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Extracurricular activities and their effects on Edgerton High School students' Geometry State Test Scores

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Extracurricular activities and their effects on Edgerton High School students' Geometry State Test Scores

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By

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The thesis entitled '**Extracurricular activities and their effects on Edgerton High School students' Geometry State Test Scores**' presented by **NICHOLAS C ARCHER**, a candidate for the degree of **Master of Science in Mathematics,** has been approved and is worthy of acceptance.

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ABSTRACT

Extracurricular activities play a big role in developing some students into well-rounded adults, while other students choose to not participate in any. This study was performed to show a specific relationship between participating in extracurricular activities and higher test scores on the geometry state test in Ohio. This study was conducted at a rural high school in northwest Ohio, with a sample of 145 students who took both the geometry state test and the eighth-grade standardized test. With this data and the data of which of these students participated in which extracurricular activity, if any, this study could then answer questions about what are some significant predictors of the geometry state test scores or if being involved in a certain type of extracurricular activity has a significantly different mean geometry state test score. Results were found by running two different tests in the data. For the first result, the geometry state test scores were recoded to be zero if the score indicated that the student failed or one of the scores indicated that the student passed. Then a Logistic Regression model was run to find any significant predictors for the geometry state test scores from gender, the student's eighth-grade standardized math scores, or the type of extracurricular activity a student was involved in. The next test was an ANOVA model to look at the differences in mean scores across the different types of extracurricular activities. From these two tests, there was a small but significant relationship showing that participating in an extracurricular activity is beneficial for students' geometry state test scores. This implies that students at Edgerton High School should be a part of some type of extracurricular activity if they would want to increase their geometry state test scores. The two types that showed the most promise were the

individual-based extracurricular activities (Cross-country, Golf, Wrestling, Track) and the team-based extracurricular activities (Football, Volleyball, Basketball, Softball, Baseball).

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Introduction

Throughout teaching and coaching different sports in Ohio, one factor has stood out to teachers and coaches compared to years past: fewer and fewer students are participating in extracurricular activities in school. From talking with administration, teachers, and students at Edgerton High School in northwest Ohio, it seems like there is a lack of motivation that drives students to compete and immerse themselves in something other than schoolwork. From this, students have stated that they have less motivation to work on their schoolwork to a higher degree since that is all they work on. With that in mind, showing students that being involved in some type of extracurricular would have benefits for the students, teachers, and coaches. Thus the reason for this study; is to connect involvement in any extracurricular activities and students achieving high scores on standardized state tests.

This topic has been explored many different times through a broad spectrum across the world, with varying degrees of success and some failures. Most studies found a small, but positive correlation between being involved in extracurricular activities and positive effects at school and on a student's achievement at school. The goal is to run a test similar to those other studies, but gear it towards Edgerton High School, and see if there are any correlations to help inspire some interest in students to join an after-school activity they might have some interest in or even use this study as a reason to create a club they would find interesting.

This study will collect data from students who have participated in different sports or clubs in the school years 2020-2022 and compare that data with those students' scores on the

Ohio Geometry state test to find any relation between them. Then, I plan to isolate different activities to find which type of extracurricular activity tends to correlate with their test scores.

Background of the Problem

The link between extracurricular activities and test scores is not a new topic. It is widely believed that there is a correlation between involvement in after-school activities and higher test scores. One Georgia study by author Steven Wesley Craft "found that students that participate in extracurricular activities have slightly higher grade point averages, SAT scores, success on the Georgia High School Graduation Writing Test, and miss fewer days of school" (Craft, 2012). While another study by Mark Furda and Michael Shuleski said, "The results of the t-test comparing grade point averages show a significantly higher grade point average among participants when compared to nonparticipants" (Furda & Shuleski, 2019). A quote from another study, which includes scores from both language arts and math standardized assessments states, "Extracurricular participation, attendance rate, and several discipline contacts were significant predictors for mathematics standardized assessment scores" (Wilcox, 2012). These are just a few examples of research projects done on similar topics, in which most found a positive correlation between extracurricular activities and test scores, regardless of where in the United States they were held.

Even though most studies talk about the positive effects of extracurricular activities, there are some negative aspects of participating. Studies done with the same goal found that even though extracurricular activities tend to positively correlate with test scores if students are "over-scheduled in too many activities", research shows the benefits of participating in out-

of-school activities may decrease (Wilson, 2009). Students over-scheduling themselves or being pressured to be involved in unwanted activities is a variable not may study touched upon. This turns what is usually a positive impact on a student's school career into a negative one and could affect their extracurricular activities and school life and grades. This is a big factor in whether extracurricular activities have a positive impact or not, and would be interesting to investigate further into what factors tend to cause students to have negative feelings towards extracurricular activities.

This study will be both hypothesis-generating and descriptive. The scores of Ohio geometry state test scores will be collected and compared with data gathered on students involved in extracurricular activities and a hypothesis will be generated. The data from Ohio geometry state test scores, ACT scores, and participation will be collected from the descriptive environment without changing anything.

Data will be obtained from Edgerton High School in northwest Ohio. Specifically, juniors, seniors, and part of the sophomore class with all personal identifying information removed. Kim Stark, the guidance counselor at Edgerton High School, and Leslie Pool, Education Management Information Specialist at Edgerton Local Schools will also support the data acquisition.

The data will include information about a group of up to 150 Edgerton High School students who have taken the Ohio Geometry state test. Students will be from age 13-18 with varying socioeconomic statuses and varying demographics, primarily white (92%).

Data is archived information contained at Edgerton Local schools and will be provided and cleansed by Mrs. Kim Stark. Personal identifying information will be removed from the data before release. Data will be provided after students have taken the Ohio Geometry state test.

The data set will include up to 150 students attending Edgerton High School during the 2021-2022 school year. Sampling will strive to use as many of these students as possible.

Students who have completed the Ohio state geometry test will be added to a list with their scores on the previously mentioned test, along with eighth-grade standardized math test scores, gender, socioeconomic status, and if they participated in a team-based sport, individual-based sport, nonathletic activity, or no activity.

Statement of the Problem

The problem is the lack of data about the connection between extracurricular activities and standardized test scores at Edgerton High School in northwest Ohio, and which activities, if any, correlate the best with higher test scores. Other studies have been conducted at most schools, but this study will give a specific relation for Edgerton High School and not just a generalized result. With this lack of data, there is a need to make better connections at Edgerton High School, so that way students can be more informed about what could help them raise the score on their state tests.

Purpose of the Study

For this study, the independent variables will be categorical. These categories will include participation in Individual-based extracurricular activities, Team-based extracurricular activities, Non-athletic extracurricular activities, gender, and the socioeconomic status of students. Each student will be recorded into one of the three types of extracurricular activities and then their socioeconomic status will be noted, as well. The last independent variable will be quantitative, being the eighth-grade standardized math test scores, which range from 604-810. The dependent variable for this study will be the scores of the Ohio state geometry test students take during their sophomore year in high school. Scores will be recorded as a quantitative variable, with scores ranging between 604 and 810. Scores for both the geometry state test and eighth-grade standardized test will also be manipulated to become categorical by checking if a student passed the test (scores of 700 or higher will be considered passing).

The purpose of this study is to find a correlation between being involved in extracurricular activities and test scores. With this information, students can better raise interest in different extracurricular activities that are already offered at Edgerton Local Schools or new activities that might interest students not involved in any extracurricular activities.

Significance of the Study

The importance of this study is two-fold in helping find new ways to raise state test scores and also increase participation in extracurricular activities at Edgerton High School, which have seen a drop in numbers over the past couple of years. This will help students make

a more informed decision about joining an extracurricular activity and help the administration and the community see the importance of different extracurricular activities. The *"Impact of Extracurricular Activities on Students"* says, "When looking at the variety of out-of-school options students may choose, it is important to consider how connecting with activity might benefit them. It has been suggested by Eccles, that participation is voluntary, school-based, and extracurricular activities increases school participation and achievement. This happens because it facilitates: a) the acquisition of interpersonal skills and positive social norms, b) membership in pro-social peer groups, and c) stronger emotional and social connections to one's school" (Wilson, 2009).

Primary Research Questions "use the announcement as a model"

Question 1: Are gender, the eighth-grade standardized math tests, and the type of extracurricular activity students are involved in significant predictors of geometry state test scores?

Question 2: Is there a statistically significant difference in mean Geometry State Test scores across extracurricular activities (Team-based, Individual-based, and Non-athletic)?

Hypotheses

Hypothesis 1: Being involved in any extracurricular activities is a significant predictor of geometry state test scores.

Hypothesis 2: There is a statistically significant difference in mean geometry state test scores across extracurricular activities.

Research Design

This study will be both hypothesis-generating and descriptive. The scores of Ohio Geometry state test scores will be collected and compared with data gathered on students involved in extracurricular activities and a hypothesis will be generated. The data from Ohio state geometry test scores, eighth-grade standardized math test scores, and participation in extracurricular activities will be collected without changing anything from the descriptive environment.

Theoretical Framework

The theoretical framework of high school extracurricular activities being a positive impact on students' test scores is not a new topic. Many different theories have proven the correlation, not just with academic scores, but also in a healthy, growing adolescent. In a study done by Duncan, Duncan, Strycker, and Chaumeton, they "examined risk and health behaviors among 356 children between the ages of 10 and 14 in Oregon. Results of this survey showed a strong positive relationship between physical activity, a healthy diet, and safety practices, indicating that health behaviors tend to be positively correlated with each other" (Eberle, 2011). Eberle later goes on to list the types of problematic behavior and how extracurricular activities have decreased the number of cases among students. She then says "Despite its many benefits, many studies have been reported that participation in physical activity declines

with age, especially throughout the adolescent years" (Eberle, 2011). This is the same problem being noticed at Edgerton High School, with numbers in most extracurricular activities, not just sports, on the general decline.

Extracurricular activities and sports are a big influence on many students throughout the United States, not just in helping students keep and maintain appropriate grade levels, but also in how students tend to act in social situations after their school career is over. To be able to connect the participation in extracurricular activities and state scores to help other students get an experience beneficial to their school career and their life after school is the main focus of this study. The literature that will be reviewed will be based on the impact of extracurricular activities, in general, and then the study will investigate deeper into the more specific parts with Edgerton High School to find a relation specifically for this district.

Assumptions, Limitations, and Scope

Assumptions for this study will be all students have completed the Ohio state geometry test to the best of their abilities. Another assumption is that all participants of extracurricular activities are doing so on their own and not because an outside source is influencing them to participate. The data will be collected from one rural school district in northwest Ohio, with minimal diversity. Data consists of students from the graduation classes of 2022, 2023, and 2024 who have completed the Ohio State Geometry test and the eighth-grade standardized test for mathematics.

Definition of Terms

Extracurricular Activities: This is a school activity that is separate from the daily academic curriculum.

Team-based sports: Athletic activities in which accomplishments come from how well the team does over the individual (Football, Basketball, Volleyball, Baseball, and Softball).

Individual-based sports: Athletic activities in which honors can be received as an individual, rather than just as a team (Cross Country, Wrestling, and Track).

Non-athletic Activities: Activities provided by the school which does not depend on the physical traits of an individual or a team (Speech and Debate Team, FFA, Band, Choir, and Student Council).

Ohio State Geometry Test: The standardized test given to all students after they take a geometry course in the high school curriculum.

Eighth-grade Standardized Math Test: A standardized test is taken by 8th graders to show how skilled those students are in the area of math.

Socioeconomic Status: an economic and sociological combined total measure of a person's work experience and an individual's or family's economic access to resources and social position about others. In the case of this research project, SES will be represented if a student is signed up for free and reduced lunch at Edgerton High School.

Summary

The goal for all teachers is to help students learn and grow while delivering the content in the best way to help every student understand. This study will be used to help give teachers at Edgerton High School another option to help increase their students' enjoyment and growth at school. This study will also provide resources to credit extracurricular activities and how they help students. Chapter 1 introduced the lack of data about the connection of extracurricular activities and standardized test scores at Edgerton High School in northwest Ohio, and which activities, if any, correlate the best with higher test scores. In the upcoming chapter, the research on extracurricular activities and their impact on student achievement and test scores will be addressed to help further the more specific area of this study.

Chapter Two: Background and Literature Review

The link between extracurricular activities and academic achievement is not a new topic. Countless studies and reviews have been done linking these along with other topics to redefine or redirect this search. In one of the many journal articles about extracurricular activities, Boaz Shulruf says "Investigations into the impact of extracurricular activities on students date back as early as the 1930s with studies documenting the range of activities being offered in schools and questioning whether participation in certain high school activities could be related to higher achievement at college" (Shulruf, 2010). With the extensive amount of research put into this topic, this study aims to narrow it down to a more specific viewpoint for a small, rural school in northwest Ohio. Before doing that, it was needed to look more into the broader spectrum of this study to find common occurrences or patterns from different studies.

General Benefits of Extracurricular Activities

First, research was done on general findings dealing with extracurricular activities and academic achievements. The benefits of joining an extracurricular activity were generally positive when it came to academic achievements. Most studies did not find an overwhelming increase in scores, but a slight, yet statistically significant, increase. In a study, Beckett A. Broh found that "Participating in interscholastic sports during both the 10th and 12th grades has small but consistent benefits to a student's grade" (Broh, 2002). For his study, he used a group of 24,599 eighth graders from different schools and had them complete a survey about schoolwork, relationships, family, attitudes, and behaviors. Then, follow-ups were conducted in their 10th and 12th grades. Broh found "Students who participate in interscholastic sports have a

stronger sense of control over their lives and a value system that is concordant with the American educational system. [Broh] also found that participation in interscholastic sports creates and intensifies students' social ties, which can be advantageous to students' educational pursuit" (Broh, 2002). This is one case of showing that extracurricular activities strengthen more than just a student's academics, but helps them grow more outside of typical school lessons. Broh finally writes "For example, the results indicate that student-athletes are more likely to talk with their teachers outside class than are non-athletes... the more opportunities they have to gain information that could be used to improve their grades or test scores. Yet, these interactions may also act to (1) encourage behavior that conforms to school expectations and norms, which, in turn, helps students succeed in school, and (2) create social bonds that motivate students to perform better for teachers with whom they have personal relationships." (Broh, 2002).

This was another common thread with extracurricular activities that the activities themselves are not directly involved with raising scores, but the relationships and lessons taught with them strengthen the students and better equip them for bettering themselves in a classroom. Haensly, Lupkowski, and Edlind dove into this deeper in their study, in which a student activity survey was given with two open-ended questions: "What benefits did you receive from participation in extracurricular activities?" and "How did participation in extracurricular activities help or hinder you" (Haensly & Lupkowski & Edlind, 1985). They then found that "For the high achieving students, the list of benefits received from participation in extracurricular activities included (in order of frequency): (1) meeting other people; (2) increasing responsibility; (3) making school more enjoyable; (4) developing leadership abilities;

(5) broadening interests ("became more well-rounded"); (6) developing self-confidence ("became more outgoing"); (7) preparing for a career; (8) enhancing time management; and (9) maintaining physical condition or health ("keeping in shape")" (Haensly & Lupkowski & Edlind, 1985). The third point stands out as a direct application for bettering students in the classroom, since if students enjoy their classes and teachers more, then they are more likely to engage in class, which links highly to the success of a student in a classroom. Going back to the list, notice that there are eight common responses. This goes to indicate that students are not just signing up for extracurricular activities to help boost their grades. This shows that there are many beneficial traits and qualities of extracurricular activities that help develop and grow young students to better prepare them for life after school. With all of these extra benefits, Haensly, Lupkowski, and Edlind also said "Despite the consistent, moderately positive correlations between achievement and participation, greater activity cannot be presumed to cause higher grades; yet it does become evident that the higher achieving students are also often more active and vice versa." (Haensly & Lupkowski & Edlind, 1985). Shulruf find something similar in his research on this topic. "The findings from studies on participation in extra-curricular activity and students' outcomes suggest a positive relationship between participation in school-sponsored activities and achievement. However, it is unclear exactly what it is about these types of activity that causes the learning-related outcomes, or indeed whether there is a causal relationship at all." (Shulruf, 2010). Thus, extracurricular activities are not directly related to improving scores, but instead help improve relationships and thoughts about school, which in turn helps to improve academic achievements.

This doesn't just apply to high school students, however. Research has been done on how extracurricular activities affect college students and students in elementary and middle school, as well. O. Myking Mehus says "That the students who are the most active in campus activities are the students who tend to receive the highest grades in academic subjects, while those who participate in no campus activity tend to receive the lowest grades." (Mehus, 1932). This is one study that talks about students on a college campus who filled out a questionnaire, in which they indicated what extracurricular activities they were involved in. One finding Mehus found was that the average scholarship for students was higher the more activities they were involved in. This would be interesting to study again in the more recent years with some colleges putting a heavy emphasis on sports as a big part of their funding. On this other side of the spectrum, Alvariñas-Villaverde, Pino-Juste, and Pumares-Lavandeira say this about a rural elementary school: "Student´s academic motivation was high, both in terms of achievement motivation, as well as in self-efficacy and achievement attributions. This gives the majority of students an overview of the intrinsic motivations, the feeling of self-efficacy, and the adaptive causal attributions, which bring them closer to academic achievements." (Alvariñas-Villaverde & Pino-Juste & Pumares-Lavandeira, 2020). This study, done with students in the last two years of primary school (fifth and sixth graders), talked about how many extracurricular activities these students were involved in, how much time per week they put into their extracurricular activities, and what their overall motivation was. The authors found that the relationship between the number of extracurricular activities and motivation for school tasks was statistically significant. This shows that being involved in extracurricular activities at any level helps students positively during their schooling.

Not only do extracurricular activities help students grow to affect them positively, but they also reduce the possibility of students succumbing to negative effects, such as smoking and dropping out. A good amount of studies talk about how extracurricular activities decrease the chances for a student to drop out of high school. Ralph B. McNeal Jr. says "Integration into the school's various arenas differentially affects dropping out. Participating in the athletic arena significantly reduces the student's likelihood of dropping out." (McNeal, 1995). He goes on to state "Although the traits that are taught in the athletic arena generally support individualism and competitiveness, the activity's prominence in the school and peer culture serves to keep students in school." (McNeal, 1995). Another study by Stephan R. Neely and Elizabeth Vaquera says "Participation in extracurricular activities is significantly related to lower odds of student dropout, even after controlling for known correlates of dropout and potential selection bias factors. The largest reduction in the odds of the dropout was associated with students who participated in both athletic and academic/fine arts activities." (Neely &Vaquera, 2017). Students dropping out of school is one outcome that is reduced by the involvement of a student in extracurricular activities.

But another outcome that can be avoided is students becoming involved with drugs. The authors of *Adolescents' Perceived Risk of Harm Due to Smoking: The role of extracurricular activities* had this to say: "Adolescents who are not involved in extracurricular activities are more likely to endorse the perception that cigarettes have no/slight risk of harm. School-based extracurricular activities may provide unintended benefits to adolescents; health care professionals, including dental hygienists, should be aware of this associated health benefit." (Weiner & Bhandari & Morgan & Trickett Shockey & Waters, 2020). This article talks greatly

about the health risks that smoking can do, especially to students. By showing how school-based extracurricular activities help decrease the chance of smoking, it helps students stay away from harmful substances. From these studies, one thing mentioned that should be looked at for a big reason why extracurricular activities draw students away from these negative consequences is the relationship they build with another trusted role model, who will generally help them to become the best person they can be. Thus going back to previously stated that the creation of a good relationship for students is the best way to help them inside of school and out. Vladimir Enăchescu touches on this in his study by saying "This 2017 study concluded that there is an inverse relationship between youth participation in extracurricular activities and their delinquent behavior; which means that young people participating in extracurricular activities are less exposed to committing crimes." (Enăchescu, 2019).

A study in which extracurricular activities were banned says "This study suggests that the school environment can influence the maintenance of healthy physical activity behavior among adolescents. More specifically, students attending schools where opportunities for physical activity were reduced were more likely to increase their physical activity levels once these activities were reinstated. The effect appeared to be greater in girls than in boys. This study highlights the importance of environmental factors on physical activity behavior among adolescents." (Pabayo & Pabayo & O'Loughlin & Gauvin & Paradis & Gray-Donald, 2006). This study shows more risks for schools without extracurricular activities and other ways of limiting the involvement of students in them, such as the pay-to-play method taken up by schools. The pay-to-play method is used by some schools that are struggling financially and end up making extracurricular activities a source of income, for the players/ player's families. In their study on

the ban of extracurricular activities, they also found that some students struggle to stay healthy and active without extracurricular activities. "Inactivity in adolescents has been linked to excess weight gain, and over the past few decades, the prevalence of overweight and obesity has increased dramatically in North American youth. A reduction in access to school sports could interrupt the maintenance of regular physical activity levels in adolescents, making them even more vulnerable to adopting a physically inactive lifestyle with the resultant effect on health. Even short-term decreases in access to school-based sports activities could result in weight gain." (Pabayo & Pabayo & O'Loughlin & Gauvin & Paradis & Gray-Donald, 2006).

Overall, benefits for students being involved in extracurricular activities go far beyond just academic achievements. What is being trained with extracurricular activities helps students to also grow outside of school, make better relationships at school, and keep them away from harmful and detrimental habits. Enăchescu also states "The results of the study show that participation in a larger number of extracurricular activities is correlated with a more extensive exploration of the vocational fields in the following year of extracurricular activities, and the knowledge of these fields led to the decrease of the career indecision in the next year." (Enăchescu, 2019). This not saying that there aren't some downfalls to extracurricular activities if not implemented right. Students can be overworked, stretched too thinly, and get unneeded pressure from themselves and others involved in extracurricular activities. The best way to make sure students get the most out of these activities is to have them set up and supported well at the school. Unstead, Umstead, and Thompson looked into this and found this: "The following suggestions are offered to those who are considering the organization of a program of extracurricular activities: 1. the most important thing to be considered is that the program

should be the outgrowth of the needs of the school. 2. The program should be administered on an elective basis. No student should be forced to participate in any activity. 3. The sponsor for each club should be carefully selected according to his or her interests and abilities. 4. All social meetings of each activity should have constructive supervision. 5. In introducing such a program, it should have considerable emphasis and close supervision in the beginning. Do not expect a program of extracurricular activities to working smoothly at first; remember it is a new type of work for students." (Unistead & Umstead & Thompson, 1929). Following these guidelines, it will make implementing extracurricular activities that are beneficial to students much easier.

Extracurricular Activities in Rural Schools

Next, shifting focus to more of the rural schools will help see some studies that have a common goal as this study. Looking at the involvement of students at a rural school compared to urban schools, McNeal found "Students in rural schools are an estimated 1.3 times more likely to participate in athletics, and students in urban schools are an estimated 1.2 times less likely to participate in athletics, than students in suburban schools." (McNeal, 1999). Since with rural schools, student bodies tend to be smaller, making a smaller sample size of students who would want to go out for different extracurricular activities. Going along with this, Berk and Goebel summarize this with the statement "Results were in agreement with previous findings that, as high school size decreases, participation in extracurricular activities increases." (Berk & Goebel, 1987), which they also found in their studies comparing rural and urban school's extracurricular activities. The benefits for rural students are similar to the benefits overall, but McNeal also points out that "Students in rural schools rely more heavily on school activities for

socializing and entertainment." (McNeal, 1999). With a rural school being farther away from common hangout places and students generally having a further distance from friends' houses, the best way to hang out would be during or after school with an extracurricular activity that interests those students. Another study by Weir, Errity, and McAvinue said another common finding, "Rural students appeared to be more involved in sports than urban students, but these differences were less pronounced. Slightly more rural than urban students indicated that they were members of a sports club or that they played sport at least twice a week after school." (Weir & Errity & McAvinue, 2015). Another possible reason for rural students to be more involved with extracurricular activities is the perception of a teacher. A study done by Guest and Schneider found "At the school level, our results indicate that participants in sports are more likely to be seen as good students at schools with low academic expectations and at schools in poor communities." (Guest & Schneider, 2003). There are still some gaps in connecting extracurricular activities and academic achievements in rural schools.

Athletic Extracurricular Activities

In this study, we will be looking at and breaking down extracurricular activities. So instead of looking at them as a whole, we will focus on different types, mainly separated into the benefits of athletic extracurricular activities (team-based or individual-based sports) and non-athletic extracurricular activities (fine arts, clubs, band, etc.). Looking into the benefits of athletic extracurricular activities (from now on known as sports), main studies were showing very similar outcomes as those discussed outcomes discussed earlier, for overall benefits of extracurricular activities. The following are a few quotes from different studies about how sports can affect a student. First, from a study by Haensly, Lupkowski, and Edlind found "The

relationship of grades to athletics participation is included, even though it is slight, as it supports the idea that athletics do not relate negatively to grades in this sample." (Haensly & Lupkowski & Edlind, 1985). Then, Silliker and Quirk found "The data ... show that participants had significantly higher GPAs in-season than out-of-season. Attendance at school seemed to be better in-season, but the difference was nonsignificant." (Silliker & Quirk, 1997). And finally, Will J. Jordan found "The results of this study provide evidence that participation in high school sports is associated not only with higher grades, better self-concept, and greater academic self-confidence but also with higher academic achievement." (Jordan, 1999). Jordan goes on to talk about other benefits other than just excelling in the classroom. He states "extracurricular activities in general, sports participation was found to increase high school students' personal investments in education by providing them with additional opportunities for interaction with adults. Within schools, for example, teachers, school administrators and staff, educational paraprofessionals, parent volunteers, and other adults who serve as coaches and related sports personnel often encourage students not only to excel in their extracurricular activities but also to focus on their total educational experience. Thus, sports participation often means exposing student-athletes to a supportive environment that enriches both their love for their respective sports as well as their interest in school." (Jordan, 1999). From this research, we can see that extracurricular activities help all students across different races, genders, and school sizes. Silliker and Quirk also say "The girls earned higher GPAs and attendance than did the boys, but the boys had a significant difference for GPA in-season versus out-of-season." (Silliker & Quirk, 1997), show that both genders can show benefits.

Non-athletic Extracurricular Activities

Other than sports, non-athletic extracurricular activities (from now on known as fine arts), had a smaller pool of studies but showed some similar results to sports. Going back to McNeal's study about high school dropouts, he specifically mentioned fine arts by saying "It may also be that acquiring the skills and knowledge that fine-arts activities have to offer in some way reduces the student's likelihood of dropping out. For example, fine-arts activities instill a less competitive focus in participants and foster a more "cooperative" environment. Therefore, although these activities are not as prominent as are athletic activities, the values taught via fine arts may be more conducive to completing school." (McNeal, 1995). Haensly, Lupkowski, and Edlind also looked at fine arts and saw "In the high school sample of 508~ students, a statistically significant, small to the moderate relationship was found between grades and participation in Fine Arts activities, Student Government, Honor Society and Out of School Activities, as well as in All In school Activities and Total Activities" (Haensly & Lupkowski & Edlind, 1985). They also found "Even more surprising was the wide difference about the Outside Work variable, with only 39 percent of the high achievers reporting no outside work, compared to 71 percent of the low achiever." (Haensly & Lupkowski & Edlind, 1985). This shows that high achievers are taking part in school-based activities, which help them gain relationships at school, making it more enjoyable. This is compared to students finding work outside of school, which makes other relationships, but not any at school to help motivate them in the classroom. Final Roxanne Long presented this statement "The present study found non-sport more strongly correlated with educational attainment. Total effects revealed that non-sport and mixture categories both significantly correlated to higher levels of education. Although,

sports were slightly stronger in relationship to social capital. Perhaps students involved in both types of activities benefit from the various advantages of sport's influence on social capital while also reaping the found advantages of non-sport participation, namely grade point average." (Long, 2020). Her study shows that being involved in either sports or fine arts will help benefit somehow, being involved in both will help gain the benefits of both, making a stronger connection for students at school.

Gaps in Research

Finally, as mentioned before, there are some gaps in this study. Though most general benefits have been explored, very few have done this study with just one specific school to look at their benefits for their student body alone. Also, very few have broken down the extracurricular in the means of team-based and individual-based sports, leaving a lack of data for those. This study plans the further the studies on more specific schools in rural areas, while also offering a different perspective on how sports can be broken down into different subcategories.

Chapter Three: Methodology

Introduction

This chapter will give an outline of the research methods that were followed in this study. It provides information on the setting and participants, which states the criteria for being included in the study, who the participants are, and how they were sampled. The researcher also describes the research design that was chosen for the study of examining if different types of extracurricular activities affect state math scores and the reasons for this choice of the instrumentation used. Lastly, the researcher also discusses the methods used to analyze the data.

Setting and Participants

The school that will be researched is Edgerton High School in rural northwest Ohio which has an enrollment of 270 students (grades 7-12). The demographic of Edgerton is mostly white, at 91.6%, and has a small portion of Hispanic, at 4.8%. At Edgerton High School, 6.8% of the student body are students with disabilities and 22.9% are considered economically disadvantaged. The students who are included in the sample are sophomores, juniors, or seniors, of ages varying from 13 to 18, who have taken or should have taken the Ohio state geometry test and the eighth-grade standardized math test at Edgerton Local Schools.

Students in this study will have taken the Ohio state geometry test and an eighth-grade standardized math assessment in their academic careers. The previous year of data on the Ohio state geometry test has Edgerton High School students having a 44.7% pass rate, which is higher than the state average of 41.2%. Also, the Edgerton High School progress indicator was

below expected (moderate evidence) for their geometry students. For the eighth-grade standardized math test, Edgerton students have a pass rate of 40.6%, which is below the state average of 42.6%. The progress indicator, for the eighth graders' math scores, states that students made less progress than expected (significant evidence).

Students may or may not be involved in different types of extracurricular activities offered at Edgerton High School. Extracurricular Activities offered at Edgerton High School include National Honor Society, Debate Team/Speech, Foreign Language Clubs, Music Activity (not associated with a class), Quiz Bowl, FFA (Future Farmers of America), FEA (Future Educators of America), Student Council, Mat Maid, Football, Basketball, Baseball, Track & Field, Wrestling, Softball, Golf, Volleyball, Cross Country, and Cheerleading. Students are allowed to participate in any extracurricular activity offered at Edgerton, with some having prerequisites or conditions, such as students can only participate in no more than one sport during a season or a cut-off GPA for some academic extracurricular activities like National Honor Society.

The desired sample size based on statistical power is 119 with an alpha=0.05 and an effect size of 0.15 or moderate. The researcher based this on a linear multiple regression model with three tested predictors and four total predictors.

Some limitations that could occur with this sample are based on the size, location, and demographic of the school. With a small, rural school the sample size is limited with a total number of student participants being 145. There are some opportunities to possibly add students from this year's geometry state test, depending on when scores are released. Also, with a lack of variety with the majority of students being white and from a similar area. Then,

the economic disadvantage statistic was noted to be skewed, due to the effect of COVID-19. Kim Stark, the guidance counselor for Edgerton High School talked about how all of Ohio qualified for free breakfast, which stopped some families from applying for free/reduced lunch, which was Edgerton's way of calculating economic disadvantage for students.

Procedure

As stated in the previous section, there are 4 total predictors for this research. First are the types of extracurricular activities: Individual-based athletic extracurricular activities, Team-based athletic extracurricular activities, Non-athletic extracurricular activities, or no extracurricular activities. Individual-based extracurricular activities will include the following activities at Edgerton: Track & Field, Wrestling, Golf, and, Cross Country. These were chosen based on the ability to compete at a state level individually, rather than just with a team. Team-based extracurricular activities will include the following activities at Edgerton: Football, Basketball, Baseball, Softball, Volleyball, and Cheerleading. These were chosen based on the only way for athletes to make it to compete at a state level is with a team and not as individuals. And last, the Non-athletic extracurricular activities will include the following activities at Edgerton: Speech/Debate Team, Music activity, Quiz Bowl, and Mat Maid. These were chosen based on extracurricular activities that have practices outside of school hours but are not included in the typical sports offered by schools. Students who did not participate in any of the above listed extracurricular activities, will be a part of the no extracurricular activities group. This data was collected by Edgerton High School when students signed up to participate in the given extracurricular activities.

The Ohio state geometry test is a standardized test that all students take if they are in a geometry class that year of school. It is an online test consisting of two parts each between 20 and 25 questions. Scores are broken down into two types: Raw Score and Performance Level. The Raw Score is a score from 604 to 810, which is got by totaling up the number of points awarded from each question. The Performance Level is a score on a scale of one to five, with one being labeled as basic and five being labeled as advanced. Students with raw scores from 604 to 677 were given a one, raw scores of 678-699 were given a two, raw scores from 700-724 were given a three, raw scores of 725-755 were given a four, and raw scores of 756-810 were given a five. Students in geometry during the 2019-2020 school year did not take the Ohio State Geometry due to school closing with COVID-19, so students were awarded a Performance Level based on their overall grade in geometry. If a student got an A, they got a five on the geometry state test, or if they got a B, they got a four on the geometry state test, and so on until if they got an F, they got a 1 on the geometry state test. Using the Raw Scores would offer more precise data, but with this limitation in mind, the research will be done with the Performance Level. An area to revisit in the future would be to do this same stud with students who did take the actual Ohio State Geometry Test and use the Raw Scores rather than the Performance Level.

In the Appendix, the researcher has attached the approval from the IRB to conduct this study. No consent forms were given out/ signed since this study did not have students performing any actions differently than any other year. The research conducted was in a commonly accepted educational setting involving normal educational practices. Students were not remunerated for this and will only receive the benefit of knowing whether extracurricular

activities at Edgerton High School show some benefits to their state testing scores. This study does involve children but is at minimal risk. The students' names were all cleansed from the data before the researcher received the information. Student ID numbers, which consist of a string of five to six numbers, were used instead for the researcher to relocate data from multiple sources. The researcher has no access to use the student IDs to identify the students by name. Student ID numbers will be purged from the data and replaced with a generic number once all data is in the same file.

Data Processing and Analysis

This research design will use statistical and multivariate techniques such as Multiple Linear Regression as discussed in "Using Multivariate Statistics (6th edition)", by Fidell and Tabachnick (2012). Studies in this area have done a mix of quantitative and qualitative. The quantitative studies look at the numbers and compare how students did on assessments or what their GPA was when involved in different extracurricular activities. While the qualitative studies examined more how the students themselves felt extracurricular activities impacted their academic careers, most of this information came from surveys and interviews. Most studies used similar statistical techniques, such as multiple linear regression and mixed-method models, but some also included logistical regression (McNeal 1995; Silliker & Quirk 1997; Haensly & Lupkoski & Edlind 1985) Most studies had similar variables with an assessment or GPA as their dependent variable and predictors, such as extracurricular activities involved, socioeconomic status, and gender, as the independent variables (Long 2020; Broh 2002; Neely & Vaquera 2017).

The dependent variable for this study will be the Ohio State Geometry test scores. This test separates its scores into five different categories from one to five: one being limited=604-677, two being basic=678-699, three being proficient=700-724, four being accelerated=725-755, and five being advance=756-810. The independent variables will be the types of extracurricular activities if any, students were involved in. They will be broken down into the three categories Individual-based athletics, Team-based athletics, and Non-athletic extracurricular activities. If a student who was tested with the Ohio state geometry test does not fall into any of these categories, then they will be included in the no extracurricular activities category.

Another variable that was looked at to be included in this study was socioeconomic status, which would be determined by students who were on free and reduced lunch. Due to the impact of COVID-19, the data collected by Edgerton High School does not represent an accurate representation of this and will skew the results. Thus this variable will not be included in the study.

The two research questions for this study will use Logistic Regression for the first research question and an ANOVA model for the second research question. The first question of this study is "Are gender, the eighth-grade standardized math test scores, or the type of extracurricular activities (Individual-based, Team-based, or Non-Athletic) significant predictors for the Ohio state geometry test?". This will be the question a Logistic Regression model will be used with the dependent variable being dichotomized to either a pass (raw scores from 700 to 810, or a 3,4 or 5 for the performance level) or fail (raw scores from 604 to 699, or a 1 or 2 for the performance level). The other question are as follows: "Is there a statistically significant

difference in the mean geometry state test scores across the extracurricular activities?". The second research question will use an ANOVA model to test the difference across extracurricular activity types and the geometry state test scores.

Summary

Chapter three has presented a description of this study's settings and participants, procedures and limitations, research design, and data processing and analysis. The research questions guiding this study are "Are gender, eighth-grade standardized math scores, or type of extracurricular activities (Individual-based, Team-based, or Non-athletic) significant predictors of the Ohio state geometry test?" and "Is there a statistically significant difference in mean geometry state test scores across extracurricular activities (Team-based, Individual-based, and Non-athletic)?" The study is using the Ohio state geometry test to answer each of the research questions above.

Chapter four will present and describe a complete analysis of the data collected by this study, using a quantitative research design using a Logistic Regression model and ANOVA model. This chapter will also present and interpret the findings from the data analysis answering each of the research questions.

Chapter Four: Results

Results

In this chapter, the results of the data analysis are presented and discussed. The purpose of this non-experimental, quantitative descriptive study was to determine if there were any differences in the mean Geometry state test scores across the different extracurricular activities offered at Edgerton High School and to see if any types of extracurricular activities, the eighth-grade state test scores or gender were significant predictors of the student's geometry state test scores. Data was collected from past students who have taken the geometry state test and the eighth-grade state test and compiled with the records of what extracurricular activities each of those students played. The extracurricular activities were separated into four different categories: individual-based, team-based, nonathletic, and none. For a student to be put into a category, they must have been a part of the same activity for two or more years, eliminating most overlap between students.

Study Participants

Students who have taken the geometry state test and the eighth-grade state test for math at Edgerton High School in northwest Ohio were chosen to be a part of this study. These students ranged from sophomores to seniors (ages 15-18) currently attending Edgerton High School. There was a total of 145 students who qualified for this study. All data were collected through Microsoft Excel from the EMIS Coordinator at Edgerton High School, along with all of the records of each extracurricular activity, students participated in.

Data Cleansing

Data cleansing occurred after the transfer of data from the EMIS Coordinator to the researcher after all identifiable factors for students were deleted from the data. Data was then transferred into another Microsoft Excel spreadsheet with a student's grade, gender, geometry score, eighth-grade score, and the category of extracurricular activity they fit into. 5 participants were removed from the data due to missing either geometry or eighth-grade test scores. 2 participants were removed for being involved in multiple categories of extracurricular activities.

Descriptive

Description of the Sample

The demographic data of students involved in individual-based (IEC), team-based (TEC), nonathletic (NAEC), or no (None) extracurricular activity were collected to describe their characteristics. The breakdown of the participants according to the type of extracurricular activity they were involved in was IEC (n=24; 17.4%), TEC (n=55; 39.9%), NAEC (n=34; 24.6%), and none (n=25; 18.1%). Participants who were involved with individual-based extracurricular activities had the highest mean geometry test score (M=3.75, SD=1.36). Test scores for the Geometry state test have a raw score range of 600-810, which is then converted to the reported score of 1-5. Due to a group of students not taking the geometry test, and receiving a reported score based on their in-class grade, the scores used in this study were the reported scores instead of the raw scores. Table 1 presents the means and standard deviations for participants by types of extracurricular activities.

Table 1

Means and Standard Deviations for geometry tests scores by extracurricular activity type

Extracurricular Activity Type	M	SD
Individual-based	3.75	1.36
Team-based	3.35	1.38
Nonathletic	3.15	1.48
None	2.64	1.35

The breakdown of participants according to gender was female (n=69; 50.0%) and male (n=69; 50.0%). The female and male groups were equal in the group participation, with the female's mean score being higher at 3.52, while the male's mean score was 2.96 (T (1,136) = -2.497; p<.05). Table 2 presents the means and standard deviations for the geometry state test across gender.

Table 2

Means and Standard Deviations for geometry tests scores by gender

Gender	N	M	SD
Female	69	3.52	1.36
Male	69	2.96	1.44

Another test used in this study was the eighth-grade standardized test for math, which was scored the same as the geometry test, with a raw score range of 600-810 recorded, then a

reported score of 1-5. For the same reasons as the geometry state test, the reported scores were used for this study. With the same groups for extracurricular activities, participants involved in team-based extracurricular activities had the highest mean (M=3.47, SD=1.00). Table 3 represents the mean and standard deviation for the eighth-grade standardized math test across the types of extracurricular activities.

Table 3

Means and Standard Deviations for eighth-grade standardized math tests scores by extracurricular activity type

Extracurricular Activity Type	M	SD
Individual-based	3.375	0.92
Team-based	3.473	1.00
Nonathletic	3.059	1.23
None	2.64	1.29

The breakdown according to gender was the same as the geometry state test with the participation of males and females both being 69 (n=69; 50%). Similarly, the mean of the eighth-grade standardized math test for females was higher (M=3.49, SD1.12) than the males (M=2.91, SD=1.08). Table 4 presents the means and standard deviations for the eighth-grade standardized math test across gender.

Table 4

Means and Standard Deviations for eighth-grade standardized math test scores by gender

Gender	N	M	SD
Female	69	3.49	1.12
Male	69	2.91	1.08

Hypothesis and Descriptive Analysis:

Hypothesis 1: The eighth-grade standardized math test and all three types of extracurricular activities will be significant predictors of geometry state test success.

A direct logistic regression analysis was performed on geometry state test scores as an outcome and 5 predictors: gender (SEX), eighth-grade standardized math scores (EIGHTH), and types of extracurricular activities students were involved in (EC). Both the geometry state test and eighth-grade standardized math test were dichotomized so that 1 was a "passing score" of 3, 4, or 5, and 0 was a "failing score" of 1 or 2. With the four types of extracurricular activities, no extracurricular activities were used as a reference when testing. Data from n=138 students were available for analysis: 52 (37.7%) students scored a 0 and 86 (62.3%) students scored a 1. Analysis was performed using R (R Core Team, 2015).

A test of the full model with five predictors against a constant-only model was statistically reliable, $\chi^2(5, N=138)=15.634, p<.01$ indicating that the set of predictors reliable distinguishes between passing and failing test scores. The variance in test scores accounted for

is small with McFadden's rho=0.086, df=5. AIC for the full model (179.21) was slightly lower than for the constant-only model (184.84), which indicates a slightly better fit.

Prediction success (using 0.5 as the threshold) was unimpressive with 91 of 138 students (65.9%) accurately classified or predicted correctly. Sensitivity and specificity values were 0.860 and 0.327, respectively.

Table 5 displays the regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for the five predictors. According to the Wald criterion, SEX and ecA were the only reliably predicted test scores, SEX: z=2.160, $p < .05$, ecA: z=2.075, $p < .05$. A model with SEX and ecA omitted was not reliably different from a constant-only model, $\chi^2(3, N = 138) = 69.6311, p = .08$; however, the model was reliably different from the full model, $\chi^2(2, N = 138) = 9.0034, p < .05$. This confirms that SEX and ecA are significant predictors of the geometry test score among the predictor variables.

Variance Inflation Factors (VIF) values ranged from 1.045 (SEX) to 1.099 (EC) indicating that multicollinearity is not a problem. Examination of the significance levels of the interaction between each predictor and the log of itself (see Hosmer & Lemeshow, 1989) indicates that linearity between each predictor and the log of itself may be assumed.

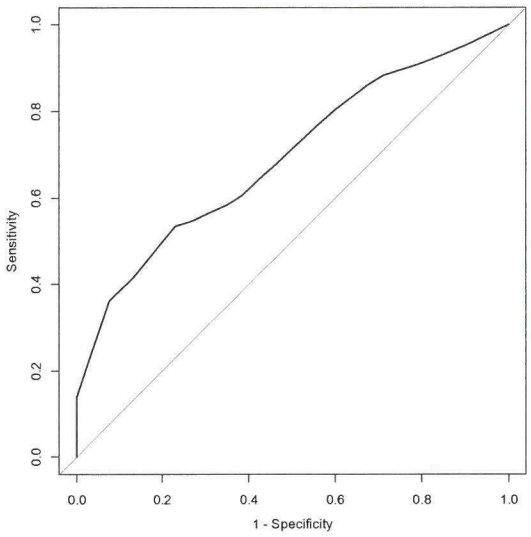
Table 5

Logistic regression analysis of geometry state test scores as a function of student information.

Variables	B	Wald (z-ratio)	p-value	Odds Ratio (OR)	95% CI Lower, OR	95% CI Upper, OR
SEX	0.826	2.160	0.0308*	2.285	1.088	4.904
EIGHTH	0.659	1.533	0.1252	1.933	0.829	4.512
ecA	1.404	2.075	0.0380*	4.073	1.124	16.491
ecB	0.674	1.271	0.2038	1.961	0.694	5.627
ecC	0.365	0.652	0.5146	1.440	0.480	4.368
(Constant)	-0.940	-1.905	0.0568	0.391	0.142	1.004

Using a five predictor model, which was found to be statistically reliable, a receiver operating characteristic curve (ROC) is presented in Graph 1. Receiver operating characteristics graphs (ROC) is a reliable technique for visualizing, organizing, and selecting classifications. Swets (1988) found that ROC analysis could be extended for use in visualizing and analyzing the behavior of diagnostic systems for determining the accuracy of a test using the area under the curve (AUC). The AUC was found to be .6911, which indicates a poor to average accuracy classification (Tape, 2015).

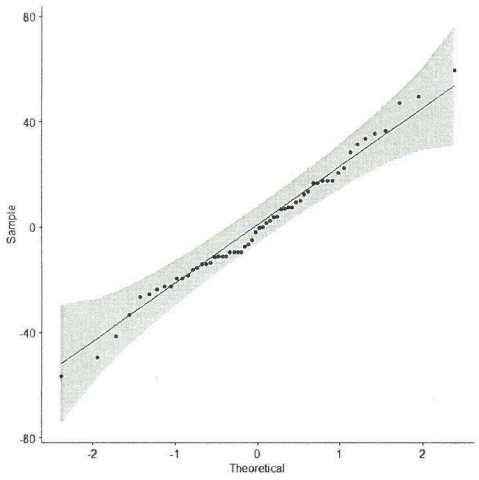
Graph 1. *ROC Curve, Geometry scores*



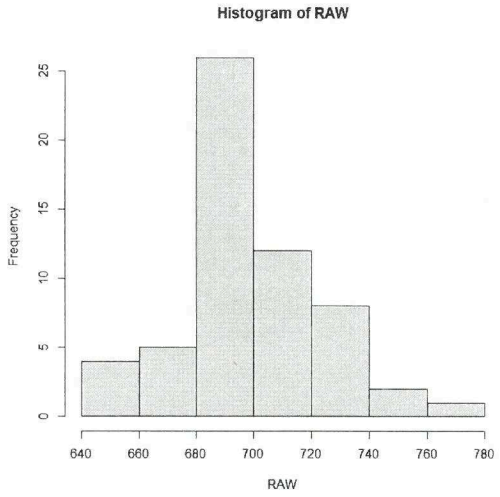
Hypothesis 2: There is a significant difference in the means of geometry test scores across the types of extracurricular activities

One-way ANOVA techniques examined the difference in mean geometry state test scores (range of 604-810) across the four types of extracurricular activities (individual-based (a), team-based (b), nonathletic (c), and none (d)). Results from Bartlett's test of homogeneity of variances indicate that the constant variance assumption is not a concern, test-statistic = 4.9432, df = 3, p=0.176. Shapiro-Wilk test results indicate that the normality assumption was not violated (W = .97685, p = .3314). This was after looking at the standardized residuals and deleting any that were below -2 and above 2, 4 subjects were deleted. Graph 2 shows the ggqqplot of the ANOVA model over its residuals, which even though the Shapiro-Wilk test was still violated, the graph raises little concern. Graph 3 shows a histogram of the raw scores for the geometry state test.

Graph 2: *ggqqplot of ANOVA model over residuals*



Graph 3: *Histogram of geometry state test scores*

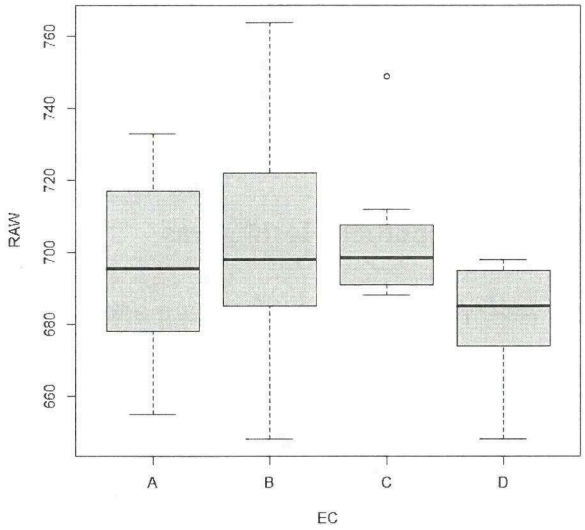


The results revealed that there is not a statistically significant difference in mean test scores across the different types of extracurricular activities, F (3, 54) = 2.176, p = .102. A medium effect size was observed, $\eta^2 = .1078$. The descriptive statistics are presented in Table 6. A boxplot is presented in Graph 4.

Table 6.

Extracurricular Type	n (%)	MEAN	ST. DEV.	MIN	MAX
Individual (a)	10 (17.2%)	696.50	25.92	655	733
Team (b)	27 (46.6%)	704.52	27.75	648	764
Nonathletic (c)	12 (20.7%)	702.00	16.94	688	749
None (d)	9 (15.5%)	681.33	16.70	648	698

Graph 4: *Boxplot of Geometry raw scores over the types of extracurricular activities*



Tukey's HSD test for multiple comparisons found that the mean geometry test score was not significantly different for any of the types of extracurricular activities. The type of extracurricular activity that was closest was the team-based extracurricular activities (difference = -23.19, p = .0719, 95% C.I. = (-47.8108, 1.4404), $g = .9606$). All other comparisons were also not statistically significant with the data shown in Table 7.

Table 7. *Tukey HSD test for comparisons between the types of extracurricular activities*

Extracurricular Activities	Difference	95% C.I. Lower Bound	95% C.I. Upper Bound	Adjusted P-value	Effect Size
B-A	8.0185	-15.6656	31.7028	.8062	.3322
C-A	5.5000	-21.8943	32.8943	.9508	.2279
D-A	-15.1667	-44.5631	14.2298	.5248	.6284
C-B	-2.5185	-24.7158	19.6787	.9904	.1044
D-B	-23.1852	-47.8108	1.4404	.0719	.9606
D-C	-20.6667	-48.8789	7.5455	.2231	.8563

Chapter Summary

The information presented in this chapter includes the results, method of data collection, and data analysis. Data was collected through school records of what extracurricular activities each student was involved in, along with cleansed data about their geometry state test scores and their eighth-grade standardized math scores. Hypothesis testing was implemented for a total of two hypotheses. A one-way ANOVA was used to compare and test whether the mean differences existed across the raw scores of the geometry state test and the dependent variable of the types of extracurricular activities. A post-hoc, Tukey test was used to further validate if statistically significant differences existed among variables and to demarcate differences. A direct logistic regression analysis was performed to test whether the gender of a student, the eighth-grade standardized math test scores (dichotomized into passing and failing), or the type of extracurricular activities a student participates in were significant predictors of success in the geometry state test (dichotomized into passing and failing). One of the hypotheses was rejected, while the other was not rejected.

Chapter Five: Summary and Conclusion

Discussion and Summary

This chapter presents the summary and conclusion derived from the study's conduct, which relates the participation in extracurricular activities at Edgerton High School with test scores on the Ohio State Geometry test. It also provides recommendations and other ways to improve this study for others looking to continue or research this topic.

The study was conducted at Edgerton High School, in northwest Ohio. The study involved students, ranging from grades 10 through 12, at Edgerton High School who have taken the Ohio State geometry test and an eighth-grade standardized math test. Pertinent data were obtained through collection from school officials, mainly the extracurricular activities each student was involved in if any, and the scores on the geometry state test and the eighth-grade standardized math test. Extracurricular activities were then separated into three different groups individual-based, team-based, and nonathletic extracurricular activities. Individual-based extracurricular activities were sports in which a student can go to state by themselves without the team having to go, including cross-country, wrestling, and track. Team-based extracurricular activities are sports in which the team goes to state and not the individual which include football, volleyball, basketball, softball, and baseball. And nonathletic extracurricular activities are activities that meet outside of school hours with no athletic necessity which include, band, choir, speech and debate team, quiz bowl, FFA, and national honor society. For a student to be part of the group, they had to take part in the extracurricular activity for at least two years to show they did not just try it but were involved in it. The statistical tools used were

mean, standard deviation, then a logistic regression and ANOVA model for various research questions.

Summary of Findings

In the scope of the motivation of this research, we can tell a few things. Since one of the primary motivation points of this research was to see if students who are involved in extracurricular activities scored better on their geometry state test scores, the results show some favorable evidence of this. We can return that students involved in individual-based extracurricular activities have a better chance of scoring higher than other students who do not participate in any extracurricular activities. Along with that, from the other test, we can tell that the mean differences on the geometry state test will be higher if a student participated in any type of extracurricular activity compared to the students who don't participate in any extracurricular activities. Though these differences were not statistically significant, they were there and are something to look into with continued research. The missing data from students who did not take a geometry state test in the spring of 2020 limited the number of students in the sample of an already small sample, thus making the result not as strong as it could have been.

The results also favor the theoretical framework that extracurricular activities will result in positive effects for students who participate in them. With the results of the second test not statistically significant, it is tough to relate them to positive effects on students, except we can see that each extracurricular activity had a positive difference when talking about the mean test scores on the geometry state test. This could be due to the small sample size or the missing

data that was omitted due to COVID-19 and students not taking the geometry state test. However, we can see that individual-based extracurricular activities were significant predictors of the geometry state test. Just being a predictor shows the positive effect that these extracurricular activities have on students since those students do not just practice geometry at these sports practices. It shows that students involved in these sports are willing to work harder in the classroom to understand the content better. This does not just apply to geometry, since usually students who work harder in the classroom do not just limit themselves to one class. They usually work just as hard for every other class they are taking as well. Also with good test scores, usually students are showing up to classes, meaning they are absent less, and they also will have higher self-esteem with the confidence of passing a state test, making them less likely to drop out.

Comparing this study with others similar to it we can see a couple of noticeable trends. Regarding the overall effects of extracurricular activities, other studies, including those done by Broh, McNeal Jr., and others in this field, show a significant and positive correlation with achievement in the classroom. "The tenet that playing school sports boost students' achievement in the classroom and on standardized math tests" (Broh, 2002). Along with boosting scores, there were other studies dealing with the positive effects on students who participate in extracurricular activities. One is the dropout rate which McNeal Jr. says "Integration into the school's various arenas differentially affects dropping out. Participating in the athletic arena significantly reduces the student's likelihood of dropping out" (McNeal Jr., 1995). Another study on extracurricular activities and dropping out by Neely and Vaquera say "Participation in extracurricular activities is significantly related to lower odds of student dropout, even after controlling for known correlates of dropout and potential selection bias

factors. The largest reduction in the odds of the dropout was associated with students who participated in both athletic and academic/fine arts activities" (Neely & Vaquera, 2017). This quote also pointed in the direction that both athletic and nonathletic extracurricular can help students not drop out, which was seen in other studies involving academics. One study by Haensly, Lupkowski, and Edlind looked into the achievement in the classroom for students involved in fine arts activities, which is similar to this study's non-athletic extracurricular activities. They then found that in a sample of over 500 students there was a statistically significant relationship between grades and these fine arts activities (Haensly, Lupkowski, & Edlind, 1985). Another study by Roxanne Long looked into both nonathletic and athletic extracurricular activities and found more similar results to the other studies. They say "The present study found non-sport more strongly correlated with educational attainment. Total effects revealed that non-sport and mixture categories both significantly correlated to higher levels of education. Although, sports were slightly stronger in relationship to social capital. Perhaps students involved in both types of activities benefit from the various advantages of sport's influence on social capital while also reaping the found advantages of non-sport participation, namely grade point average" (Long, 2020). This suggests that being a part of one or the other type of extracurricular activity will have benefits to a student's growth in a classroom, but being involved in both will reap the benefits of both, namely the grade point average for a student.

Looking at the results of this study, we can see that it aligns with some similarities of the literature, but also has some slight differences to point out. One result that goes with most other studies from the literature is that being involved in some type of extracurricular activity will have a positive impact on test scores. The largest effect is being involved with individual-based extracurricular activities is a significant predictor for the geometry state test. This shows that students involved with these sports tend to understand the geometry content enough to have a better chance of getting a three or higher on the state test. What about the other types of extracurricular activities? Since they are not significant

predictors, are they worse to be involved in? Though they are not significant predictors, the results still show they have some benefits. When looking at the means of state test scores across the extracurricular activities, this study shows that compared to students who did not participate in any extracurricular activities, students who did participate have a high mean score, with team-based extracurricular activities having the largest difference of 23 points. This result was not statistically significant, but due to the small sample size for this test and the missing scores due to COVID-19, it is a good start to see some trends for these extracurricular activities. One difference from the studies talked about is that some studies find nonathletic extracurricular activities to have a stronger correlation with grades or test scores compared to athletic extracurricular activities, which this study did not find. Though the nonathletic extracurricular activities were not a significant predictor or statistically significant with the means for the state test, they still had a positive difference when compared to students not involved in any extracurricular activities. However, their differences were small than the differences in athletic extracurricular activities. An interesting follow-up study would be to break down the types of nonathletic extracurricular activities and see which of those would be better predictors, or have a statistically significant mean, then run this study while only accounting for those nonathletic extracurricular activities instead of all of them.

Limitations and Recommendations

While running this study, there were multiple mentions of some limitations and other fixes that would be done if this exact study was conducted again. One of the first limitations that were known going into this study was the small number of students that would be included in the study. With Edgerton having an average graduation size of 60 students per class and the study needing students to take a test that is generally offered to students in their second year of high school made the possible sample on average 120 students plus the number of

sophomores who took geometry as a freshman. Not only was there a limited sample size but the global pandemic of COVID-19 caused some of these students not to take the geometry state test, which limited the sample size even more when dealing with the raw scores of the students' test. This limited the variability for the second test dealing with raw scores in particular, which is one possibility why there were no statistically significant differences in the means. In running this test again, it would have been conducted over multiple years and without any outside influences causing students to not take the test. This would allow not only a much larger sample size but also little to no missing data. This will also allow the look into several different classes that are distinct from those going through Edgerton. With multiple years for this study, classes that would have graduated could be added to the study giving more classes, each with their dynamics and styles of learning a chance to show their scores. This could lead to more interesting findings about not just the current classes at Edgerton, but the student population as a whole.

Another limitation, which is talked about in the literature review about rural schools is that most students are not just involved in one type of extracurricular activity, but they are involved in multiple types which could skew the results. The remedy for this during this study was to make a requirement of a student having to participate in a certain extracurricular activity for at least two years, so that way any students just trying the extracurricular activity would not be included in the research, since they were not influenced by the extracurricular activity. Though the two-year cut-off helped fix some of the overlapping problems for this study, there were still students who had to be removed from the study since they were still involved in multiple types of extracurricular activities. So a better fix, which could be

implemented would be to interview or send a survey to students after their senior year and ask which extracurricular activity they feel influenced them the most academically if any. This gives a chance for students to input what they think helped them grow the most if they were involved in multiple types of extracurricular activities. For example, there was a student who was a four-year football player, making them a part of the team-based extracurricular activities, a four-year track runner, making them a part of the individual-based extracurricular activities, and they were also involved with FFA for four years, making them a part of the nonathletic extracurricular activities group. Since they were a part of all three, this student was removed from the study to keep independence, while with the recommendation, the student could choose which extracurricular activity influenced them the most, helping to define them as a part of one of the types of extracurricular activities.

The findings for this study coincide with other similar studies, but should not be used directly when applied to any other school other than Edgerton High School. Since this data was provided by Edgerton High School and has no variability with schools other than it, these results will most likely vary if done with other schools, even if they are of a similar size and make-up. So this study does have an inherent threat to generalizability and the results only represent this school and nothing beyond.

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Shawnee State University

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Protocol # 2021-30

Exempt Review Instructions

Instructions

Researchers who wish to conduct scientific research involving less than minimal risk to non-vulnerable adult participants must complete this form and submit it to the Shawnee State University Institutional Review Board (IRB). ***Proposals must be reviewed and approved by the IRB before any contact with research participants can begin.***

Although we prefer electronic submission, applications can be submitted in two different ways. If you wish to submit the application electronically, please email the items from the check-off list to IRB@shawnee.edu Completed applications must include a scanned file of the signature page of the application or a paper copy of the signature page. If you wish to submit a hard copy, then submit completed printed applications to the Office of the Provost (Massie Hall, Room 124) to Pam Otworth, Administrative Secretary. No review shall be conducted until a complete application is submitted. All applications should be typed. For questions, please contact the IRB Chair, Ed Kehres (ekehres@shawnee.edu).

All Principal Investigators must complete the Human Research Participants Training from the National Institutes of Health (NIH), before submitting an application. This training is completed online at http://phrp.nihtraining.com/users/login.php.

Application Check-off List (All applicable items must be given to the IRB, unless noted otherwise.)

- ☐ Certificates of Completion of NIH Human Research Participants Training for all Principal Investigators (must be less than 3 years old)
  - If certificates are already on file with the IRB, then you need not submit a new copy.
- ☐ Completed "What Type of Review" Form—Keep this form for your records.
- ☐ Consent Form (If applicable, see question 5)
- ☐ Document answering the Research Summary Questions (see p. 2 of application)
- ☐ Copies of all questions or forms that will be used in data collection
- ☐ Any advertisements for research participant recruitment (if applicable)
- ☐ This completed form (pages 3-6)

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Exempt Review Instructions

Research Summary Questions

Please submit your answers in a separate document titled "Research Summary." We request that the document be no longer than 2 pages, double-spaced. If your answers to the questions from the application (p. 3-6) exceed the amount of space given, please include those answers in this separate document and write "see Research Summary" in place of the answer on the application. Please clearly distinguish which question you are answering by labeling it with the appropriate Roman numeral or number.

I. Give a short summary of the research questions. Please include information about prior studies that are directly related to the currently proposed study.

II. Give a short summary of the methodology, research design, and procedures.

III. How will the data be analyzed and reported? Please note if there is any risk of privacy or confidentiality breach in the reported results.

IV. What is the estimated timeline for data collection for this study?

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Exempt Review Application

Title of Research Project: The Effects of Extracurricular Events on High School State Test Scores

Name(s) of Principal Investigators:	Email address:	Faculty	Student	Other
Nicholas Archer		☐	☒	☐
Dr. Douglass Darbro		☒	☐	☐
		☐	☐	☐
		☐	☐	☐
		☐	☐	☐
		☐	☐	☐

*Please place an asterisk by the investigator name(s) whose NIH certificate(s) is/are already on file with the IRB, if the certificate is less than 3 years old.

Contact Name: Nicholas Archer Contact Phone Number: (419) 348-2306

Department(s)/Division/Agency: _____

Please place a check mark next to the category that best describes your research. You may check more than one category.

- ☒ Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (a) research on regular and special education instructional strategies, or (b) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- ☐ Research involving the use of educational tests (e.g., cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (a) data obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (b) any disclosure of the human subjects' responses outside the research could reasonably place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability, or reputation. No videotaping or photography is allowed for data collection. You may not collect data from appointed public officials or candidate for public office.
- ☐ Research involving the collection or study of existing information, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a

manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

- ☐ Research and demonstration projects that are conducted by or subject to the approval of supporting agencies, and which are designed to study, evaluate, or otherwise examine: (a) public benefit or service programs; (b) procedures for obtaining benefits or services under those programs; (c) possible changes in or alternatives to those programs or procedures; or (d) possible changes in methods or levels of payment for benefits or services under those programs.
- ☐ Taste and food quality evaluation and consumer acceptance studies, (a) if wholesome foods without additives are consumed or (b) if a food is consumed that contains a food ingredient at or below the level, and for a use, found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration and approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

If at least one of these categories does NOT describe your research, then you should complete the "Expedited and Full Review Application" instead of this one.

1. Describe the key demographics (age, SES, ethnicity, geographic locations, gender, etc) of the sample that you wish to obtain.

My sample of data will have students between the ages of 13-18, 22% of them are in the low socioeconomic status, the school's geographic location is in northwest Ohio, there is an about an even split of males and females, and the ethnicity is about 92% white, 5% Hispanic, 2% Black, 0.5% Islander, and 0.5% multiracial.

1a. What is the greatest number of participants that will be recruited? _____

1b. How will participants be recruited? I will use students (mainly Juniors and Seniors) at Edgerton High School who have taken the Ohio State Geometry Test and the ACT

2. Will participants be remunerated for their participation? Yes (No)

2a. If so, how will participants be remunerated? Please indicate the type of remuneration and the amount. For instance, the participants will be given a $10 Amazon Gift Card for participation or the participants will receive 3% of their final grade in extra credit in their Introduction course. _____

2b. If participants do not complete the study, will partial or full remuneration be given? Please describe how that will be determined. _____

_____

_____

3. What direct benefits (other than remuneration) exist for the participants who participate?

The study will be shown at Edgerton High School to help raise interest in different extracurricular activities

_____

4. What direct risks could the participants potentially face? Check all that apply.

_____ Risk of breach of confidentiality or privacy

_____ Risk of coercion by researcher(s)

_____ Risk of psychological harm

_____ Risk of physical harm

_____ Other potential risk: _____

If you checked any direct risks in Item 4, then you should complete the "Expedited and Full Review Application."

5. Will the participants be informed of the risks and benefits of the study? Yes (No)

5a. If so, how will the participants be informed?

All data will be cleansed prior and no participants involved

_____

5b. Please check each box if the following criteria match your research.

- ☐ The research involves no greater than minimal risk.
- ☐ It is not practicable to conduct the research without a waiver of informed consent or alteration to informed consent.
- ☐ Waiving or altering the informed consent will not adversely affect the subjects' rights and welfare.
- ☒ The consent document would be the only record linking the subject and the research, and the principal risk would come from a breach of confidentiality.

5c. Do you wish to waive the signed informed consent? (Yes) No

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In submitting this form and the corresponding documents, I acknowledge that I have completed Human Research Participants training and that I understand and will uphold the rights of human participants. I also verify that all information contained in this form and any other corresponding documentation is correct based on my knowledge. I understand that I may not have contact with any research participants until the Shawnee State University IRB has given me their approval.

Signature of Principal Investigator 1

Signature of Principal Investigator 2

Signature of Principal Investigator 3

Signature of Principal Investigator 4

Signature of Principal Investigator 5

Signature of Principal Investigator 6

Date of Submission: 10/29/2021

BIBLIOGRAPHY

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