

ABSTRACT OF CAPSTONE

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The Graduate School
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April 11, 2023

HOW DAILY MOVEMENT IMPACTS ELEMENTARY STUDENTS IN MATH

Abstract of Capstone

A capstone submitted in partial fulfillment of the
Requirements for the degree of Doctor of Education in the
Ernst and Sara Lane Volgenau College of Education
At Morehead State University

By

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Lancaster, Kentucky

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Morehead, Kentucky

April 11, 2023

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Following the COVID-19 pandemic, students returned to the classroom facing heightened challenges. Students lacked motivation, struggled with increased mental health issues, and required social emotional learning. As teachers worked extensively to close deep academic deficits, they dealt with barriers such as increased behaviors that caused frustration and tested educators to the extent of creating a teacher shortage across the United States. Educators were challenged to improve school culture and manage the various needs of students.

Prior to the pandemic, this school had found success using a zero-hour fitness program targeting students that struggled with Adverse Childhood Experiences that impacted attendance, behavior, and academics. The school built on this idea the following year by taking the physical education teacher out of the performing arts special class rotation to be used as an interventionist, increasing the minutes of physical activity each week for all students.

This quantitative study compared the growth on the math iReady assessment before and after 20 minutes of physical activity was added before math class each day for fourth and fifth grade students. It also compared the growth of various subgroups to determine if physical activity had a greater impact on one subgroup over the other.

The results indicated a significant statistical difference in both fourth and fifth grade math scores when students participated in 20 minutes of physical activity before math. It is important to note that the 20 minutes used for physical activity was

taken from math instruction. The students went from 90 minutes of math instruction the first year to 70 minutes the second year. There was not a significant difference in subgroups other than the external, internal, both behaviors and no identified behavior subgroup. Therefore, it can be concluded that physical activity makes a significant difference in math for all students.

Humans were designed to move. Physical activity not only increases math scores but can be used as a built-in intervention to assist students in many ways. Not only does physical activity impact the body but most importantly for students, it impacts the brain.

KEYWORDS: academic achievement, COVID-19, mental health, physical activity, social emotional learning

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DEDICATION

I would like to dedicate this work to my husband Sam and our two daughters, Addey and Morgan. To Sam, thank you for supporting me throughout this process and allowing me to follow the path God chose for me. When I felt called to become a school administrator and go back to school, you never hesitated. You allowed me to listen and serve Him in a way that neither one of us expected.

To my girls, Addey and Morgan, thank you for allowing me to chase my dreams and reach my goals. I hope that by witnessing this process, you will do the same. I hope you learn to set high expectations and achieve them in whatever you desire to do. I hope that I can be there to support you as you work to achieve your goals, just as you have for me.

To my parents, thank you for teaching me the importance of education from a young age. You provided for me both emotionally and financially so that I had every possible opportunity. Thank you for teaching me about Jesus Christ and how to follow His way.

Last but not least, thank you to our Almighty God for hearing my prayers and guiding me through this life. Thank you for choosing me for these opportunities to serve my family, my students and my community.

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TABLE OF CONTENTS

	Page
List of Tables	14
Chapter 1: Introduction.....	16
Statement of the Problem	17
Background of the Problem.....	18
Significance of the Problem	21
Research Questions.....	25
Definition of Terms	25
Summary.....	26
Chapter 2: Review of Literature	29
Academic Achievement.....	30
Focus and Engagement.....	32
Motivation	33
COVID-19	35
Externalizing Behaviors	36
Internalizing Behaviors.....	38
Males and Females	40
Economically Disadvantaged	41
Students with Disabilities	41
Conclusion	43
Chapter 3: Methodology.....	45

Local Context 46

Research Design 53

 Research Questions..... 54

 Hypothesis(es) 55

 Subjects and Sampling..... 56

 Instrumentation..... 57

Procedures 59

Data Analysis..... 60

Chapter 4: Findings/Identified Strategies and Products 62

 Participants 62

 Subgroup Participants..... 63

 Internalizing and Externalizing Behaviors 64

 Gender 64

 Economically Disadvantaged 65

 Students with Disabilities 65

 iReady Results 66

 Internalizing and Externalizing Behaviors 68

 Gender 70

 Economically Disadvantaged 72

 Students with Disabilities 73

 Summary..... 74

Chapter 5: Conclusions, Actions, and Implications 78

Summary of Results and Findings.....	78
Interpretations.....	81
Implications for Improvement/Change.....	82
Limitations, Delimitations, and Assumptions	82
Limitations.....	82
Delimitations	83
Assumptions	84
Recommendations	85
Future Actions	86
Conclusions	87
References	89
Vita	100

LIST OF TABLES

	Page
Table 1 Minutes of Physical Education Every Two Weeks	20
Table 2 Math iReady Assessment Scores	22
Table 3 Kentucky Summative Assessment Math Proficiency Scores	23
Table 4 Percent of Students Identified with Externalizing and Internalizing Behaviors	24
Table 5 Minutes of Physical Education Every Two Weeks	48
Table 6 4 th Grade Sample Schedule in 2021-2022	48
Table 7 5 th Grade Sample Schedule in 2021-2022	49
Table 8 4 th Grade Sample Schedule in 2022-2023	50
Table 9 5 th Grade Sample Schedule in 2022-2023	50
Table 10 CDR's 2021-2022 Physical Education Intervention Schedule.....	51
Table 11 CDR's 2022-2023 Physical Education Intervention Schedule.....	52
Table 12 Minutes of Math Instruction	53
Table 13 Total Students in Study.....	63
Table 14 Results from 2022-2023 SRSS Screener Number One	64
Table 15 2022-2023 Gender	65
Table 16 2022-2203 Economically Disadvantaged and Advantaged.....	65
Table 17 2022-2023 Students with Disabilities and No Disabilities	66
Table 18 Examination of 3 rd Growth and 4 th Growth	67
Table 19 Examination of 4 th Growth and 5 th Growth	67

Table 20	4 th Grade Descriptive Results	68
Table 21	Analysis of 4 th Grade Behaviors.....	69
Table 22	5 th Grade Descriptive Results	70
Table 23	Analysis of 5 th Grade Behaviors.....	70
Table 24	Analysis of 4 th Grade Male and Female Students	71
Table 25	Analysis of 5 th Grade Male and Female Students	71
Table 26	Analysis of 4 th Grade Economically Challenged.....	72
Table 27	Analysis of 5 th Grade Economically Challenged.....	73
Table 28	Analysis between 4 th Grade Students with Disabilities and Without ...	74
Table 29	Analysis between 5 th Grade Students with Disabilities and Without ...	74

Chapter 1

Introduction

The return to in-person school following the COVID-19 pandemic was difficult on everyone. Educators, parents, and most importantly students faced challenges and struggles more than ever before. Some students returned to their school buildings after being isolated at home for more than a year. Students were accustomed to creating their own daily schedules at home without the structure of routines or expectations that exists in a school setting. Students were overexposed to screen time, and some became intensely addicted to YouTube and video games. Returning to the in-school setting, educators were met with challenging behaviors and outbursts in the classrooms while students lacked energy and motivation. There were various learning gaps and students struggling with academics while social emotional issues reached an all-time high. As a result of this most difficult time, educators and families were met with increased challenges that highlighted social emotional learning and various behavior issues.

In March of 2020, Governor Andy Beshear announced that all public schools in the state of Kentucky would be closing because of COVID-19. This single announcement marked the beginning of a historic set of challenges for public educators. Teachers did their best to create Non-Traditional Instruction (NTI) packets and Google Classrooms to finish out the remaining school year. State testing was canceled and the 2019-2020 school year ended abruptly creating frustration for all stakeholders. As the 2020-2021 school year began, teachers navigated their way

through a new type of learning in which they were not prepared for through college courses or professional development. They connected with students virtually as best they could with an inconsistent school calendar fluctuating between in-person school and virtual learning experiences. Educators commonly used the phrase “building the plane while flying it” to replicate their efforts.

Families became irritated and complained they were not prepared to teach their own children. Educators felt exasperated as they witnessed students and their efforts declining. Educators began exiting the field causing a significant teacher shortage because of the increased challenges, lack of resources and pay, and increased frustration. By the summer of 2020, one out of five U.S. teachers reported they were unlikely to return when schools physically opened (Page, 2020). Negative criticizing of public education was at an all-time high and school culture at an all-time low.

Statement of the Problem

Although the full impact COVID-19 had on education may never be known, this challenging period and its complexity caused the most confident students to struggle with the unique challenges set before them. Evidence suggests heightened levels of anxiety and depression among typically developing children during the COVID-19 pandemic (Henderson et al., 2020; Jiao et al., 2020). In addition, half of the children diagnosed with a known mental health issue do not receive services (Whitney & Peterson, 2019).

As reported in a meta-analysis project looking at 59 studies, there was a positive link between participation in physical activity and several physical,

physiological, and psychological aspects (Fortier et al., 2009) as well as positive effects on academic achievement (Fedewa & Ahn, 2011). The purpose of this capstone was to determine how 20 minutes of physical activity before math instruction each day might have impacted math achievement for fourth and fifth grade students. This idea not only increased physical activity minutes for students but provided a built-in intervention for students with social emotional and behavior needs.

This project compared the growth students made on the math iReady assessment before and after physical activity was incorporated before math in the master schedule. In addition, it looked at specific subgroups to see how this intervention benefited various groups of students. The subgroups considered in this study included students with identified external, internal, both behaviors, or no identified behaviors, male and female, economically disadvantaged and non-economically disadvantaged, and students with and without disabilities.

Background of the Problem

Following the COVID-19 pandemic and upon returning to school for the 2021-2022 school year, financial resources such as ESSER funds were distributed to districts to provide additional resources to support public education through this challenge. This allowed schools to brainstorm innovative ways to meet the evolving academic deficits, challenging behaviors, and social emotional needs of students.

Prior to COVID-19, the elementary school which served as the setting for this study had found success using a zero-hour fitness program to target students that

struggled with behavior, attendance, and academics as well as other various Adverse Childhood Experiences (ACEs). Identified students began their school day in the gym with a 20-25 minute workout to increase heart rate and prepare them to learn. This structured time included activities such as fun fitness games, short high intensity workouts and motivational stories and quotes. Students were also educated on the impact physical activity has on the brain. Not only did the staff begin to see a shift in these students and their attitudes, but the students were motivated to work harder while at school.

In addition, the physical education teacher started educating the staff on the impact movement had on the brain and how it could benefit students in the classroom. Monthly faculty meetings opened with a movement activity and a balanced lifestyle was encouraged for adults throughout the building. The staff became involved with promoting this idea by stopping in the gym during their planning to get in time on the machines (purchased with Healthy Schools grant money) or taking a walk during their break. Teachers shared brain breaks and ideas for incorporating movement into daily classroom instruction. The school was off to a great start with changing the culture of the school before the pandemic occurred.

Using the momentum and success of the zero-hour fitness program that occurred before the pandemic and benefited a targeted group of students, the opportunity to extend this idea schoolwide was discussed for the 2021-2022 school year. This idea meant taking the physical education teacher out of the daily 45 minute performing arts specials rotation to be used as an “interventionist” to allow students

to have more minutes of physical activity each week in the gym. The additional class in the performing arts rotation would substitute technology for physical education and be paid for using ESSER funds.

This shift in the master schedule would allow every student to visit the gym more often, therefore increasing the weekly physical education minutes of every individual in the school. In the past, students had participated in physical education through a weekly performing arts specials rotation. Prior to the 2020-2021 academic year, the specials rotation included library, half time music/art, physical education, and PAWS class which incorporated a social emotional learning curriculum. During this time, most students only participated in physical education through the specials rotation unless they were a part of the zero-hour fitness program.

Therefore, the School-Based Decision Making Council (SBDM) made the decision to take physical education out of the specials rotation and replace it with technology. This allowed the extra allocated position to create a physical activity interventionist which gave all students the opportunity to visit the gym more frequently and increase weekly physical education minutes (see Table 1).

Table 1

Minutes of Physical Education Every Two Weeks

	2020-2021	2021-2022
Kindergarten – 3rd Grade	90	150
4 th -5 th Grade	90	150

Upon completion of the 2021-2022 school year, the positive impact movement had on students was evident. Discussion took place about the notable shift and the positive change that was contagious. The feel of the building and the culture was positive but the challenge to produce measurable data of how this initiative truly impacted students continued. Students completed an informal survey about movement, and it was found that 74.1% reported they felt getting their heart rate up made them a better student. Approximately 63% said that having movement motivated them to come to school. As teachers continued competing with a digital world with more and more challenges, they were beginning to see positive results in students.

When preparing for the 2022-2023 school year, administrators and teachers were encouraged by the motivation they saw in students with the physical activity intervention. Students seemed to benefit from the shift in the master schedule in a variety of ways and the desire to continue the intervention was overwhelming throughout the school. The administration wanted to continue the intervention but data to support this opportunity was needed. Each year the district's administration makes critical decisions with annual allocations. Having measurable evidence could reinforce options in making decisions that best meet the needs of students.

Significance of the Problem

Since virtual learning in 2020-2021, the math scores had significantly declined on iReady, the universal screening tool given three times a year for all students at this elementary school. In 2018-2019, 71% of students were on grade

level. The students on grade level decreased from 71% to 58% since the COVID-19 pandemic and implementation of virtual learning. Table 2 illustrates the iReady math scores since the 2018-2019 school year and the changes that took place over a four-year period.

Table 2
Math iReady Assessment Scores.

	On Grade Level	One Grade Level Below	More than One Grade Level Below
2018-2019	71%	25%	4%
2019-2020* (445 students)	50%	43%	6%
Virtual Learning 2020-2021 (414 students)	55%	35%	9%
2021-2022 (450 students)	58%	37%	5%

*2019-2020 we did not finish the year due to COVID. Data are from the December 2019 assessment.

Each year in Kentucky, all public-school students in grades third, fourth and fifth take the Kentucky Summative Assessment (KSA) to meet state and federal testing requirements. This annual assessment measures progress in each content area on the Kentucky Academic Standards. Students are tested in the content area of math in grades third through eighth, tenth and eleventh. Similar to the results on the math iReady assessment, students struggled with math proficiency on the state assessment as well. Less than half of the students that were tested performed in the proficient or distinguished category in the content area of Math. (see Table 3)

Table 3

Kentucky Summative Assessment Math Proficiency Scores

	Proficient/ Distinguished	Male/ Female	Economically Disadvantaged / Advantaged	Students with Disabilities
2018-2019	44.6%	47.2% 42.3%	37.6% 54.2%	21.7% 47.9%
2019-2020* (448 students)				
Virtual Learning 2020-2021 (414 students)	45.4%	50.5% 39.5%	30.8% 59.8%	17.7% 34.1%
2021-2022 (450 students)	52.0%	58.0% 46.0%	28% 56%	17% 42%

*2019-2020 Students did not take a State Assessment due to COVID-19.

When digging deeper into the Kentucky Summative Assessment (KSA) achievement gaps, it is interesting to note the difference in males and females, economically disadvantaged and economically advantaged, and students with disabilities and without disabilities. Consistently across the math data, females are less proficient than males, economically disadvantaged are less proficient than economically advantaged and students with disabilities are less proficient than those without disabilities.

In addition to the academic challenges that impact education, student behavior patterns impede the learning environment. These behavior patterns include externalizing and internalizing behaviors. Externalizing behaviors such as noncompliance, aggression, and defiance can include outbursts, and disrespect to

escape classroom tasks. Internalizing behaviors can include students that are extremely shy, anxious, and socially withdrawn. The depth of these identified behaviors is often unknown.

The tool used to screen for externalizing and internalizing behaviors by this district was the Student Risk Screening Scale (SRSS), which was first implemented during the 2019-2020 school year. The assessment was designed to be given three times a year in which it was only given once during the 2019-2020 and 2021-2022 school year. The screener was not given at all during 2020-2021 because of virtual learning. The results of the SRSS since 2019-2020 are included in Table 4.

Table 4

Percent of Students Identified with Externalizing and Internalizing Behaviors

	2019-2020 (N=448)	2021-2022 (N=450)
Externalizing Behaviors – Moderate Risk	18%	19%
Externalizing Behaviors – High Risk	10%	.04%
Internalizing Behaviors – Moderate Risk	11%	17%
Internalizing Behaviors – High Risk	15%	17%
Students with Both External and Internal Behaviors	15%	10%

*2020-2021 not assessed due to COVID

In addition to identified behaviors, teachers struggled to facilitate cooperative learning and discussion because students lacked motivation and enthusiasm in the classroom. Students became emotional and frustrated much more quickly than before with simple daily tasks. Overall, behavior events at this elementary school jumped

from 48 events in the year 2019-2020 prior to the pandemic to 89 events in 2021-2022 when students returned to school full time. A plan was created to put behavior interventions in place. According to Weiner (1992), there is a distinction between internal or personal causality, and external or environmental causality. Both have an impact on academic achievement, and both need to be addressed to see progress. Thus, it was decided to focus on physical activity before math to determine the true value of physical activity and academics at this elementary school.

Research Questions

In an effort to determine how to best maximize resources, the following research questions were investigated.

1. What impact did the implementation of physical activity before math each day have on fourth and fifth grade math iReady scores?
2. What impact did the implementation of physical activity before math each day have on various subgroups in this elementary school?

Definition of Terms

ACEs – Adverse Childhood Experiences

Growth Score – the growth score is obtained by subtracting the percentile on the math iReady assessment post-test from the percentile of the math iReady pre-test.

Intervention – Provides students with the support needed to acquire the content required by the educational system.

iReady Assessment – The iReady diagnostic is a computer-adaptive test that matches the difficulty of test questions to the proficiency level of each student. As

students answer questions correctly, they will get more difficult questions. As students answer questions incorrectly, they will get easier questions. The Diagnostic results identify the placement of students based on the mastery of grade level skills.

KSA – The Kentucky Summative Assessment is the Kentucky public school system’s annual summative assessment that measures student proficiency and progress on the Kentucky Academics Standards. The assessment is given to students in grades 3 through 8, 10 and 11.

Movement – Movement opportunities for students in the classroom integrated into daily instruction such as brain breaks, sensory walks, walking classroom.

Physical Activity – a behavior requiring energy expenditure beyond rest (Castelli et al., 2014)

Physical Education – an academic subject in schools that includes a planned curriculum based on national standards that includes content that increases motor skills, knowledge, and behaviors for physical activity (CDC, 2002).

Score – the percentile ranking of the raw score obtained on the math iReady assessment.

Summary

The setting for this study, an elementary school, is dedicated to exploring innovative ways to reach the needs of all students. This research project was designed to assist school administration and faculty in making decisions based upon data collected from the school population to make decisions that are best for students. This

information will hopefully assist in gaining insight on how physical activity impacts math academics and assist in scheduling.

This elementary school is not alone. Educators across the nation continue to make critical decisions for students because of increased challenges and lack of funding. Although positive results from physical activity have been documented, in 2011-2012, only 10% of states in the United States required daily recess at the elementary school level (Institute of Medicine, 2013). Unfortunately, this statistic is very common throughout schools today.

With the reduction in funds and the increase in need, school districts are stretched thin and forced to make decisions that could be detrimental to students. Healthy active school age students learn. Research confirms the positive correlation between physical activity, physical fitness, and academic achievement (Wittberg et al., 2012). These data are critical in supporting physical education programs in public schools.

Humans were designed to move. The health benefits of physical activity for people of all ages have been known for years. Physical activity not only increases physical health but mental health as well. The purpose of this project was to determine if 20 minutes of physical activity before daily math instruction would impact math iReady scores for fourth and fifth grade students. In addition, it compares identified subgroups to see which students benefited the most from this intervention. This schedule change required taking the physical education teacher out of the performing arts weekly rotation to increase the weekly minutes of physical

education. Using the physical education teacher as an interventionist provided daily movement to benefit students academically by addressing behaviors, focus, engagement, and motivation.

Chapter 2

Review of Literature

The benefits of physical activity and how it impacts academic performance, engagement, motivation, and positive attitudes at the elementary level has been studied since 1967 (Castelli et al., 2014). Even though there is a plethora of research on the value physical activity has on students, the information is not considered when educational decisions are made. When budget cuts occur, anything beyond academic classes or core content seems to be eliminated first. Many times, this includes valuable resources and engaging opportunities that enhance a student's education.

It is critical that those making decisions for the education system understand the complex needs of students and the value in training staff to fully implement programs to maximize results. The Physical Activity Guidelines for Americans provided by the U.S. Department of Health and Human Services (USDHHS, 2008) states that children and adolescents need a minimum of 60 minutes of daily physical activity. Despite this recommendation, recess and physical activity minutes have been cut across the United States.

While previous studies have shown a significant link between physical fitness and academic achievement in school age children, fitness measures and programs vary and some of the research is inconsistent (Chomitz et al., 2009). Students have now experienced COVID-19, which adds an additional layer to already existing complex issues. This literature review will share what is known about physical activity and elementary students, how movement can impact academic achievement,

focus and engagement as well as motivation. It will also share research found on COVID-19, and subgroups including external and internal behaviors, males, and females, economically disadvantaged and student with disabilities.

Academic Achievement

Physical education has been a part of elementary curriculum for years. Research linking physical education to academic achievement has shown positive results. Blom et al. (2011) explored the relationship between fitness activities, test scores, attendance, discipline, and socio-demographics amongst students in Mississippi public schools. The results indicated a significant correlation between students that were fit and how they scored on academic assessments and in addition, had better attendance. It is important for students to be physically active and fit. Chen et al. (2019) shared the report card for physical activity in youth and children which reports that only 24% meet the national recommendation of 60 minutes of daily activity. Providing physical activity is just one way public schools can provide an intervention opportunity with the resources currently in place to support students and their quest for academic success.

As curriculum and master schedules are created, it is important to prioritize opportunities for students that boost academic achievement. This requires support from administration in both the curriculum and culture as well as a transition from defined subjects to a new system with more of an integrative approach. According to Wilkens et al. (2003), part of the integrative approach includes providing students with daily physical education classes starting in elementary school. Lynch (2015)

suggests that physical education is best implemented when general education teachers and physical education teachers collaborate by working together. These opportunities promote communication and strengthen the school implementation plan. Students not only received daily physical activity in the gym but at recess and in the classroom. Studies of childhood obesity identify the school as the primary remediation and prevention of obesity for students (Green & Reese, 2006).

Integration and collaboration are essential components in the physical activity that takes place within the physical education classes. Wittberg et al. (2012) conducted a study that examined the benefits of aerobic fitness on student achievement over a two-year span. Students who participated in aerobic fitness showed greater academic achievement and the academic achievement was maintained over time, especially when students continued to participate in the aerobic activities. It is important that aerobic fitness be embedded in students' daily schedules and that educators give all students these opportunities to maximize learning.

As physical education teachers lead this charge, it is critical that they ensure this intervention is molded using the research that will maximize results, therefore having the biggest impact on students. Castelli et al. (2014) shared that scholars must get this information into the hands of teachers and administrators since the research had taken place since 1967. Part of that is understanding what should be included during this designated time. Research indicates that the physical activity must have an aerobic focus. Bartee et al. (2018) suggested the correlation of fitness and academic achievement benefited students most often when aerobic fitness occurred.

Although there is an abundance of research on how physical activity impacts academics, there is not much research on how it specifically impacts math. It is important to note this lack of research because math anxiety impedes math performance. According to Richardson and Suinn (1972, p. 551), “anxiety undermining performance on mathematics tasks was termed mathematics anxiety”. Hembree (1990) conducted a meta-analysis to determine the effects of math anxiety on students. His work affirmed that learning, mastery and motivation connected with math anxiety. Wigfield and Meece (1988) discovered math anxiety levels are similar in older and younger children, boys and girls. Ma and Xu (2004) also concluded there was not a difference in males versus females with math anxiety. “Math anxiety impeded performance in simple arithmetic tasks” (Allen & Vallée-Tourangeau, 2015, p. 1553).

Students with challenging behaviors experience difficulty in all core academic subjects, but research has uncovered persistent difficulties with spelling and mathematics (Reid et al., 2004). Intentionally placing physical activity before math allows students with significant behaviors to self-regulate themselves.

Focus and Engagement

Focus and engagement can be a challenge in any classroom. Howie et al. (2015) states that when students are not exposed to enough activity throughout the school day, they are most likely to be off-task and fidgety. If students cannot focus or concentrate, students will struggle to learn and retain information. Classroom teachers can maximize student focus by implementing classroom breaks into daily schedules.

Research supports the connection between physical activity and cognitive processes including attention, memory, and academic performance (Castelli et al., 2014).

A study was conducted in Canada with elementary age students to investigate the intensity of student movement during the school day during instructional time, recess, and physical activity. The results found that participants spent more than 80% of instructional time in sedentary activities (da Costa et al., 2022). This practice has become so common for instruction that students sit and get for most of the school day.

da Cruz (2017) research supports movement breaks, both integrated into the daily schedule and during recess breaks. The research focused on short bouts of teacher-led physical activity, integrated classroom activities, and increasing structured activities during recess rather than just letting students play. Students report that they feel the additional activities help them to better stay on task while the teachers feel they need more training to implement the programs. This is extremely important for students that struggle with executive functioning. Tomporowski et al. (2007) went to the extent of suggesting that systematic exercise programs may enhance the development of specific types of mental processing that can have an impact on fluid intelligence in elementary aged students.

Motivation

Finding ways to motivate students has become a huge challenge for educators as they are competing with technology along with many other distractions that students face. It is important to offer students opportunities to have personal choice as

well as participate in organized activities. Shen (2012) compared the motivation of students participating in organized outside activities to self-determined activities within the school. While students may enjoy participating in organized activities with their friends and these activities may create confidence and empower students, students in the school setting were able to become competitive and were self-motivated by the activities. It is important for physical education teachers and classroom teachers to provide a rationale of the activities they plan for students to better understand their purpose.

Allowing students personal choice and organized activities increases motivation. Another way to encourage motivation is by ensuring students have access to recess equipment to encourage physical activity while on the playground. Elliot et al. (2011) investigated adding equipment to outdoor play and how it increased engagement due to students focusing on a specific activity. Other factors include teachers being intentional about planning recess, nutrition and the impact that eating habits have on students and the need for professional development for teachers on how to implement the physical activity and the use of the equipment. Frequent participation in physical activity positively impacts the attitudes of children. Rodriguez et al. (2013) shares results that provide a shift in attitude contributed to movement. Also, students self-reflected with more of an emphasis on nutrition and safety.

The decrease in motivation to participate in physical activity continues to challenge adults as they age. National statistics indicate that the motivation for

physical activity decreases after early teenage years and therefore becomes a health concern as people grow older. Halvari et al. (2011) completed a study to determine physical inactivity levels for people as they age by predicting the activity levels of people when they are young adults, ages 15 to 20. The results determined that setting goals is critical in student motivation, attitude, and exertion. The powerful part of this research is the opportunity to have physical activity at school daily, positively motivates students to want to come to school.

Analyzing how older students feel about their past experiences with physical education in elementary school can be helpful in future planning. Larouche et al. (2015) shares the results of his study indicating all participants felt strongly that an increase in current physical education minutes was needed. In addition, the students that participated in daily physical education rather than weekly physical education had more positive attitudes towards physical activity as adults. Creating a master schedule that increases daily physical education minutes for all students is challenging, especially with only one physical education teacher, but beneficial to the educational experience.

COVID-19

Following COVID-19, educators faced a variety of barriers as they strived to meet the ever-changing needs of students. Challenged to develop opportunities to create successful, contributing, members of society, goals shifted as the world evolved. While the main focus of education continued to be instruction, it was necessary to give students the tools in their daily schedules to be successful. During a

time when children faced a variety of social emotional needs, increased behaviors and lack of personal self-worth and motivation, the responsibility of education expanded.

Instead of solely providing instruction to meet the grade level content standards, educators found themselves as mental health therapist, behavior specialist and content interventionist all while advocating for the variety of individuals placed in one classroom setting together. Many students with diagnosed mental health issues prior to the pandemic regressed during the pandemic because of a loss of services during COVID-19 (Fegert et al., 2020).

Upon returning to school, the classroom teacher assumed the responsibility of meeting various individual needs. However, educators can only control what happens during the school day. According to Castelli et al. (2014), students that engage in lifestyles that include unhealthy eating habits, lack of sleep, overindulging in screen time and sedentary activities are less likely to experience developmentally appropriate learning.

According to Sideropoulos et al. (2021), COVID-19 impacted students with special educational needs and disabilities differently than their typically developing siblings. Their study in the UK concluded that students with disabilities consistently experienced higher levels of anxiety throughout all three checkpoints in the study.

Externalizing Behaviors

According to the Comprehensive, Integrated Three-Tiered Model of Prevention, externalizing behaviors include noncompliance, aggression, and defiant behavior patterns. Research by Stoltz et al. (2013) reported multiple studies

conducted on the effects of child intervention reduced externalizing behaviors in highly controlled settings with selected individuals. While this is important to note, Weisz et al. (2004) pointed out there was more interest in the effectiveness of interventions in a real-world setting such as school. Another area that lacked research was the impact physical activity had on students with external behaviors.

Physical activity motivated students and frequent participation in physical activity positively impacted the attitudes of children (Rodriguez et al, 2013). It had also been established that students that are healthier, learn more and both educators and scientists recognize the vital role physical, cognitive and brain health plays in education (Basch, 2011). In research from Lassiter (2019), it is confirmed that teacher ratings of classroom behavior were consistently more positive after a recess break with opportunities for physical activity. However, Lee et al. (2007) found that the majority of schools allow their faculty and staff to withhold recess for poor behavior. The findings of this study indicate that withholding recess may be counterproductive.

Attention-Deficit/Hyperactivity Disorder (ADHD) is a chronic neurobehavior disorder characterized by inattention, over-activity, distractibility, and impulsiveness manifesting as a childhood-onset disorder (American Psychiatric Association, 2013; Banaschewski et al., 2005; Schachar et al., 2000). According to the CDC (2022), about half of students diagnosed with ADHD also have a behavior or conduct problem. According to Pontifex et al. (2013), an experiment was completed that supported a positive association between exercise and acute changes in cognitive functioning with ADHD students by measuring the effect of a 20 minute intense

aerobic exercise on 20 preadolescent children with ADHD. Findings suggested that physical activity may be a non-pharmaceutical intervention for children with developmental disorders. According to Medina (2008), “Movement is like ‘cognitive candy’ to our brains, and our brains can make a comeback: All we have to do is move” (p. 22).

In their book SPARK, Ratey and Hagerman (2013) discuss the impact exercise has on students with ADHD. They share how an overactive cerebellum is what causes the fidgetiness in students and how drugs are commonly used to elevate dopamine and norepinephrine levels to balance this area. They explain that exercise can have the same effect. The more complex the exercise, the greater impact the physical activity will have on the student.

Another example is a study completed by Nakutin (2019) on the effect physical activity had on three students with autism spectrum disorder that struggled with academic engagement and executive functioning. The study found that physical activity improved active engagement for all three participants and exercise was found to have an immediate impact on academic engagement.

Internalizing Behaviors

The Comprehensive, Integrated Three-Tiered Model of Prevention states that internalizing behaviors include students that are extremely shy, anxious, and/or social withdrawn. Anxiety disorders in childhood, and generalized anxiety disorder (GAD) specifically, have several immediate and long-term negative effects for the child, the child’s family, and society at large (Esbjørn et al., 2014). Longitudinal studies

indicate that children with anxiety disorders are at significant risk for having anxiety disorders as adults (Biederman et al., 2007; Pine et al., 1998). According to Sideropoulos et al. (2021), COVID-19 has significantly disrupted children and young lives as well as their families. Many times, these behaviors lead to worry, depression, and low self-esteem.

Merikangas et al. (2010) suggest children with internalizing behaviors manifest problems that begin as early as first grade. These conditions impact the classroom learning environment in a variety of ways. Internalizing symptoms in children can be prevented by altering environments that foster adaptive thoughts and behaviors (Stormont et al., 2015). According to Cushing et al. (2018), it is important to screen adolescent students for anger and depression and to educate students on how physical exercise may serve to improve physical and mental health as an early intervention to clinical conditions.

The combination of math and anxiety have also been a common theme throughout the United States. According to Brown et al. (2008), students that experience math anxiety tend to give up studying math as soon as they possibly can. Many times, math anxiety detours students from career paths or academic tracks they may have pursued (Hembree, 1990).

Students that experience internalizing issues may be hard to identify. It is sometimes difficult to understand the depth of these issues. Students that are physically active have a healthier self-esteem and body image than those who are not physically active (Hallal et al., 2006; Southern et al., 1999).

Males and Females

There is not a lot of evidence that suggests physical activity in children significantly benefits one gender over the other. However, it has been shown that females experience less enjoyment and less confidence in sports (The Lancet Public Health, 2019). According to new research conducted on Canadian children during their school day by da Costa et al. (2022), females spent more time sitting and less time in light, moderate or vigorous intense physical activity than males in all school day segments. Overall, this study provided evidence that most of the time students are participating in sedentary behavior during the school day.

After adolescence, hormone levels fluctuate like clockwork in females. The importance of physical activity continues and can help balance the female system (Ratey & Hagerman, 2013). James Clapp, author of *Exercising through Your Pregnancy* goes as far to say that children of exercising mothers performed better academically, and his unpublished observations suggest that years later their overall academic performance is better than the children whose mothers were inactive (Clapp & Cram, 2012).

Obese female children also report higher incidents of teasing compared to males (Loewy, 2004). This is an important factor for classroom teachers to remember when teaching social emotional skills in the classroom.

Economically Disadvantaged

The COVID-19 experience was different for families depending on their socioeconomic status. This experience for students depended on access to mental health services, support for online learning and socialization opportunities (Fegert et al., 2020).

Garber et al. (2018) compared the academic achievement of students that participated in cardiorespiratory fitness groups to their socioeconomic status in Georgia elementary schools between 2011 to 2014. Interestingly enough, race and urbanity did not play any factor, but the higher socioeconomic students benefited from the fitness groups more than any other group. Therefore, this shift in mindset is as important for the higher socioeconomic class as it is for the lower socioeconomic students.

Economically disadvantaged students may not have the opportunities of those that are economically advantaged. Organized activities and sports can be expensive and require transportation and equipment. Providing these occasions for students during the school day gives all students access to physical education.

Students with Disabilities

Students with individualized education programs (IEP) include a variety of diagnosis and disabilities. One specific diagnosis that has increased in numbers at the elementary level has been autism spectrum disorder (ASD). According to Christensen et al. (2020), 1 in every 54 children are diagnosed with ASD. These students are challenged with greater health issues compared to their same age level peers. A

variety of interventions have been identified to support students with ASD including physical activity.

Early intervention is important for these students. A study conducted in an urban community involved 25 preschool students with ASD using physical activity, fitness, and motor competence as an intervention over a 12-week span. The results found that physical activity as an early intervention has positive gains for ASD students (Ketcheson et al., 2021). These results relate closely to Collins and Staples (2017) research that resulted in ASD students ages 7-12 making significant gains in health-related physical fitness after participating in a 10-week physical activity intervention program.

A multiple-baseline design study took place in a public elementary school setting in California (Nakutin & Gutierrez, 2019). This study involved three low academic engaged students with autism spectrum disorder. These students participated in physical activity as an intervention. Although there were only three students involved in the study, the findings indicated that “school-based interventions using exercise may largely benefit students with autism spectrum disorder by improving academic achievement and overall educational outcomes” (Nakutin & Gutierrez, 2019, p. 183).

Physical activity not only benefits school-aged children in regular classrooms but has been found to play a pivotal role in improving the health in individuals with developmental disabilities (Horvat & Franklin, 2001; Winnick 2011). Although this area of research is lacking, a study was conducted among students with intellectual

disabilities at the primary and intermediate levels. This experiment compared the student's academic performance on language arts and mathematical seat work when they participated in physical activity before their work session to their academic performance without the physical activity. According to the results, the intermediate students showed more progress in their work while the primary student results were more inconsistent. However, the teacher of both groups agreed that the students appeared more focused on their learning following the physical activity (Everhart et al., 2012).

Conclusion

The idea of connecting physical activity and academic achievement has been around for years. Although there is a plenty of evidence to support physical education for students, this is not a priority area for educators. Our educational systems continue to be overwhelmed and financially stretched thin. The challenging needs of students have expanded even more, following the COVID-19 pandemic.

Keays and Allison (1995) conclude in their literature review that schools should prioritize the amount of vigorous physical activity they offer because it connects with overall health, attitudes, behavior, and academic performance. Erwin et al. (2013) suggests even short activity breaks have been correlated with increased reading and math scores.

Physical education is critical to a child's educational experience. Participation in a variety of movement activities throughout the school day not only positively impacts academic performance but increases brain performance. Physical activity also

assists students that struggle with a variety of behaviors and increases overall engagement in the classroom. According to Jenson (2000), the same areas of the brain that light up when a child is engaged in a movement activity is the same part of the brain that lights up when a child calculates math.

Chapter 3

Methodology

While the amount of research on physical activity and the brain is plentiful, most of the research at the elementary level includes a physical education teacher operating on a traditional schedule seeing students on a weekly performing arts rotation or before or after school hours. This research is informative regarding the positive influence physical activity can have on a student's life and learning. However more information was needed on how daily physical activity directly impacted academic achievement, specifically on students that had experienced COVID-19. Another question is how physical activity impacted academics for groups of students included in special populations. The answers to these questions can guide future decisions to best meet the needs of students.

In education, an interventionist addresses a particular need of a student when what they are receiving in the regular classroom is not enough. Allowing the physical education teacher to become an interventionist means seeing the students on a daily schedule versus a weekly performing arts rotation schedule. It can also mean seeing students as needed when a particular behavior occurs. This chapter restates the purpose of the study, local context, research design, research questions, hypothesis, participants, instrumentation, procedures, and data analysis.

The purpose of this project was to investigate how 20 minutes of physical activity prior to math instruction could impact math academic scores for fourth and fifth grade students. In addition, this project addressed how this daily intervention

could impact the following subgroups: students with identified external, internal, both behaviors or no identified behaviors, males and females, economically disadvantaged and advantaged, and students with disabilities and those with no disabilities. English Language Learners could not be addressed in this study because of the few numbers of students identified in fourth and fifth grade.

Local Context

The elementary school used in this study was one of three elementary schools in the district. The three elementary schools feed into one middle school and eventually into the single high school. For the 2022-2023 school year, overall district enrollment was approximately 2500 students. For the same school year, the elementary school used in this study had 474 students enrolled in preschool through fifth grade. Approximately 60% of those students qualified for free or reduced lunch, and the school qualified as a Title I school.

This rural elementary school's vision statement is "Every Bobcat, Every Day". The mission of the school is that the school is the heart of the community and strives to partner with families to provide a welcoming environment, build on individual strengths and assist in developing students to their fullest potential, ultimately creating productive members of society.

Following COVID-19, the elementary school faced similar deficits as those across the district, state, and country. Math scores as well as other academic areas had significantly declined, and students struggled to return to the school routine. Social emotional needs and behaviors had increased, and teachers were questioning how

they would reach students to teach them the required skills to achieve the next level. The school administration and leadership team began brainstorming ways to support students that struggled to return to a full day school routine which required students to sit and focus for longer periods of time than what they were accustomed to during the pandemic.

When planning for the 2022-2023 school year, the school was challenged with increasing math scores and decreasing behaviors. The school had experienced positive results before the COVID-19 pandemic with motivating students using physical activity. During the 2021-2022 school year, the SBDM had added a position in the performing arts rotation making the physical education teacher an interventionist. This transition increased the weekly physical education minutes for every student. The staff had been educated on the value movement has on the brain and started seeing positive results.

Therefore, the 2022-2023 master schedule included a more strategic physical education schedule. The school continued to build a positive culture and the students seemed more motivated, but measurable data was critical to inform future decisions. The school decided to implement physical activity before math to determine if physical activity could be tied to math scores. This master schedule allowed all fourth and fifth grades students to participate in 20 minutes of physical activity in the gym before a 70 minute math class. This allowed all fourth and fifth grade students to participate in 100 minutes of physical activity each week and 200 minutes every two weeks. This was an increase of 25 minutes each week. (see Table 5)

Table 5*Minutes of Physical Education Every Two Weeks*

	2020-2021	2021-2022	2022-2023
Kindergarten – 3rd Grade	90	150	150
4 th -5 th Grade	90	150	200

During the 2021-2022 school year, fourth and fifth grade schedules were divided into three, content area blocks. The fourth-grade schedules (Table 6) included reading, math, writing/social studies, and science. They also participated in 15 minutes of physical education each day, but it was randomly scheduled throughout the day depending on which schedule a fourth grader was assigned.

Table 6*4th Grade Sample Schedule in 2021-2022*

Schedule	A	B	C
Block 1	90 Math	60 Writing/SS	30 Reading
	15 PE	45 Science	15 PE 60 Reading
Block 2	90 Reading	75 Math 15 PE	45 Writing/SS 45 Science
Lunch	25	25	25
Block 3	45 Writing/SS 45 Science	90 Reading	90 Math
Performing Arts (Specials)	45	45	45
Recess/SEL	45	45	45
Homeroom	20	20	20

The fifth-grade schedules included reading, math, writing/science, and social studies. Fifth grade also participated in 15 minutes of physical education each day randomly scheduled throughout the day. (see Table 7)

Table 7

5th Grade Sample Schedule in 2021-2022

Schedule	A	B	C
Block 1	15 Math 15 PE 75 Math	45 Reading 15 PE 45 Reading	60 Writing 45 Science/Social Studies
Block 2	90 Reading	45 Science/Social Studies 45 Writing	60 Math 15 PE 15 Math
Recess/SEL	45	45	45
Lunch	25	25	25
Block 3	45 Science/Social Studies 45 Writing	90 Math	90 Reading
Performing Arts (Specials)	45	45	45
Homeroom	10	10	10

During the 2022-2023 school year, the schedules were very similar and continued to be divided into three content area blocks including reading/writing (90 minutes), physical activity/math (90 minutes) and science/social studies (90 minutes) for both fourth (Table 8) and fifth grades (Table 9). In addition, fourth and fifth grade students strategically participated in 20 minutes of physical activity each day before math class as well as 15 minutes of Social Emotional Learning.

Table 8

4th Grade Sample Schedule in 2022-2023

Schedule	A	B	C
Homeroom	15	15	15
Block 1	20 PE 70 Math	90 Science/SS	90 Reading/Writing
Block 2	90 Science/SS	90 Reading/Writing	20 PE 70 Math
Lunch	25	25	25
SEL	25	25	25
Block 3	90 Reading/Writing	20 PE 70 Math	90 Science/SS
Performing Arts (Specials)	45	45	45
Recess/	25	25	25
Homeroom	20	20	20

Table 9

5th Grade Sample Schedule in 2022-2023

Schedule	A	B	C
Homeroom	15	15	15
Block 1	90 Science/SS	90 Reading/Writing	20 PE 70 Math
Block 2	20 PE 70 Math	90 Science/SS	90 Reading/Writing
SEL	25	25	25
Recess	25	25	25
Lunch	25	25	25
Block 3	90 Reading/Writing	20 PE 70 Math	90 Science/SS
Performing Arts (Specials)	45	45	45
Homeroom	15	15	25

The 2021-2022 master schedule was the first to include the physical education teacher as an interventionist. This schedule change allowed third, fourth and fifth grade students to have daily physical education but at random times throughout the day. In addition, kindergarten, first and second grades were able to alternate days allowing thirty minutes of physical education every other day. (see Table 10) While this was believed to be valuable to students, there was no way to determine the impact it had on students or their academics.

Table 10

CDR’s 2021-2022 Physical Education Intervention Schedule

7:25-7:50	Zero-Hour
8:00-8:15	5th
8:15-8:30	4th
8:30-8:45	5th
8:45-9:15	2 nd A/B
9:15-9:30	4 th
9:45-10:15	1 st A/B
10:15-10:30	5th
10:30-10:45	3rd
10:45-11:00	4th
11:00-11:30	2nd/3rd
11:30-11:45	3rd
11:45-12:15	1 st A/B
12:15-12:45	Lunch
12:45-1:15	K A/B
1:15-1:45	K A/B
1:45-2:30	PS

For the 2022-2023 school year, physical activity and math was the initiative. The new schedule enabled all fourth and fifth grade students to participate in 20 minutes of physical activity before their 70 minute math class. This addition also

increased the number of physical activity minutes each week from 75 to 100 minutes. This change in the master schedule meant that one class of fourth-grade students and one class of fifth grade students would both attend physical education in the gym at the same time collaborating with the fourth and fifth grade math teachers. The 2022-2023 school was the first year to experiment with physical activity before math each day. (see Table 11)

Table 11

CDR’s 2022-2023 Physical Education Intervention Schedule

7:25-7:50	Zero-Hour Fitness
8:00-8:20	4th/5th
8:20-8:50	1st A/B
8:50-9:20	1st A/B
9:30-9:50	4th/5th
10:00-10:30	2nd A/B
10:30-11:00	2nd A/B
11:00-11:30	Lunch
11:40-12:00	4th
12:15-12:35	5th
12:35-12:50	3rd
12:50-1:05	3rd
1:05-1:20	3rd
1:20-1:50	K A
1:50-2:20	K B

It is significant to note the difference in the 2021-2022 and 2022-2023 master schedules and the amount of time spent on math instruction each year for fourth and fifth grade students. The first year fourth and fifth grade students spent 90 minutes in math class and the second year they spent 70 minutes. (see Table 12) The 20 minutes

sacrificed during the 2022-2023 school year was replaced with physical activity in the gym.

Table 12

Minutes of Math Instruction

	2021-2022	2022-2023
4 th Grade	90	70
5 th Grade	90	70

A 20 minute block of time in the gym for fourth and fifth grade students was led by the physical education teacher and typically involved the following activities.

- 2-3 minute high/medium intensity dynamic warm up (movement to get muscles warmed up and heart rate elevated)
- 2-3 minute SEL check in and/or motivation quote/story
- 3 minute moderate skill/game review
- 8-10 minute high/moderate workout or fitness game
- 1 minute clean up
- 1 minute SEL Mindfulness

Research Design

This study was a quantitative quasi-experimental research study in which multiple t-tests were used to determine if physical activity before math made a statistical difference in math iReady scores. The first part of the study used a 2-tailed

paired t-test to compare growth from third to fourth grade and another 2-tailed paired t-test to compare growth from fourth to fifth grade.

The next part of the research design used a one-way analysis of variance (ANOVA) to compare students with externalizing, internalizing, both behaviors and no identified behaviors. Students could have been placed in both the externalizing and internalizing categories if there was evidence of both. This test determined if physical activity before math made a significant difference in any of these four categories.

The last part of the research design included 2-tailed independent t-test to compare males and females, economically disadvantaged (Yes) and economically advantaged (No), students with disabilities (IEP) and students without disabilities (No IEP). Fourth and fifth grade subgroups were compared using separate t-tests.

The research design examined if physical activity before math was valuable to academic achievement. It also helped identify if various subgroups benefited from this type of intervention to assist in future planning in this elementary school and district. The results of this research project gave valuable insight to stakeholders to use when making future decisions to assist with intervention, master schedules and staffing.

Research Questions

The following research questions were developed to focus the investigation of this capstone.

1. What impact did the implementation of physical activity before math each day have on fourth and fifth grade math iReady scores?

2. What impact did the implementation of physical activity before math each day have on various subgroups in this elementary school?

Hypotheses

The null hypotheses for this capstone were:

H₀ 1: There is no statistical difference in the fourth-grade math iReady growth scores when incorporating physical activity before math each day for 20 minutes.

H₀ 2: There is no statistical difference in the fifth-grade math iReady growth scores when incorporating physical activity before math each day for 20 minutes.

H₀ 3: There is no statistical difference in the fourth-grade math iReady growth scores for students identified having externalizing, internalizing, both behaviors and no behaviors.

H₀ 4: There is no statistical difference in the fifth-grade math iReady growth scores for students identified having externalizing, internalizing, both behaviors and no behaviors.

H₀ 5: There is no statistical difference in the fourth-grade math iReady growth scores for male and female students.

H₀ 6: There is no statistical difference in the fifth-grade math iReady growth scores for male and female students.

H₀ 7: There is no statistical difference in the fourth-grade math iReady growth scores for economically disadvantaged and economically advantaged.

H₀ 8: There is no statistical difference in the fifth-grade math iReady growth scores for economically disadvantaged and economically advantaged.

H₀ 9: There is no statistical difference in the fourth-grade math iReady growth scores for students with disabilities and students without disabilities.

H₀ 10: There is no statistical difference in the fifth-grade math iReady growth scores for students with disabilities and students without disabilities.

Subjects and Sampling

All fourth and fifth grade students enrolled in the elementary school August through December of the 2022-2023 school year were subjects for this study. In addition, students who enrolled in third and fourth grade during the 2021-2022 school year were used for comparison data.

The number of fourth grade students who also attended in third grade was 76. The number of fifth grade students who also attended in fourth grade was 76. This sampling allowed the percentile growth on math iReady to be compared before and after the 20 minutes of daily physical activity before math was added to the master schedule.

The second part of the study looked specifically at subgroups which included students enrolled in fourth and fifth grade during the 2022-2023 school year. The subgroups included all students currently enrolled that took both the August and December assessment. The special population subgroups in this study included students with external, internal, both behaviors or no identified behaviors, males and females, economically disadvantaged and advantaged and students with disabilities and those with no disabilities.

Both fourth and fifth grade curricula were taught using the same district curriculum maps provided by the district and based on Eureka Math. The teachers for the 2021-2022 and 2022-2023 school years were different although the curriculum maps and standards were the same.

Instrumentation

The iReady diagnostic was used to determine math academic progress. iReady is a type of computer-adaptive test that matches the difficulty of test questions to the proficiency level of each student. As students answer questions correctly, they get more difficult questions. As students answer questions incorrectly, they get easier questions. The assessment was designed for students to answer about 50% of the questions correctly and adapts to find the precise proficiency level of each student in the quickest, most efficient way possible. This assessment was used as the universal screening tool and was given to all students in kindergarten through fifth grade, three times a year.

The results of the iReady diagnostic identify a cut score and a national normed percentile based upon the results for the individual student. National normative scores compare student performance across the nation in the same grade level who took the diagnostic at the same time of the year (I-Ready Central Resources | View Resource, n.d.). For this study, the overall percentile gain was measured from the first to the second assessment to determine the individual student's percentile growth.

The Student Risk Screening Scale (SRSS) was used to identify students who may be at risk for challenging antisocial behavior and provide information to best

support students through the learning process. The SRSS required the student's teacher to rate their current knowledge of the student based on what they have observed from the student on the following actions: steal, lie/cheat/sneak, behavior problems, peer rejection, low academic achievement, negative attitude, aggressive behavior, emotionally flat, shy/withdrawn, sad/depressed, anxious, and lonely. Scores were calculated into three categories including low, medium, or high risk. The teacher rates the frequency of each behavior included in the screener with a 0=never, 1=occasionally, 2=sometimes, 3=frequently. Scores were calculated by the district school psychologist and cut scores were used to place students into one of the following categories: low, moderate, or high risk (Michigan's Integrated Behavior and Learning Support Initiative, 2020).

The SRSS was completed by all three departmentalized teachers in fourth and fifth grade at least 30 days into the school year. Prior to completing the screening, all teachers were trained by the guidance counselor at a faculty meeting on how to complete the screening. This screener determined which students were at risk for externalizing and internalizing behaviors. Students were identified to have moderate or severe behaviors based upon teacher observation on the screening tool.

Externalizing behaviors include outward behaviors such as anxiety, extreme shyness, worry and depression. Internalizing behaviors include inward behaviors such as noncompliance, aggression, and defiance. The difference in moderate and severe is the frequency of the behaviors. Therefore, for the purpose of this study, if students were identified either moderate or severe, they fell into the identified category. The

only distinction occurred for students that were identified to have both externalizing and internalizing behaviors. Fourth and fifth grade students were kept in separate groups.

Additional data for subgroups was pulled from Infinite Campus including males and females, economically disadvantaged and advantaged and students with disabilities and those with no disabilities.

Procedures

All fourth and fifth grade students took the iReady math assessment in August and December of 2022 to measure their performance based upon grade level standards. The iReady assessment produces a scale score and a national norm percentile. The national norm percentile was used to determine the growth score that was made and then compared to the growth score made from the previous school year.

The SRSS screening tool was given by the homeroom teachers, at least 30 days after the beginning of the school year. Fourth and fifth grades are departmentalized and therefore all three teachers completed the screening tool on each individual student. Teachers were trained by the guidance counselor to administer the SRSS screener during a monthly faculty meeting. The results were compiled by the school psychologist and shared with the principal.

The special population information for the students enrolled during the 2022-2023 school year was pulled from Infinite Campus, the student information system.

This information was compiled into a spreadsheet and sorted according to each subgroup.

Data Analysis

The first part of the study compared the percentile growth on iReady from August to December 2021 to the percentile growth on iReady from August to December 2022. To examine this research question, two hypotheses were tested using a 2-tailed paired t-test to determine if there was a significant statistical difference in the iReady scores before and after the physical activity was implemented. The null hypotheses tested were:

H₀ 1: There is no statistical difference in the fourth-grade math iReady growth scores when incorporating physical activity before math each day for 20 minutes.

H₀ 2: There is no statistical difference in the fifth-grade math iReady growth scores when incorporating physical activity before math each day for 20 minutes.

The next part of the study used a one-way analysis of variance (ANOVA) to compare the mean growth of each group at the .05 level of significance. The null hypotheses tested were:

H₀ 3: There is no statistical difference in the fourth-grade math iReady growth scores for students identified having, externalizing, internalizing, both behaviors and no behaviors.

H₀ 4: There is no statistical difference in the fifth-grade math iReady growth scores for students identified having externalizing, internalizing, both behaviors and no behaviors.

The last part of the research design included 2-tailed independent t-test to determine if there was a significant statistical difference when comparing the following subgroups: males and females, economically disadvantaged (Yes) and economically advantaged (No), students with disabilities (IEP) and students without disabilities (No IEP). The null hypotheses tested were:

H₀ 5: There is no statistical difference in the fourth-grade math iReady growth scores for male and female students.

H₀ 6: There is no statistical difference in the fifth-grade math iReady growth scores for male and female students.

H₀ 7: There is no statistical difference in the fourth-grade math iReady growth scores for economically disadvantaged and economically advantaged.

H₀ 8: There is no statistical difference in the fifth-grade math iReady growth scores for economically disadvantaged and economically advantaged.

H₀ 9: There is no statistical difference in the fourth-grade math iReady growth scores for students with disabilities and students without disabilities.

H₀ 10: There is no statistical difference in the fifth-grade math iReady growth scores for students with disabilities and students without disabilities.

Chapter 4

Results and Findings

The purpose of this study was to determine how physical activity impacted math achievement for fourth and fifth grade students by implementing 20 minutes of physical activity before math instruction each day. This chapter focuses on the findings of the research based on the math iReady diagnostic assessment used to measure math achievement on grade level standards.

This quantitative research design enabled the school to have very specific data on the impact this intervention has on students to assist in making future decisions with staffing and master scheduling. It also gave specific data on the impact this intervention had on various subgroups to use when making decisions about student schedules.

The research questions for this study include:

1. What impact did the implementation of physical activity before math each day have on fourth and fifth grade math iReady scores?
2. What impact did the implementation of physical activity before math each day have on various subgroups in this elementary school?

Participants

The first part of the study looked at growth between the 2021-2022 and the 2022-2023 school year once physical activity before math was implemented.

Participation for this part of the study required the student to be enrolled during both school years. Out of 142 participants, 69 of the students were fourth graders,

previously third graders and 73 of the students were fifth graders, previously fourth-graders. (see Table 13). The study compared the growth these students made by percentile on the math iReady assessment before and after physical activity was strategically placed before math.

Table 13

Total Students in Study

Study	School Year	N	3rd	4th	5th
Part 1	2021-2022	142	69	73	
Part 1	2022-2023	142		69	73
Part 2	2022-2023	152		76	76

Subgroup Participants

The second part of the study looked at percentile growth only for the 2022-2023 school year between August and December. This part of the study looked at subgroups to determine if the physical activity before math intervention impacted one subgroup more than another.

Out of 152 participants during the 2022-2023 school year, 76 fourth graders and 76 fifth graders were used for the subgroup portion of the study. Fourth and fifth grade student data was kept separate within the subgroups. The subgroups included gender, economically disadvantaged and students with disabilities. They also included students identified with at-risk challenging behaviors including internal, external, both behaviors and no identified behaviors. Internalizing behaviors included

noncompliance, aggression, and defiance while externalizing behaviors included anxiety, extreme shyness, worry and depression.

Internalizing and Externalizing Behaviors

The SRSS screener was used to identify students with internalizing behaviors, externalizing behaviors, both behaviors and students with no identified behaviors (Table 14). Students could be identified in both internalizing behaviors and externalizing behaviors if they exhibited both. There were 17 fourth grade students and 29 fifth grade students identified on the screener for possible internalizing behaviors such as anxiety, extreme shyness, worry and depression. There were 32 fourth grade students and 23 fifth grade students identified on the screener for possible externalizing behaviors such as noncompliance, aggression, and defiance. There were 36 fourth grade students and 38 fifth grade students with no identified behaviors.

Table 14

Results from 2022-2023 SRSS Screener Number One

	N	Internal Behaviors	External Behaviors	Both External and Internal	No identified Behaviors
4th	76	9	24	8	36
5th	76	15	9	14	38

Gender

Table 15 presents the student count by gender. Fourth grade had 43 male and 33 female students. Fifth grade had 32 male and 44 female students.

Table 15

2022-2023 Gender

	N	Males	Females
4th	76	43	33
5th	76	32	44

Economically Disadvantaged

Table 16 presents the student count by economically disadvantaged. This subgroup was determined by students qualifying for free or reduced lunch. Fourth-grade had 46 students listed as economically disadvantaged and 30 students who were not listed as economically disadvantaged. Fifth grade had 42 students listed as economically disadvantaged and 34 that were not listed as economically disadvantaged.

Table 16

2022-2023 Economically Disadvantaged and Economically Advantaged

	N	YES	NO
4th	76	46	30
5th	76	42	34

Students with Disabilities

Table 17 presents the student count by students with disabilities. This subgroup was identified by students with Individual Educational Program (IEPs). Fourth grade had 7 students identified in Special Education and 69 that were not. Fifth grade had 9 Students identified in Special Education and 67 that were not.

Table 17*2022-2023 Students with Disabilities and Students with No Disabilities*

	N	IEP	No IEP
4 th	76	7	69
5 th	76	9	67

iReady Results

A directional t-test was used to determine if there was a significant statistical difference in fourth grade math iReady scores from fall to winter during the 2021-2022 school year compared to the 2022-2023 school year when students participated in 20 minutes of physical activity before math. For students moving from third to fourth grade, the percentile growth on math iReady went from negative gain in third grade ($M = -0.029$, $SD = 0.154$) to a positive gain in fourth grade ($M = 0.086$, $SD = 0.167$) once the physical activity was implemented. Based on the results summarized in Table 18, the rejection of H_0 : *There is no statistical difference in the fourth-grade math iReady growth score when incorporating physical activity before math each day for 20 minutes*, was warranted, $t(68) = 4.231$, $p = .000$, $d = 0.51$.

Table 18*Examination of 3rd Growth and 4th Growth*

	N	M	SD	df	t	p	d
3rd	69	-0.029	0.154	68	4.231	.000	0.51
4th	69	0.086	0.167				

An additional t-test was used to determine if there was a significant statistical difference in fifth grade math iReady scores from fall to winter during the 2021-2022 school year compared to the 2022-2023 school year when students participated in 20 minutes of physical activity before math. For students moving from fourth to fifth grade, the percentile growth on math iReady went from positive gain in fourth grade (M = 0.045, SD = 0.125) to slightly negative gain in fifth grade (M = -0.010, SD = 0.145) once the physical activity was implemented. Based on the results presented in Table 19, the rejection of Ho2: *There is no statistical difference in the fifth-grade math iReady growth score when incorporating physical activity before math each day for 20 minutes*, was warranted, $t(72) = 2.496$, $p = .015$, $d = 0.29$.

Table 19*Examination of 4th Growth and 5th Growth*

	N	M	SD	df	t	p	d
4th	73	0.045	0.125	72	2.496	.015	0.29
5th	73	-0.010	0.145				

Internalizing and Externalizing Behaviors

A one-way analysis of variance (ANOVA) was used to determine if there was a significant difference in growth scores between fourth grade students with externalizing behaviors, internalizing behaviors, both externalizing and internalizing behaviors or no behaviors on the math iReady assessment from the fall to winter during the 2022-2023 school year. As presented in Table 20, the growth scores for fourth grade students on the math iReady with externalizing behaviors ($M = 9.9167$, $SD = 16.6392$) showed positive gains while internalizing behaviors showed negative growth ($M = -3.7778$, $SD = 7.9965$). Students with both externalized and internalized behavior ($M = 11.625$, $SD = 21.0709$) made the greatest growth gains. Those with no identified behaviors ($M = 10.5556$, $SD = 7.9965$) also showed positive gains.

Table 20

4th Grade Descriptive Results

	External	Internal	Both	None	Total
N	24	9	8	36	77
Mean	9.917	-3.778	11.625	10.556	8.792
SD	16.639	7.997	21.071	7.997	16.278
SE	3.397	2.666	7.450	2.666	1.855

According to the analysis in Table 21, the rejection of H_03 : *There is no statistical difference in the fourth-grade math iReady growth scores for students*

identified having externalizing, internalizing, both behaviors, and no behaviors, was not warranted, at $F(3,73) = 2.14, p = .306$.

Table 21

Analysis of 4th Grade Behaviors

Source	SS	df	MS	F	Sig.
Among Groups	1628.523	3	542.841	2.14	.306
Within Groups	18510.153	73	253.564		
Total	20138.675	76			

A second one-way analysis of variance (ANOVA) was used to determine if there was a significant difference in growth scores between fifth grade students with externalizing behaviors, internalizing behaviors, both externalizing and internalizing behaviors or no behaviors on the math iReady assessment from the fall to winter during the 2022-2023 school year. For the fifth grade students, the growth scores on the math iReady for students with externalizing behaviors ($M = -2.5556, SD = 9.710$) showed negative growth while internalizing behaviors also showed negative growth ($M = -0.8, SD = 12.531$). Students with both externalized and internalized behavior ($M = 7.143, SD = 15.698$) made the greatest growth gains. Those with no identified behaviors ($M = -3.816, SD = 15.157$) also showed negative growth.

Table 22*5th Grade Descriptive Results*

	External	Internal	Both	None	Total
N	9	15	14	38	76
Mean	-2.556	0.8	7.143	-3.816	-0.7368
SD	9.710	12.531	15.698	15.157	14.583
SE	3.237	3.236	4.196	2.459	1.673

According to the analysis in Table 23, the rejection of Ho3: *There is no statistical difference in the fifth-grade math iReady growth scores for students identified having externalizing, internalizing, both behaviors and no behaviors*, was not warranted, at $F(3,72) = 2.12, p = .105$.

Table 23*Analysis of 5th Grade Behaviors*

Source	SS	df	MS	F	Sig.
Among Groups	1294.690	3	431.563	2.12	.105
Within Groups	14656.047	72	203.556		
Total	15950.737	75			

Gender

A directional t-test was conducted to compare growth on the math iReady assessment from the fall to winter during the 2022-2023 school year between males and females. For the fourth grade students, the percentile growth on math iReady for

the male students ($M = 0.097$, $SD = 0.176$) showed slight growth while those students who were female had slightly less growth ($M = 0.078$, $SD = 0.149$). According to the results in Table 24, the rejection of H_05 : *There is no statistical difference in the fourth-grade math iReady growth score for male and female students*, was not warranted, $t(74) = 0.509$, $p = .612$, $d = 0.12$.

Table 24

Analysis of 4th Grade Male and Female Students

	N	M	SD	df	t	p	d
Male	43	0.097	0.176	74	0.509	.612	0.12
Female	33	0.078	0.149				

For the fifth grade students, the percentile growth on math iReady for male students showed a negative growth ($M = -0.039$, $SD = 0.121$) while female students had a slightly larger growth ($M = 0.016$, $SD = 0.159$). According to the results in Table 25, the rejection of H_06 : *There is no statistical difference in the fifth-grade math iReady growth score for male and female students*, was not warranted, $t(74) = 1.634$, $p = .107$, $d = 0.38$.

Table 25

Analysis of 5th Grade Male and Female Students

	N	M	SD	df	t	p	d
Male	32	-0.039	0.121	74	1.634	.107	0.38
Female	44	0.016	0.159				

Economically Disadvantaged

An independent sample directional t-test was conducted to compare growth on the math iReady assessment from the fall to winter during the 2022-2023 school year between students who are economically disadvantaged (Yes) compared to students who are not economically disadvantaged (No). For the fourth grade students, the percentile growth on math iReady for economically disadvantaged students showed a slight growth ($M = 0.083$, $SD = 0.165$) while those students who were not economically disadvantaged had a slightly larger growth ($M = 0.096$, $SD = 0.165$). According to the results in Table 26, the rejection of H_0 : *There is no statistical difference in the fourth-grade math iReady growth scores for economically disadvantaged students compared to economically advantaged*, was not warranted, $t(74) = 0.332$, $p = .740$, $d=0.08$.

Table 26

Analysis of 4th Grade Economically Challenged

	N	M	SD	df	t	p	d
Yes	46	0.083	0.165	74	0.332	.740	0.08
No	30	0.096	0.165				

For fifth grade students, the percentile growth on math iReady, disadvantaged student showed a negative growth ($M = -0.006$, $SD = 0.141$) while those students who were not disadvantaged had a slightly larger negative growth ($M = -0.009$, $SD = 0.154$). According to the results reported in Table 25, the rejection of H_0 : *There is no statistical difference in the fifth-grade math iReady growth scores for*

economically disadvantaged and economically advantaged, was not warranted, $t(74) = 0.078$, $p = .938$, $d = 0.02$.

Table 27

Analysis of 5th Grade Economically Challenged

	N	M	SD	df	t	p	d
Yes	42	-0.006	0.141	74	0.078	.938	0.02
No	34	-0.009	0.154				

Students with Disabilities

An independent sample directional t-test was conducted to compare growth on the math iReady Assessment from the fall to winter during the 2022-2023 school year between students with a disability who have an IEP and students without a disability who do not have an IEP. For the fourth grade students, the percentile growth on math iReady for students with disabilities showed slight positive gains ($M = 0.181$, $SD = 0.145$) while those students without disabilities showed slightly fewer positive gains ($M = 0.079$, $SD = 0.164$). Using Table 28 to summarize the results, the rejection of H_0 9: *There is no statistical difference in the fourth-grade math iReady growth scores for students with disabilities and students without disabilities*, was not warranted, $t(74) = 1.591$, $p = .116$, $d = 0.63$.

Table 28*Analysis between 4th Grade Students with Disabilities and Without*

	N	M	SD	df	t	p	d
IEP	7	0.181	0.145	74	1.591	.116	0.63
No IEP	69	0.079	0.164				

For the fifth grade students, the percentile growth on math iReady for students with disabilities showed slight positive gains ($M = 0.020$, $SD = 0.094$) while those students without disabilities showed negative gains ($M = -0.011$, $SD = 0.152$). Using Table 29 to summarize the results, the rejection of $H_0:10$, *There is no statistical difference in the fifth-grade math iReady growth scores for students with disabilities and students without disabilities*, was not warranted, $t(74) = 0.597$, $p = .552$, $d = 0.21$.

Table 29*Analysis between 5th Grade Students with Disabilities and Without*

	N	M	SD	df	t	p	d
IEP	9	0.020	0.094	74	0.597	.552	0.21
No IEP	67	-0.011	0.152				

Summary

This chapter focused on the results of the physical activity before math initiative to determine if 20 minutes of physical activity before math was academically beneficial to students. This study measured the percentile growth using the math iReady results from fall to winter compared to the previous school year when students had the opportunity for physical activity but not directly before math

class each day. It also looked at specific subgroups to see if this intervention benefited one group more than another.

The results indicated that there was a significant statistical difference in math iReady scores for both the fourth and fifth grade students when they participated in 20 minutes of physical activity before math class each day as presented in Table 18 and 19. Math instruction was reduced from 90 minutes the first year to 70 minutes the second year to accommodate 20 minutes of physical activity before math class in the master schedule.

The ANOVA was used to determine if there was a significant difference in percentile growth for students with internalizing behaviors, externalizing behaviors, both behaviors and no behaviors on the math iReady assessment. The ANOVA results indicated that there were positive gains for three of the four, fourth grade groups. The fourth grade group with both identified behaviors made the most growth followed by the group with no behaviors. The externalizing group made positive gains while the internalizing group made the least gains. For the fifth-grade group, two of the four groups made positive gains. The students with both identified behaviors made the most growth followed by the internalizing group. The externalizing group and those with no identified behaviors made the least gains.

Directional t-test were conducted to determine how physical activity before math impacted the other subgroups. While both fourth grade male and female students made positive gains, males made slightly more growth than females. In fifth grade, male growth was in the negative while female growth was slightly in the

positive. For both fourth and fifth grade groups, there was not a significant difference in percentile growth on math iReady for male and female students.

The subgroup consisting of students who were economically challenged had slightly different results for fourth and fifth grade students. The fourth grade students who were economically disadvantaged and those who were not, both made positive gains, while those who were not economically challenged made slightly more. The fifth grade students who were both economically disadvantaged both showed negative growth. Students who were economically advantaged made slightly greater gains than those who were economically challenged. For both fourth and fifth grades, there was not a significant difference in economically challenged students.

The last subgroup included students with disabilities and students without. The fourth grade students with and without disabilities both made positive gains while those with disabilities made slightly greater gains. The fifth grade students with disabilities made positive gains while those with no disabilities made negative gains. For both fourth and fifth grade students, there was no significant difference in the students with disabilities and those without.

The results of the study indicate there was a significant difference in math iReady scores in fourth and fifth grade students once physical activity before math was implemented. The results from this study also indicated that there was a significant difference in physical activity before math for the students with externalizing, internalizing, both behaviors and no identified behaviors. For both the fourth and fifth grade groups, students with both identified behaviors made the

greatest gains. However, there was not a difference in the other subgroups including males and females, economically challenged, or students with disabilities. These results were consistent throughout the study for both fourth and fifth grade students.

Chapter 5

Conclusions, Actions, and Implications

The health benefits of physical activity for people of all ages have been known for years. Physical activity not only increases physical and mental health but academic achievement as well. The purpose of this project was to determine if taking the physical education teacher out of the performing arts weekly rotation in an elementary school to provide daily physical activity as an intervention would benefit students academically. The master schedule allowed for students to participate in physical activity for 20 minutes before their daily math instruction to determine if this schedule change was beneficial to math iReady growth scores. The research questions for this study included:

1. What impact did the implementation of physical activity before math each day have on fourth and fifth grade math iReady growth scores?
2. What impact did the implementation of physical activity before math each day have on various subgroups in this elementary school?

Summary of Results and Findings

The results of the study indicate that 20 minutes of physical activity before math made a significant statistical difference in both fourth and fifth grade students. It is critical to note that math instruction for these students decreased from 90 minutes to 70 minutes to allow for the 20 minutes of physical activity each day. Instructional minutes are valuable to students when they are engaged and prepared to retain information. The saying of quality not quantity applies to instruction. According to

Ratey and Hagerman (2013), exercise improves alertness, attention, and motivation, encourages nerve cells to retain new information and develops new nerve cells in the hippocampus. Classroom teachers must continue to be educated on the impact physical activity has on the brain.

As for the special population subgroups, physical activity does not make a significant statistical difference in one subgroup over the other in the following subgroups: males or females, economically disadvantaged or economically advantaged and students with disabilities or students without disabilities. Physical activity is important for all students. The ANOVA was used to measure if there is a significant difference in students with external, internal, both behaviors and no behaviors, in which a significant difference was found.

Separate directional t-tests were used for both fourth and fifth grade students. It was determined that there was a significant difference in the percentile growth for students from third grade to fourth grade and fourth grade to fifth grade once the physical activity was implemented. The growth score was obtained by subtracting the percentile on the math iReady assessment post-test from the percentile of the math iReady pre-test. This measure illustrates that the academic growth is timely. It is expected for students to make gains each year but making the growth at the pace of their age level peers is critical. The results of this study indicate that when physical activity was implemented before math class each day, students made significant gains.

The results of the subgroups indicate that there is not a significant difference in one subgroup over the other. Directional t-test showed there was not a significant difference in the growth scores on math iReady. In fourth grade, males made slightly more growth than females and in fifth grade females made slightly greater growth than males. There was also not a significant difference in growth scores on math iReady in economically disadvantaged (Yes) and students not economically disadvantaged (No). In fourth grade, students not economically disadvantaged (No) made slightly more growth than students economically disadvantaged (Yes). In fifth grade, both groups made negative gains of almost equal amounts. There was not a significant difference in growth scores on math iReady for fourth grade students with an IEP and students without an IEP, although those with an IEP made the most gains. For fifth grade, students with IEPs also made greater gains while students with No IEPs made slight negative gains.

The only exception with the subgroups is the external, internal, both external and internal and no identified behaviors group. The ANOVA results indicated that there was a significant difference in growth among the four groups for both fourth and fifth graders. This is the only subgroup in both fourth and fifth grade that indicated a significant difference. Therefore, it is important to recognize the value this intervention has on students with identified behaviors.

The ANOVA results for fourth grade behaviors showed that students with both external and internal behaviors made the greatest positive gains followed by students with no identified behaviors. Students with only external behaviors also

made great gains while students with internal behaviors made negative gains. The fifth grade ANOVA results also indicated that students with both external and internal behaviors made the greatest growth gains while students with internal behaviors made slight positive gains. Students with only external behaviors and students with no identified behaviors both made negative gains. The zero-hour fitness club was successful at this school and these results prove to be similar. Students with both external and internal behaviors in both fourth and fifth grade made the greatest gains. These results explain the value the zero-hour fitness program made for the school and how powerful this intervention is for students that have experienced ACES.

Interpretations

Using the physical education teacher as an interventionist to increase daily physical activity minutes pays off in the classroom. When looking for ways to use funds wisely to target academics, social emotional learning and behaviors, physical activity is key.

Providing professional development to educate teachers on the value movement and physical activity has on the brain and learning is money well spent for districts. In addition to brain breaks, recess, and daily physical activity minutes, teachers can learn how to incorporate movement opportunities and routines into their classrooms and daily learning. The more opportunity students have to move throughout the day, the greater academic gains they will make.

Making decisions that decrease minutes of physical education, physical activity or recess is detrimental to students and their education. These decisions are

frequently made to allow more time to be spent on curriculum and reduce costs for districts. In addition to funding physical education and requiring recess, teachers should reconsider the structure of their lessons, providing more opportunities for movement in the classroom. Taking away movement opportunities or recess to punish students works against the goals of the classroom. Continuing to educate all stakeholders on the value movement has on the brain is critical for student success.

Implications for Improvement and Change

Based upon the results of this study, students made significant academic gains when physical activity before math was implemented into the master schedule. Therefore, it is critical to students that this intervention continues and expands. Creating policies through state and federal legislation may help create change and educate stakeholders on the value physical activity has on students. If additional physical education teachers cannot be hired, other staff can be trained to provide similar interventions. In addition, producing data to support innovative ways to create change allows stakeholders to see how new ideas benefit students.

Limitations, Delimitations, and Assumptions

Limitations

The results of this study were limited to the iReady results from the fall and winter of 2022 compared to the results from the fall and winter of 2021. The iReady assessment is given three times a year and the final assessment would provide an additional data point for this study. The Kentucky Summative Assessment is also given at the end of each school year; however, the results are not released until the

following fall. Both data points will provide additional information to expand the study.

Delimitations

The delimitations of this study include the assessment, time, and the research design of the study. The iReady assessment was used to measure individual student growth because it is an unbiased assessment given to all students three times a year. This assessment creates a computer-generated score and does not require a teacher to grade the assessment which could interpret bias. The iReady assessment is given on a computer and students that are not motivated or interested tend to click through the assessment to complete it.

Time was also a factor in this study because the assessment was given three times a year. This study only used two of the three assessments to compare. However, growth scores were calculated equally using the first assessment as the pre-test and the second assessment as the post-test.

The researcher chose to focus specifically on quantitative data for this study. Physical activity is known to increase moods and produce happier students so it would have been interesting to add a qualitative portion to this study to examine how this intervention made students and staff feel. Students could have shared their opinions on if this intervention encouraged or motivated them in any way and staff could have reported their thoughts on the intervention.

Based upon the master schedule, this study only encompassed fourth and fifth grade data because these were the only grade levels that could experience physical

activity before math with only one physical education teacher employed at this location. During this study, both fourth and fifth grade students participated in 20 minutes of physical activity each day before returning to their classroom for 70 minutes of math instruction. Both fourth and fifth grade math teachers were new this school year but taught towards mastery of the same grade level Kentucky Academic Standards.

Assumptions

During the iReady assessment given during fall and winter of 2021 and 2022, an assumption would be that students put forth their best effort on the assessments. It would also be an assumption that teachers completed the SRSS screener correctly. The SRSS screeners were completed by departmentalized teachers for every student to the best of their knowledge. Therefore, each individual student had three SRSS screeners filled out for them. The teachers knew the students for at least 30 days before completing the screener but may not have recognized or identified some behaviors as this was based upon their opinion. Teachers were trained on how to complete the screener during a faculty meeting. The training was provided by the guidance counselor.

All students participated to the best of their ability during the 20 minute physical activity session each day. Attendance was recorded but not used in this study. In this school, fourth and fifth grades are departmentalized. Both fourth and fifth grade students were in the gym for their 20 minute session at the same time. The

math teachers assisted the physical education teacher during this 20 minutes for safety, but the physical education teacher provided the instruction.

Recommendations

Physical activity before math increases test scores. Taking the physical education teacher out of the performing arts rotation and using the position as an interventionist is academically beneficial to students. In addition to the physical education teacher acting as a physical activity interventionist, a physical education teacher could be hired to teach the physical education curriculum to students during the weekly performing arts rotation.

There are multiple ways of increasing physical activity opportunities for students. One way to accomplish students being more active during the school day is to increase the minutes of physical education each week. Depending on enrollment, this may require hiring a second physical education teacher. Creating a master schedule that incorporates physical education for every student, every day is best for students. Areas of need could be targeted with this intervention by building the master schedule around the content area.

Another way to add physical education time to the master schedule is to continue the zero-hour fitness program to target students with ACES. Not only does this opportunity prepare students for the classroom but gives students something to look forward to when they arrive to school each day. Students want to come because they look forward to what they will receive when they arrive.

In addition to using the physical education teacher as a physical activity interventionist, providing professional development to teachers to educate them on the value physical education and movement has on the brain is essential. This would increase opportunities for movement in daily classroom routines and during instruction.

Future Actions

If physical activity before math benefited both the fourth and fifth grade students, imagine what it could do for all students. Taking this approach and expanding it with other content areas will be beneficial for future planning. Continuing to educate and communicate to stakeholders the benefits this intervention has on students is essential to expanding the idea to impact other academic areas.

When the idea of incorporating more minutes of physical education into the master schedule was shared, this school had no idea how the data would support academic gains. The staff bought in because they knew how physical activity made students feel and the positive impact it had on school culture. As the school culture continues to evolve in this direction, next steps include creating schoolwide expectations that promote getting students moving before taking assessments, not taking away recess because of behavior and unfinished assignments and students sharing their knowledge of movement and the brain. This shift includes letting go of some of the old practices and incorporating new. Educators must create change that benefits twenty-first century students and students that have experienced COVID-19.

Conclusions:

Upon returning to school following the COVID-19 pandemic, educators across the United States struggled to identify normalcy. Students returned to the classrooms with multiple challenges including large deficits in academics, challenging behaviors, and the need for social emotional learning. Education, children, and the typical classroom had changed forever.

With increased needs, schools began brainstorming innovative ways to reach students. The school used in this study was not any different. With a decrease in math scores and continued concerns focused on behavior data with both external and internal behaviors, it was evident that educators faced major challenges. As the funding depleted and life returned to pre-COVID-19, students and schools tried to recover. In addition, districts began feeling the impact of the teacher shortage. Change and innovation to support students and staff was imperative for the future.

This school decided to build upon an initiative that started before COVID-19. They took the physical education teacher out of the performing arts specials rotation to become an interventionist for all students in the school. The daily physical education schedule increased physical activity minutes and allowed students to participate in physical activity more frequently to increase their heart rates and make students more productive in the classroom.

Fourth and fifth grade students visited the gym for 20 minutes every day before their 70 minute math class. The growth these students made from fall to spring on the math iReady assessment was compared to the year before when the students

participated in 15 minutes of physical activity that was randomly added into their daily schedules.

This research study along with the literature review, confirm the impact physical activity has on academic performance in fourth and fifth grade elementary students. A study conducted by (Gouveia et al., 2019) included various predictors of attitudes towards physical education and that the enjoyment aspect of physical activity was the most powerful. Not only does physical activity produce smarter students but happier students too.

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