

Visual Arts	23	4.29	8
Athlete	23	4.31	84
Non-Participant	24	3.67	28
Total	24	4.08	150

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subject effects, the gender sum of squares was 1.387, with 1 degree of freedom. The mean square was also 1.387, with a calculated $\underline{F}$ of .096 and a significance of .757. The group sum of squares was 158.269, with 4 degrees of freedom. The group mean square was 39.567, resulting in an $\underline{F}$ of 2.742. A significance of .029 was found to be present. The interaction between gender and group sum of squares was 27.451, with 4 degrees of freedom. The mean square for interaction was 6.863, with a calculated *F* of .476 and a significance of .754. The error sum of squares for between subject effects was 4416.263, with 306 degrees of freedom and a mean square of 14.432. The corrected total was 4609.038, with 315 degrees of freedom. The between-subjects effects are outlined in Table 14.

Table 14: Dependent Variable: ACT; Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Gender	1.387	1	1.387	.096	.757
Group	158.269	4	39.567	2.742	.029
Interaction	27.451	4	6.863	.476	.754
Error	4416.263	306	14.432		
Corrected Total	4609.038	315			

The calculated *F* for interaction of gender and group was .476, with a significance of .754. Interaction did not indicate a significant difference between gender and group. The calculated *F* for gender and the ACT average was .096 with a significance of .757. The null hypothesis was accepted and no difference was found to be present for gender and the ACT.

Data Analysis for Research Question Five

What effect does participation or non-participation in school-sponsored, extra-curricular activities (i.e. music, drama, visual arts, and athletics) have on cumulative grade point averages earned in the core curriculum subjects of computer science, foreign language, history/English (an interdisciplinary course at the school studied), mathematics, and science? A null hypothesis for research question five is as follows: there is no difference among participants or non-participants in school-sponsored, extra-curricular activities (i.e. music, drama, visual art, and athletics) on the cumulative subject grade point averages earned in the core curriculum subjects of computer science, foreign

language, history/English (an interdisciplinary course at the school studied), mathematics, and science at a private school in north central Texas.

Computer Science GPA

Sixteen music students completed computer science, with a cumulative grade point average in computer science of 3.83 and a standard deviation of .193. Two dramatic arts students completed computer science, with an average cumulative grade point average in computer science of 4.00 and a standard deviation of .0000. Three visual arts students completed computer science, with a cumulative grade point average in computer science of 3.50 and a standard deviation of .2500. Twenty-nine athletes had a computer science cumulative grade point average of 3.72, with a standard deviation of .4616, and eighteen non-participants completed computer science, with a subject cumulative grade point average of 3.82 and a standard deviation of .3719. The data on cumulative grade point averages in computer science among the school-sponsored, extra-curricular activity groups is presented in Table 15.

Table 15: Cumulative Grade Point Averages in Computer Science

Group	Mean	Std. Deviation	N
Music	3.83	.1983	16
Dramatic Arts	4.00	.0000	2
Visual Arts	3.50	.2500	3

Athletes	3.72	.4616	29
Non-participants	3.82	.3719	18

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subjects effects, the contrast sum of square was .508 with 4 degrees of freedom. The mean square was .127, resulting in an *F* ratio of .887. A significance of .477 was found to be present. The error sum of squares for between-subject effects was 9.031, with 63 degrees of freedom and .143 mean square. The Corrected total sum of squares is 9.540, with 67 degrees of freedom. The between-

subjects effects for cumulative grade point averages in computer science are presented in Table 16.

Table 16: Dependent Variable: Computer Science GPA;

Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Contrast	.508	4	.127	.887	.477
Error	9.031	63	.143		
Corrected Total	9.540	67			

The statistic for ANOVA is the *F* ratio, which is defined as the degrees of freedom associated with the two variance estimates (Hinkle, 1994). The *F* tests the effect of group means. The *F* for cumulative grade point averages in computer science across the subgroups was equal to .887. This test is based on the linearly independent pairwise comparisons among the estimated marginal means. A significant difference did not occur in the main effect of group. With a calculated *p* = .05, the null hypothesis was accepted at the significance result of .477 for cumulative grade point averages in computer science.

Foreign Language GPA

Sixty-six music students completed foreign language, with a subject cumulative grade point average of 3.53 and a standard deviation of .6040. Eighteen dramatic arts students completed foreign language, with an average cumulative grade point average in foreign language of 3.39 and a standard deviation of .6314. Twenty-three visual arts students completed foreign language, with a cumulative grade point average in foreign language of 3.20 and a standard deviation of .7574. One hundred forty-three athletes had

a foreign language cumulative grade point average of 3.09, with a standard deviation of .7119, and one hundred eleven non-participants completed foreign language with a subject cumulative grade point average of 3.22 and a standard deviation of .7053. The data on cumulative grade point averages in foreign language among the activity subgroups is presented in Table 17.

Table 17: Cumulative Grade Point Averages in Foreign Language

Group	Mean	Std. Deviation	N
Music	3.53	.6040	66
Dramatic Arts	3.39	.6314	18
Visual Arts	3.20	.7574	23
Athletes	3.09	.7119	143
Non-participants	3.22	.7053	111

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subjects effects, the contrast sum of squares was 8.773, with 4 degrees of freedom. The mean square was 2.193, resulting in an *F* of 4.598. A significance of .001 was found to be present. The error sum of squares for between

subject effects was 169.806, with 356 degrees of freedom and .477 mean square. The Corrected total sum of squares was 178.579, with 360 degrees of freedom. The between-subjects effects for cumulative grade point averages in foreign language are presented in Table 18.

Table 18: Dependent Variable: Foreign Language GPA

Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Contrast	8.773	4	2.193	4.598	.001
Error	169.806	356	.477		
Corrected Total	178.570	360			

The statistic for ANOVA is the *F* ratio, which is defined as the degrees of freedom associated with the two variance estimates (Hinkle, 1994). The *F* tests the effect of group means. The calculated *F* for cumulative grade point averages in foreign language across the subgroups was 4.598. This test is based on the linearly independent pairwise comparisons among the estimated marginal means. A significant difference of .001 indicated that a difference did occur in the main effect of group when comparing cumulative grade point averages in foreign language. With a calculated $p = .05$, the null was rejected at the significance result of .001 for the cumulative core curriculum grade point average of foreign language.

The Scheffe post hoc procedure was applied to determine pairwise comparisons,

and the result of group interaction was significant, occurring between musicians and athletes at the .002 level of significance. Based upon estimated marginal means, the mean difference was significant and the null hypothesis was rejected.

History/English GPA

Sixty-six music students completed history/English (an interdisciplinary subject at the studied school), with a subject cumulative grade point average of 3.30 and a standard deviation of .6740. Eighteen dramatic arts students completed history/English, with a subject cumulative grade point average of 3.20 and a standard deviation of .7574. One hundred forty-three athletes had a subject cumulative grade point average of 3.09, with a standard deviation of .7119, while one hundred eleven non-participants completed history/English with a subject cumulative grade point average of 3.22 and a standard deviation of .7053. The data on cumulative grade point averages in history/English is presented in Table 19.

Table 19: Cumulative Grade Point Averages in History/English

Group	Mean	Std. Deviation	N
Music	3.30	.6740	66
Dramatic Arts	3.13	.6016	18
Visual Arts	2.98	.7624	23

Athletes	2.87	.6620	143
Non-participants	2.97	.7189	111

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subjects effects, the contrast sum of squares was 8.642, with 4 degrees of freedom. The mean square was 2.161, resulting in an *F* of 4.591. A significance of .001 was found to be present. The error sum of squares for between-subject effects was 167.545, with 356 degrees of freedom and .471 mean square. The corrected total sum of squares for history/English grade point averages was 178.579, with 360 degrees of freedom. The between-subject effects are outlined in Table 20.

Table 20: Dependent Variable: History/English GPA

Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Contrast	8.642	4	2.161	4.591	.001
Error	167.545	356	.471		
Corrected Total	178.579	360			

The statistic for ANOVA is the *F* ratio, which is defined as the degrees of freedom associated with the two variance estimates (Hinkle, 1994). The *F* tests the effect of group means. The *F* for cumulative grade point averages in history/English across the subgroups was equal to 4.591. This test is based on the linearly independent pairwise comparisons among the estimated marginal means. A significant difference of .001 indicated that a difference did occur in the main effect of group when comparing cumulative grade point averages in history/English. With a calculated *p* = .05, the null was rejected at the significance result of .001 for differences in the cumulative core curriculum subject of history/English.

The Scheffe post hoc procedure was applied to determine pairwise comparisons, and the result of group interaction was significant, occurring between musicians and athletes at the .002 level of significance.

Mathematics GPA

Sixty-six music students had a subject cumulative grade point average in mathematics of 3.43, with a standard deviation of .6423. Eighteen dramatic arts students completed mathematics, with an average cumulative grade point average in mathematics of 3.03 and a standard deviation of .7270. Twenty-three visual arts students completed mathematics, with a subject cumulative grade point average in math of 3.11 and a standard deviation of .6983. One hundred forty-three athletes had a mathematics cumulative grade point average of 2.98, with a standard deviation of .6402, and one hundred eleven non-participants completed math, with a subject cumulative grade point average of 3.11 with a standard deviation of .7611. The data on cumulative grade point

averages in mathematics among the activity subgroups is presented in Table 21.

Table 21: Cumulative Grade Point Averages in Mathematics

Group	Mean	Std. Deviation	N
Music	3.43	.6423	66
Dramatic Arts	3.03	.7270	18
Visual Arts	3.11	.6983	23
Athletes	2.98	.6402	143
Non-participants	3.11	.7611	111

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subjects effects, the contrast sum of squares was 9.272, with 4 degrees of freedom. The mean square was 2.318, resulting in an *F* of 4.899. A significance of .001 was found to be present. The error sum of squares for between-subject effects was 168.462, with 356 degrees of freedom and .473 mean square. The corrected total sum of squares was 177.734, with 360 degrees of freedom. The results of the tests of the between-subjects effects is outlined in Table 22.

Table 22: Dependent Variable: Mathematics GPA

Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Contrast	9.272	4	2.318	4.899	.001
Error	168.462	356	.473		
Corrected Total	177.734	360			

The *F* tests the effect of group means. The *F* for cumulative grade point averages in mathematics across the subgroups was equal to 4.899. This test is based on the linearly independent pairwise comparisons among the estimated marginal means. A significant difference of .001 indicated that a difference did occur in the main effect of group when comparing cumulative grade point averages in mathematics. With $p = .05$, the null hypothesis was rejected at the significance result of .001 and a significant difference was found to exist in the cumulative core curriculum subject of mathematics.

The Scheffe post hoc procedure was applied to determine pairwise comparisons, and the result of group interaction was significant, occurring between musicians and athletes at the .001 level of significance. Based upon estimated marginal means, the mean difference was significant and the null hypothesis was rejected for subject cumulative grade point average in mathematics.

Science GPA

Sixty-six music students completed science, with a subject cumulative grade point

average of 3.46 and a standard deviation of .6143. Eighteen dramatic arts students completed science, with a subject cumulative grade point average of 3.34 and a standard deviation of .6132. Twenty-three visual arts students completed science, with a cumulative grade point average in science of 3.15 and a standard deviation of .7824. One hundred forty-three athletes had a science cumulative grade point average of 3.05, with a standard deviation of .6323, while one hundred eleven non-participants completed science, with a subject cumulative grade point average of 3.13 with a standard deviation of .7070. The data on science subject cumulative grade point averages is presented in Table 23.

Table 23: Cumulative grade point averages in Science

Group	Mean	St. Deviation	N
Music	3.46	.6143	66
Dramatic Arts	3.34	.6132	18
Visual Arts	3.15	.7824	23
Athletes	3.05	.6323	143
Non-Participants	3.13	.7070	111

The Levene's Test of Equality of Error Variances was computed to test the null hypothesis that multiple population variances corresponding to multiple samples were equal. The result was that the error variance of the dependent variable was considered

equal across the subgroups. Therefore, no violation of the equal variance occurred.

When testing the between-subjects effects, the contrast sum of square was 8.315, with 4 degrees of freedom. The mean square was 2.079, resulting in an *F* of 4.739. A significance of .001 was found to be present. The error sum of squares for between subject effects was 156.147, with 356 degrees of freedom and .439 mean square. The corrected total sum of squares was 164.462, with 360 degrees of freedom. The between-subjects effects are listed in Table 24.

Table 24: Dependent Variable: Science GPA

Tests of Between-Subjects Effects

	SS	df	Mean Sq	F	Sig
Contrast	8.315	4	2.079	4.739	.001
Error	156.147	356	.439		
Corrected Total	164.462	360			

The *F* tests the effect of group means. The *F* for cumulative grade point averages in science across the subgroups was equal to 4.739. This test is based on the linearly independent pairwise comparisons among the estimated marginal means. A significant difference of .001 indicated that a difference did occur in the main effect of group when comparing cumulative grade point averages in science. With $p = .05$, the null hypothesis was rejected at the significance result of .001, and a significant difference was found present among the groups in the core curriculum subject grade point average of science.

The Scheffe post hoc procedure was applied to determine pairwise comparisons, and the result of group interaction was significant, occurring between musicians and athletes at the .002 level of significance. Based upon estimated marginal means, the mean difference was significant at the .05 level of significance.

CHAPTER 5

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Findings

The purpose of this research was to determine whether a tenuous, cause-effect relationship existed between participation/non-participation in school-sponsored, extra-curricular activities, specifically fine arts and athletics, and the academic achievement of students during grades nine through twelve at a private school in north central Texas. The research involved gathering data from graduates of the classes of 1996, 1997, 1998, 1999, and 2000. The identity of the graduates was encoded, and the following data was recorded for each graduate: gender; participation in school-sponsored, extra-curricular activities; cumulative grade point average; SAT score; ACT score; and cumulative grade point averages for the core curriculum subjects of computer science, foreign language, history/English (an interdisciplinary subject at this school), mathematics and science. After completing ANOVA tests and post hoc procedures on the five research questions, the following results emerged. Results of this study suggest that the curriculum for grades nine through twelve could be significantly impacted if evidence is discovered to support the arts as an important component of the school curriculum.

Results for Research Question One

For research question one regarding the impact of school-sponsored, extra-curricular activities on cumulative grade point averages, the findings indicated that it was possible that a tenuous, cause-effect relationship existed. Participation in music did

appear to have a positive impact over participation in athletics on the cumulative grade point average in this population.

Cumulative grade point averages for musicians at the school included in this study was 3.61 on a 4.00 scale. The cumulative grade point average for students in dramatic arts was 3.5, while the students who participated in visual arts had a cumulative grade point average of 3.37. The students who participated in athletics had a cumulative grade point average of 3.26, and students who did not participate in school-sponsored, extra-curricular activities had a cumulative grade point average of 3.38.

The null hypothesis was rejected at the alpha level .05. A significant difference occurred between musicians and athletes, resulting with musicians recorded as having a significantly higher cumulative grade point average than athletes. There was no interaction between the other subgroups when post hoc comparisons were made.

Results for Research Question Two

For research question two regarding the impact of school-sponsored, extra-curricular activities on SAT scores, the findings indicated that it was possible that a tenuous, cause-effect relationship existed. Participation in music did apprear to have a positive impact over participation in athletics and over non-participation on the SAT scores in this population.

The SAT score average for musicians at the school included in this study was 1196. The SAT average for students who participated in dramatic arts was 1168, while the students who participated in visual arts had an SAT average of 1128. The students

who participated in athletics had an SAT average of 1117, and the students who did not participate in school-sponsored, extra-curricular activities had an SAT average of 1122.

For research question two, the null hypothesis was rejected at the alpha level of $p = .05$. The post hoc results indicated that a significant difference occurred between musicians and athletes and also between musicians and non-participants, with musicians having significantly higher SAT scores than athletes and non-participants.

Results for Research Question Three

For research question three regarding the impact of school-sponsored, extra-curricular activities on ACT scores, the findings indicated that it was possible that a tenuous, cause-effect relationship existed. A significant difference was found to be present at the $p = .05$ level. When the Scheffe post hoc multiple comparison test was applied, a significant difference was not present among the subgroups. However, when the LSD, a less robust post hoc procedure, was applied, a significant difference was found to exist between musicians and two other groups, athletes and non-participants. Participation in music did appear to have a positive impact on ACT scores over participation in both athletics and non-participants. Additionally, the LSD indicated significance between students who participated in drama and those who participated in athletics and non-participants. The thespians at the studied school scored significantly higher on the ACT than did the athletes and non-participants. The results of research question three differs from other data in that thespians out score musicians on the ACT.

The ACT score average for musicians was 25. Students who participated in drama averaged an ACT score of 26, while students who participated in visual arts scored

a 23. Athletes had an ACT average score of 23, and non-participants scored an average of 24.

For research question three, the null hypothesis was rejected at the alpha level of $p = .05$. The following significant differences were found to exist. Musicians scored significantly higher on the ACT than both athletes and non-participants. Thespians scored significantly higher on the ACT than both athletes and non-participants.

Results for Research Question Four

Gender and GPA

For research question four regarding the impact of gender on cumulative grade point averages, SAT scores, and ACT scores, the findings indicated that it was possible that a tenuous, cause-effect relationship existed regarding cumulative grade point averages. In this population, females achieved higher cumulative grade point averages than did males. However, no significance was found to be present for gender in this population regarding SAT scores or ACT scores.

The null hypothesis was rejected at the alpha level of $p = .05$ for differences in cumulative grade point averages between males and females at a private school in north central Texas. A significant F was found to exist with the significance of .010. Females were found to have a significantly higher cumulative grade point average than their male counterparts at a private school in north central Texas.

When testing for interaction between gender and the subgroup activities, a significance of .228 was found. With $p = .05$, a significant difference was not determined to be present, with interaction of gender and the school-sponsored, extra-curricular group

activities of music, drama, visual arts, athletics, and non-participation regarding the cumulative grade point averages.

Gender and SAT

When testing the SAT score averages for males and females at the studied school, the null hypothesis was accepted. No difference was determined to exist at the $p = .05$ level of significance; therefore, a significant difference was not found to be present between males and females and their respective SAT score averages.

When testing for interaction between gender and the subgroup activities, a significance of .606 was found. With $p = .05$, a significant difference was not found on the SAT scores with interaction of gender and the school-sponsored, extra-curricular group activities of music, drama, visual arts, athletics, and non-participantion.

Gender and ACT

When testing the ACT score averages for males and females at the studied school, the null hypothesis was accepted. No difference was determined to exist between males and females and their respective ACT scores at a private school in north central Texas.

When testing for interaction between gender and the subgroup activities, a significance of .754 was found. With $p = .05$, no significant difference was found to be present with interaction of gender and the school-sponsored, extra-curricular group activities of music, drama, visual arts, athletics, and non-participantion on ACT scores.

Results for Research Question Five

For research question five regarding the impact of school-sponsored, extra-curricular activities on cumulative grade point averages in the core curriculum subjects of

computer science, foreign language, history/English (an interdisciplinary subject at the school studied), mathematics, and science, a possible tenuous cause-effect relationship was found to exist between participation in school-sponsored, extra-curricular activities and some of the subject core curriculum grade point averages. The findings are reported as follows:

1) Computer Science – Participation in school-sponsored, extra-curricular activities did not appear to impact the cumulative grade point average in computer science in this population. No difference was determined to exist at the $p = .05$ level of significance; therefore, a significant difference was not found to be present among the subgroups regarding the cumulative grade point average in the core curriculum subject of computer science. The null hypothesis was accepted at the alpha level of $p = .05$ for the subject cumulative grade point averages in computer science. Therefore, no difference existed among musicians, thespians, visual artists, athletes, and non-participants in the subject cumulative grade point averages in the core curriculum subject of computer science at a private school in north central Texas. It should be noted that computer science is not a required course at the school included in this study and that the number of students taking computer science during the five year period was significantly low. Therefore, it is presumed that this particular core curriculum data does not offer significant information.

2) Foreign Language – Participation in music appeared to have a significant positive impact over athletics on the subject cumulative grade point average in foreign language. A difference was determined to exist at the $p = .05$ level of significance; therefore, a significant difference was found to be present among the subgroups regarding the cumulative grade point average in the core curriculum subject of foreign language. Musicians were reported to have a significantly higher foreign language cumulative grade point average over athletes at a private school in north central Texas. The null hypothesis was rejected at the alpha level of $p = .05$ for the subject cumulative grade point averages in foreign language. Therefore, a significant difference was found to exist among musicians, thespians, visual artists, athletes, and non-participants in the subject cumulative grade point averages in the core curriculum subject of foreign language at this private school in north central Texas.
3) History/English – Participation in music appeared to have a significant positive impact on the subject cumulative grade point average in history/English. A difference was determined to exist at the $p = .05$ level of significance; therefore, a significant difference was found to be present among the subgroups regarding the cumulative grade point average in the core curriculum subject of history/English. Musicians were reported to have a significantly higher history/English cumulative grade point average over athletes at a private school in north central Texas. The null hypothesis was rejected at the alpha level of $p = .05$ for subject cumulative grade point

averages in history/English. Therefore, a significant difference was found to exist among musicians, thespians, visual artists, athletes, and non-participants in the subject cumulative grade point averages in the core curriculum interdisciplinary subject of history/English.

4) Mathematics – Participation in music appeared to have a significant positive impact on the subject cumulative grade point average in mathematics in the population studied. A difference was determined to exist at the $\underline{p} = .05$ level of significance; therefore, a significant difference was found to be present among the subgroups regarding the cumulative grade point average in the core curriculum subject of mathematics. Musicians were reported to have a significantly higher mathematics cumulative grade point average over athletes at a private school in north central Texas. The null hypothesis was rejected at the alpha level of $\underline{p} = .05$ for subject cumulative grade point averages in mathematics. Therefore, a significant difference was found to exist among musicians, thespians, visual artists, athletes, and non-participants in subject cumulative grade point averages in the core curriculum subject of mathematics.
5) Science – Participation in music appeared to have a significant positive impact on the subject cumulative grade point average in science in the population studied. A difference was determined to exist at the $p = .05$ level of significance; therefore, a significant difference was found to be present among the subgroups regarding the cumulative grade point average in the core

curriculum subject of science. Musicians were reported to have a significantly higher science cumulative grade point average over athletes at a private school in north central Texas. The null hypothesis was rejected at the alpha level of $p = .05$ for the subject cumulative grade point averages in science. Therefore, a significant difference existed among musicians, thespians, visual artists, athletes, and non-participants in the subject cumulative grade point averages in the core curriculum subject of science.

Conclusions

This study investigated the possibility that a tenuous, cause-effect relationship exists between participation/non-participation in school-sponsored, extra-curricular activities and the academic development of students in grades nine through twelve at a private school in north central Texas. Overall, music appears to significantly impact student performance at the school studied. Musicians' score significantly higher than athletes on cumulative grade point average, SAT score, ACT score, and core curriculum subject cumulative grade point averages in foreign language, history/English, mathematics, and science. Musicians also scored significantly higher on the SAT and ACT than did non-participants. On the ACT, thespians scored significantly higher than both athletes and non-participants. Gender appeared to positively impact the cumulative grade point average but was not significant on college entrance test scores.

The results of this study are in line with theories and previous research that indicate the value of arts education, especially music education, in promoting students' academic achievement. The review of the literature revealed that the arts have been

systematically "softened" or eliminated altogether in their importance in the school curriculum in the United States. However, if one looks to countries and cultures where academic achievement is of utmost importance, the arts are also placed within the curriculum as important factors in academic development. Clark (1994) quoted Governor Thomas Kean of New Jersey, "Art is the ultimate ambassador." The arts offer validity that genius is not racial or ethnic biased. The link to education was formalized with the federal Goals 2000 legislation, which proposed national curriculum standards for the arts.

Reimer (1999) stated that music education should be part of the school curriculum for the way it influences spatial-temporal reasoning, which is critical for math, science, and logic. As with all of the arts, music is first about creating. When considering the school curriculum, the key factor for the arts is balance. Educators should be encouraged to continue to learn about, apply, and promote the benefits of involvement in the arts as part of the school curriculum.

Grandin (1998) theorized two types of reasoning: spatial-temporal and language-analytic. Both are critical for thinking, reasoning, and creating. Music involves language-analytic ability. This development of language-analytic ability emphasizes the pattern development concept, which is the ability to create, maintain, transform, and relate complex images.

Through PET scans (brain scans), neuroscience studies conclude that when a musician plays, both sides of the brain are active and music is the only discipline proven to use both sides of the brain simultaneously (Goetinck, 1998). Therefore, if brain plasticity is truly a multiplicative factor, that is, if one synapse makes two, two makes

four, four makes eight, etc., then music can be described as a discipline that promotes brain function and development.

The importance of the arts to the school curriculum is clear. There is much to be gained in developing the mind from active participation in the arts. Nelson (1998) stated that it is possible to infuse the arts into the school curriculum. Nelson suggested that interdisciplinary courses open unlimited possibilities for arts exposure. Opportunities to incorporate the arts into the core curriculum subjects become endless.

While the findings presented in this study suggest the importance of the arts, specifically music, to education, they should not be interpreted as indicating/suggesting the unimportance of athletic training, visual arts, and drama. Rather, this study serves to strengthen the argument for the importance of music training in the development of the student in grades nine through twelve. When administrators allocate budgets, the arts are often thought of as frills and not as significant disciplines to the school curriculum. The multiple contributions that the arts make to the school curriculum are numerous. Cortines (1999) stated that the arts provide educators with constructivist materials and activities bridging the cultural gaps with activities that provide a diverse range of opportunities for interdisciplinary instruction. The arts promote critical thinking skills for both teachers and learners whereby innovation, novelty, and creativity are fostered and developed. One can only question why something that offers so much to the full scope of the curriculum is often the last served.

Recommendations for Future Research

Results from this study suggest that further research is needed in the following areas:

1) While this study included student participation in school-sponsored, extra-curricular activities, further study from younger populations may prove to be of great importance. For example, this study did not consider if a student had studied piano or participated in band prior to the ninth grade year. Earlier child development may or may not prove to be of even greater importance to academic development and thus academic achievement in later years. Future studies might look at the impact of participation in the early years.

2) Further longitudinal study in other school and district populations is needed to further support the findings of this study. At the school represented in the study, music, drama, visual arts, and athletics are the only school-sponsored, extra-curricular activities available. Research is needed to include other activities such as dance, which actually bridges arts and athletics into one form.

3) Further study regarding the impact of gender on achievement and college entrance scores is needed to better serve the school curriculum.

4) Further research using a true experimental design is needed to determine the true impact of school-sponsored, extra-curricular activities on academic achievement and college entrance scores.

5) Further research might explore the nature of non-participants and sub-groups within the non-participant category. For example, a student might not elect to participate in school-sponsored, extra-curricular activities, but might be involved to some degree of participation in activities or employment outside of the school arena.

6) Further research on the subgroup of athletics might prove to be of significant value. From early on, some school athletes see themselves as participating at the collegiate level or even professional level and therefore do not have the motivation to perform academically. Academic achievement may not a priority to them and therefore their respective academic work may not truly reflect their abilities.

There are many theories revolving around the impact of the arts, music, drama, and visual arts, on the development of intellectual achievement. However, there is actually very little previous research to verify these theories. This study adds significantly to the current literature by determining whether a tenuous cause-effect relationship can be established between participation or non-participation in school-sponsored, extra-curricular fine arts or athletic activities and academic achievement. The study impacts the core curriculum by contributing to the research evidence supporting the inclusion or continuation of the arts in the school curriculum.

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