The Effects of Physically Active Lessons on Engagement in a Fifth- and Sixth-Grade Classroom

by

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Abstract

Teachers who design physically active lessons (PALs) do so with the purpose of including physical activity in the classroom while maintaining a connection with cognitively based activities. This study examined how PALs affect academic engagement in a fifth- and sixth-grade classroom. Reading lessons were video recorded and academic engagement was assessed for a two-week control period and a two-week trial period. During the trial period, PALs were implemented. The implementation of PALs had various levels of impact on two forms of academic engagement.

Acknowledgments

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To my husband and children- thank you for being incredibly patient, for listening to one too many conversations (lectures?) on engagement, and for encouraging me to persevere.

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Chapter I: Introduction

Identify the Issue

Teachers share a common goal of working for the success of their students. A major focus within the classroom setting is students' academic success. There is widespread agreement that higher academic engagement in the classroom is related to greater levels of academic success (Harvey et al., 2018; Lei et al., 2018; Owen et al., 2016). Academically successful students generally have higher behavioral, cognitive, and emotional engagement levels, and these engagement levels are good indicators of long-term academic success (Abid & Akhtar, 2020; Lekwa et al., 2019). Because they are concerned for the long-term success of their students, teachers are continually researching ways to improve their students' academic engagement.

Both within and beyond the classroom, physical activity (PA) is considered critical for the all-around well-being of students. Physical activity promotes better fitness, body composition, mental health, and improved cognitive function (Campbell & Lassiter, 2020; Chacón-Cuberos et al., 2020; DeWitt, 2018; Tottori et al., 2019). Furthermore, PA can affect brain growth and the development of cognitive processes such as executive function, which are directly linked to academic achievement (Bartholomew et al., 2018; Caldas & Reilly, 2019; Donnelly et al., 2016). The clear benefits of PA make it necessary for teachers to focus on ways to ensure that students are sufficiently active.

It is recommended that students are active for at least 60 minutes each day. However, a high percentage of students fall short of the recommended daily PA guidelines (Bedard et al., 2019; Campbell & Lassiter, 2020; Chacón-Cuberos et al.,

2020). The lack of participation in daily PA is concerning because PA has such clear benefits for students.

Students spend a large portion of their waking hours in a school setting. Because schools are largely directing students' schedules, educators have a great influence on how students spend their time. Educators have the ability not only to ensure the academic success of students but also consider ways for students to obtain the recommended daily 60 minutes of PA. It is important to continue to research ways to increase students' PA levels and increase academic engagement within the classroom setting.

Importance of the Project

It is necessary to study the complex relationship between PA, academic engagement, and academic success. Physically active students are more likely to show interest in classroom activities, and as a result, these students are more academically engaged (Lindt & Miller, 2017). Engaged students are more successful in meeting their educational goals (Mavilidi et al., 2020). Previous studies have had varying results linking PA with academic success (Chacón-Cuberos et al., 2020; Daly-Smith et al., 2018; Donnelly et al., 2016). More research needs to be done to determine the extent to which PA affects a student's academic performance.

Some educators are turning to physically active lessons (PALs) to provide students with more PA while increasing academic engagement in the classroom. Physically active lessons are connected to academic outcomes and link PA with cognitive activities (Bedard et al., 2019). Research suggests but does not definitively prove a link between PALs and academic success (Bedard et al., 2019). It is important to design

studies that focus on this specific type of intervention (PALs) to obtain more information on the impacts PA can have on academic achievement.

Findings from the wider body of research are echoed in the Wisconsin Evangelical Lutheran Synod (WELS). A recent study notes that most students in WELS grade schools receive regular PA but continue to fall short of the recommended 60 daily minutes (Olson, 2022). Subsequently, it is recommended that WELS teachers look for opportunities to add PA into their daily classroom schedules. Studies providing data on the effects of different types of interventions specific to the unique educational settings of WELS schools are both meaningful and necessary.

Teachers in WELS schools need to be deliberate about putting research into practice to ensure students receive a high-quality education. Many schools within the WELS offer unique educational settings which include multi-age classrooms and smaller class sizes. Applying research-based practices to those unique educational settings can be a challenge, thus making the findings of studies like this one even more valuable.

Project Goal

Higher engagement levels increase academic success. Additionally, PA increases engagement levels, and students in general need more opportunities for PA. The first goal of this project was to understand the impact of 40-minute PALs students' academic engagement with a specific emphasis on the behavioral and emotional aspects of academic engagement. A second goal was to discover whether PALs were viable options for increasing academic engagement, specifically in a combined fifth- and sixth-grade classroom.

The results of this project had practical implications. The data results gave direct feedback regarding engagement levels in the classroom in this study. The quantitative data can be used to direct future instruction. This quantitative data is more reliable than solely relying on personal observations and reflections. Additionally, baseline data from the classroom in the study can be used to compare and track future trends within that classroom.

Educators in similar teaching environments to the classroom in the study also benefit from the results of this project. Those in WELS schools or multi-grade classrooms can learn from the results of the classroom in the study and consider the implications for their own settings. Because this study was carefully designed to be easily replicated in similar educational settings, future researchers can compare and build upon the results to learn additional implications of implementing PALs in a fifth- and sixth-grade combined classroom.

Finally, the results of this study are beneficial because the project built upon and extended recent research from within the WELS. Olson (2022) found that schools need to provide additional opportunities for PA within the school day. The investigation of PALs in a combined fifth- and sixth-grade classroom provided data on one additional way that teachers can easily incorporate additional PA into their schedules.

Chapter II: Literature Review

Introduction

Physical activity affects children's overall physical and mental health. Physically active students are more likely to have better levels of fitness, better body composition, and have lower occurrence of chronic diseases and mental health problems (Campbell & Lassiter, 2020; Chacón-Cuberos et al., 2020). Additionally, physical activity (PA) positively affects students' academic engagement, which is a predictor of academic success (Owen et al., 2016). These benefits of PA should be of note for teachers as they work daily with students.

Because the positive benefits of PA on health and academic engagement are widely recognized, researchers have studied how PA during the school day affects students' academic success (Chacón-Cuberos et al., 2020; Daly-Smith et al., 2018; Donnelly et al., 2016). The current study continued the work of other researchers. The first goal of this study was to understand the impact of 40-minute PALs students' academic engagement with a specific emphasis on the behavioral and emotional aspects of academic engagement. A second goal was to discover whether PALs were viable options for increasing academic engagement, specifically in a combined fifth- and sixth-grade classroom.

Research within the WELS notes that each week, a majority (61%) of WELS elementary students receive 30-60 minutes of PA in the form of physical education class. In addition, 28% of WELS elementary school students receive 30 minutes of recess per day. When recess and physical education class minutes are combined, WELS elementary school students still fall short of the recommended 60 minutes of daily PA. In the same

survey, only 57% of WELS elementary school teachers believed that their students receive enough minutes of PA. The recommendation was for teachers to evaluate classroom schedules to look for more opportunities to add PA during the school day (Olson, 2022). To continue the work of Olson, it was important to study the opportunities for and implications of adding additional PA in WELS elementary classrooms.

Other studies outside the WELS also emphasized the need to find additional ways to incorporate PA in the classroom. Isaac (2014) suggested teachers who have complete control over their classroom schedules hypothesize and test optimal times for PA for their specific groups of students. This research outside the WELS had direct implications for WELS schools. Because many WELS schools provide unique educational environments, it falls on the teachers to make, based on reliable research, the best decisions for their classrooms.

One promising option for teachers who are looking to add more PA into their classroom schedules is the use of physically active lessons (PALs), which combine physical activity with academic instruction (Bartholomew et al., 2018).

This study sought to answer the question:

How does the implementation of PALs affect academic engagement in the fifth- and sixth-grade classroom?

Goals of the study:

- Understand the impact of 40-minute PALs on students' academic engagement with a specific emphasis on the behavioral and emotional aspects of academic engagement.

- Discover whether PALs were viable options for increasing academic engagement, specifically in a combined fifth- and sixth-grade classroom.

Engagement

An important focus for educators is the engagement levels of their students. Definitions of engagement vary widely among researchers. Most definitions focus on students' meaningful involvement- participation, behaviors, motivation, emotions, attitudes, metacognition, and buy-in to school activities (Appleton et al., 2008; Kong et al., 2020; Parsons et al., 2014; Ulmanen et al., 2014). A clear understanding of the definition of engagement allows specific research, which has the greatest impact on student achievement.

Academic engagement is regarded as a fundamental component of effective teaching and learning and is the foundation upon which knowledge is built. Conversely, being disengaged from school can lead to lower rates of homework completion and academic achievement, disassociation from peers, and school dropout (Salmela et al., 2021). This research shows that being engaged has a significant, positive outcome, whereas being disengaged has the opposite effect. Considerable focus should be placed on keeping students academically engaged.

Engagement levels are considered dynamic because they can be affected, among other things, by school culture and teaching styles. Students tend to be most engaged in early elementary school, and then engagement levels decrease as students approach middle school (Parsons et al., 2014). The classroom teacher holds a great responsibility to design learning environments and lessons students find intriguing. Students also need to feel they can work with others as part of a team. Academic tasks should be authentic and

allow students to make choices in their learning (Parsons et al., 2014). Each of these elements is important for teachers to consider when planning for the learning that will take place in their classrooms.

Types of Academic Engagement

Definitions of academic engagement vary. Across the literature, however, researchers agree that academic engagement is comprised of emotional, cognitive, and behavioral elements (Appleton et al., 2008; Kong et al., 2020; Owen et al., 2016; Ulmanen et al., 2014). Understanding each of the components can be beneficial to raising engagement levels in the classroom.

Emotional Engagement.

One component of academic engagement is emotional engagement. Emotional engagement refers to students' feelings, attitudes, and emotional reactions to classes, activities, peers, and teachers (Kong et al., 2020; Lindt & Miller, 2017). A student who is emotionally engaged has a positive attitude toward school and learning (Appleton et al., 2008). Emotional engagement is largely affected by physically active lessons (PALs) because students generally enjoy the activities during PALs (Schmidt et al., 2016). As a result, emotional engagement was of special interest to this study.

Emotional engagement can be personal or situational. Personal engagement in a subject matter is long-term and increases over time. A student may have more interest in math than reading, and that interest may grow as the student grows and progresses through the curriculum. The personal interest that students have in the subject matter will influence their emotional engagement (Lindt & Miller, 2017). Because levels of personal

interest vary, it is important to understand how this personal interest affects the overall engagement in the classroom.

In contrast, situational interest pertains to a student's interest in what is currently happening in the classroom. A student's level of situational interest is dependent upon that day's lesson and may change throughout the lesson. Teachers pay special attention to situational interest because it can determine day-to-day levels of engagement (Lindt & Miller, 2017). The increased emotional engagement that Schmidt et al. (2016) noted during PALs is most likely because of situational interest.

Cognitive Engagement.

A second component of academic engagement is cognitive engagement. Cognitive engagement is related to the effort a student puts into learning and includes the different metacognitive processes associated with academic success (Ulmanen et al., 2014). These metacognitive processes involved in cognitive engagement include knowing and implementing different study methods, setting goals, and working independently (Salmela et al., 2021). A student with high cognitive engagement is demonstrating the skills necessary for long-term academic success.

Parsons et al. (2014) described a student with high cognitive engagement as the student who perseveres through learning and goes above and beyond. This student is motivated to read more material than was assigned. The student will probably even search out ways to share the learning with others. He uses multiple different strategies during the course of learning (Ulmanen et al., 2014). When challenged, rather than giving up, the student with high cognitive engagement will search out resources and determine new strategies to solve the problem (Kong et al., 2020).

Cognitive engagement affects other areas of engagement within the classroom. Students who are more cognitively engaged generally receive more and better assistance from the classroom teacher. It follows that those cognitively engaged students end up being more engaged emotionally and behaviorally within the classroom (Yang et al., 2021). Because cognitive engagement provides the endurance needed to persevere through classroom learning, it should be an important long-term focus in the classroom.

Behavioral Engagement.

A third component of academic engagement is behavioral engagement. Behavioral engagement consists of students' actions. These actions can include the students' ability to keep focus on and appropriately participate in prescribed activities, whether in the classroom or in extra-curricular activities. Within the classroom, engaged students actively participate in lessons, focus their attention properly, and refrain from fidgeting (Salmela et al., 2021). Simply put, students who are behaviorally engaged obey the rules in the classroom or activity (Harvey et al., 2018). Because there is such a connection between behavioral engagement and classroom expectations, teachers are likely to quickly notice and be affected by behavioral engagement during their day-to-day lessons.

A teacher has a tremendous influence on all types of engagement levels. In the same way that the use of various teaching strategies affects cognitive engagement, a teacher's use of classroom management techniques in the classroom can largely affect behavioral engagement. Teachers who are successful with classroom management generally see higher levels of behavioral engagement (Lekwa et al., 2019). What follows is to consider the quality of engagement that comes as a result of proficiency in behavior

management and if the resulting engagement extends beyond behavioral to the other types of engagement.

Just because a teacher sees higher behavioral engagement levels due to classroom management strategies, it does not mean that the students are equally engaged emotionally or cognitively. The students could appear to be engaged because they are complying with classroom expectations. These students, however, are most likely only going through the motions and are not actively interested in the subject material. As a result, the teacher should focus on having good classroom management and designing instruction to engage students emotionally and cognitively (Parsons et al., 2014). While using PALs lessons to increase engagement, it is necessary to have successful behavioral management alongside cognitively engaging lessons.

Agentic Engagement.

Some researchers include agency as a fourth aspect of academic engagement. Agentic engagement refers to the contributions students make to their education through interactions with the teacher both during and after instruction (Klemenčič, 2015). Students with high agentic engagement actively ask questions and share personal learning preferences with the teacher, allowing the teacher to modify instruction based on what the students have expressed (Kong et al., 2020). Agentic engagement is evidence of a two-way flow of teaching and learning in the classroom.

Klemenčič (2015) argues that agentic engagement is a necessary and important facet of engagement because the academic success that students achieve is a direct result of their intentional efforts in the classroom. Agency can help qualify the motivation element of engagement. Whereas scales rating behavioral and emotional engagement

traditionally focus more on the students' reactions to the lesson and activities, agentic engagement also focuses on students' next steps in response to learning.

Of the four types of engagement discussed in this literature review, behavioral and emotional engagement were the most directly relatable to increasing engagement through PALs. Physical activity in the classroom increases emotional engagement by piquing situational interest. As situational interest is held, there is a higher chance of increasing personal interest over time (Lindt & Miller, 2017). If students are interested in and behaviorally engaged in an activity, and if the activity has a strong cognitive base, there is a better chance of building the habits and skills which lead to long-term academic success.

Engagement and Academic Achievement

Academic achievement is defined as students' performance as related to their educational goals (Donnelly et al., 2016). These educational goals are set and then measured by formative and summative assessments. Students who demonstrate competency on the assessments are considered academically successful (Harvey et al., 2018; Lei et al., 2018; Owen et al., 2016). To determine the academic success of students, a teacher needs to clearly define learning goals and use quality assessments to measure students' progress toward the goals.

Academically successful students generally have higher behavioral, cognitive, and emotional engagement levels and put forth effort to be successful. Additionally, these engagement levels are good clues to long-term academic success (Abid & Akhtar, 2020; Lekwa et al., 2019). Engagement levels are such clear predictors of academic success

because knowledge is built when students are engaged in their learning (Salmela et al., 2021). As knowledge is built, students move closer to achieving their academic goals.

All three major areas of engagement (emotional, cognitive, and behavioral) have been shown to be linked to academic success. Of the three areas of engagement, the highest correlation was between behavioral engagement and academic achievement (Akpur, 2021; Harvey et al., 2018; Lei et al., 2018). As a result, many schools have begun to study ways to improve behavioral engagement and improve academic success rates (Harvey et al., 2018). It should be noted that Salmela et al. (2021) found that a majority of studies on academic engagement choose to measure behavioral engagement because it is considered easier to quantify, observe, and record examples and non-examples of engaged behaviors in the classroom.

A variety of factors can affect levels of academic engagement, which in turn can affect academic success. One critical factor in student engagement is teacher pedagogy. The more teachers design their lessons to capture student interest and involve students in subject matter, the higher the achievement levels of the students (Lekwa et al., 2019). Student engagement is significantly affected by the way the teacher designs learning (DeWitt, 2018; Gettinger & Walter, 2012; Havik & Westergård, 2020; Lekwa et al., 2019; Parsons et al., 2014; Ulmanen et al., 2014).

Gender can also play a role in academic engagement, especially in the areas of behavioral and cognitive engagement (Lei et al., 2018). Female students have been shown to be more academically engaged than male students (Abid & Akhtar, 2020). Havik and Westergård (2020) proposed that one reason for females' higher-level engagement could be that schools are organized and run in a way that is more fitting for

females than males because females tend to choose to study more than males. Additionally, they found females have been shown to relate better to others than males. School is a setting where relationships, especially relationships with teachers, are of utmost importance. It could follow that females are more engaged at school because they place higher value on the relationships they share with teachers and peers (Havik & Westergård, 2020).

Gender is only one factor to consider when designing learning to optimize engagement and achievement levels. Students with emotional, behavioral, and learning differences also tend to have lower levels of engagement in the classroom. Often, the interventions given to these students remove them from the classroom, further lowering engagement levels in the traditional classroom (Harvey et al., 2018). Interventions using PA have been found to be beneficial because they increase behavioral engagement, and students participate alongside their peers in the traditional classroom setting (Harvey et al., 2018). Incorporating PA through PALs could be one way to include students with learning differences and increase PA and engagement levels in all students.

Special care must be taken while designing lessons to meet the needs of all students in the classroom. To ensure students' academic success, attention must be given to differing needs among students and how those variables can affect engagement levels (Abid & Akhtar, 2020). When designing PALs, the teacher should include activities accessible to all students in the classroom.

Physical Activity

The benefits of physical activity (PA) for children are abundant- better fitness, body composition, and mental health and improved cognitive function (Campbell &

Lassiter, 2020; Chacón-Cuberos et al., 2020; DeWitt, 2018; Tottori et al., 2019). Major brain growth happens in children during childhood and adolescence, and activities including PA or those that evoke the senses are especially important (DeWitt, 2018; Isaac, 2014). A teacher should take the different growth stages of her students into account when planning learning to maximize the effects of the activities on the students' development.

One of the specific areas of the brain developed during movement is executive function. Executive function skills include working memory, behavioral self-control, and adaptability in thought. These skills are critical for academic success (Tottori et al., 2019). Pruitt and Morini (2021) described increased executive functioning skills as a result of PA. Incorporating PA in the classroom can have the added benefit of strengthening executive function skills.

Even though it is recognized that PA is important for children, less than half of all students are physically active for the recommended 60 minutes per day. Furthermore, many students spend up to two thirds of the day sitting. These sedentary periods often take place in a school setting (Bedard et al., 2019; Campbell & Lassiter, 2020). Because so many children are failing to meet recommended levels of movement, it is important for teachers to give students more opportunities for movement during the school day (Campbell & Lassiter, 2020). Teachers can begin by analyzing daily schedules to find logical times to incorporate more student movement.

In recent years, a great focus has been on finding more opportunities for students to be physically active during the school day (Bedard et al., 2019). Not only could providing additional opportunities for movement in school improve students' physical

and mental health, but it could also lead to higher levels of academic success (Harvey et al., 2018; Owen et al., 2016). The recommendation for 60 minutes of daily PA is for students to be moving at a moderate to vigorous level (Campbell & Lassiter, 2020). In a classroom setting, however, it is difficult to ensure that students achieve PA at a moderate to vigorous level.

Most previous studies evaluating PALs interventions did not assess intensity levels of PA. Additionally, the types of PA varied greatly from study to study. (Daly-Smith et al., 2018). An important consideration is whether incorporating more PA at any intensity level has added benefits for students and what those benefits are. There were no studies found from this review of the literature that studied the benefits of PA or PALs in a combined fifth- and sixth-grade classroom.

Physical Activity and Engagement

Physical activity increases academic engagement levels, especially in behavioral engagement, and most notably in the class periods directly following the PA (Caldas & Reilly, 2019; Findley, 2017; Harvey et al., 2018; Isaac, 2014). These increases in behavioral engagement are seen in students having better impulse control, being more attentive, and interacting positively with peers (Bartholomew et al., 2018; DeWitt, 2018). The benefits of PA can be especially significant during adolescence (Owen et al., 2016). The impact of PA during adolescence was significant to the current study because the participating students were entering adolescence.

Lindt and Miller (2017) studied the effects of PA on student engagement. They found that when students are physically active, they are more likely to be interested in the lessons. As a result, their engagement level is higher and lasts longer during the lesson. It

is important to consider ways to increase students' academic engagement because it has been shown that increased academic engagement can lead to increased academic success (Mavilidi et al., 2020). The situational interest that PA can provide during a lesson can be an important first step in increasing all types of engagement.

In recent years, there have been many studies looking at the relationship between PA and academic engagement. While the studies found positive correlations between the PA and academic engagement, the degrees of positive correlation varied. Differences in results between studies were due to the different methods (types of interventions) and contexts (school, teacher, and student demographics) of the various studies. More reliable and focused studies are needed to add to the body of knowledge (Owen et al., 2016). These additional studies should seek to be repeatable in similar educational settings and have clear study parameters.

Physical Activity and Academic Achievement

Researchers agree that students who are more active are generally more successful in school. Short PA breaks can correspond with positive results in academic achievement. Physical activity can affect brain growth and cognitive processes, which are directly linked to academic achievement (Bartholomew et al., 2018; Caldas & Reilly, 2019; Donnelly et al., 2016). Because of its clear benefits, adding more opportunities for PA during the school day should be a focus of educators. This study was designed with the goal of examining whether PALs are a viable option for teachers who want to increase opportunities for PA without sacrificing instructional time.

Across studies, there were varying degrees of positive correlation between PA and academic achievement (Chacón-Cuberos et al., 2020; Daly-Smith et al., 2018; Donnelly

et al., 2016; Kreider, 2019). Numerous researchers have also linked PA to increased cognitive function, especially when the PA was taking place during the learning process (Pruitt & Morini, 2021). Addressing the differing strengths of positive correlation between studies, Daly-Smith et al. (2018) noted that different study parameters, school environments, and degrees of implementation affected students' cognitive outcomes. Chacón-Cuberos et al. (2020) concurred and cited different methods of measurement as a reason for the varying results. Designing studies that focus on a specific type of intervention and age group allows for more information on the impacts PA can have on academic achievement.

Another variable among studies of PA and academic achievement is the specific type of PA included in the study. Pruitt and Morini (2021) evaluated studies focusing on aerobic and anaerobic physical activity to research whether the type of PA affects academic achievement. Aerobic PA can be linked to attention, problem-solving, and overall executive function. They found that results of studies of anaerobic PA are less clear and generally have less positive correlation than those with aerobic PA. In studies incorporating PA through PALs, it was found that integrating at least ten minutes of moderate to vigorous PA is best (Daly-Smith et al., 2018).

Physically Active Lessons

The best opportunities for adding movement during the school day are when students would otherwise be seated at desks. As high as 73% of students' time in school is sedentary (Bartholomew et al., 2018). The more schools can substitute PA for seated time, the more benefit. Schools should develop opportunities for PA throughout the school day without sacrificing academic instructional time (Bartholomew et al., 2018).

Individual teachers can analyze daily schedules to find even small time periods where PA can be incorporated.

Additional PA is beneficial, but in many cases, teachers feel pressure to sacrifice recesses and opportunities for movement in favor of meeting curriculum outcomes (Campbell & Lassiter, 2020). An option for teachers who wish to engage students in more PA while still maximizing time for academic instruction is to incorporate physically active lessons (PALs). In PALs, teachers create lessons which intentionally combine different types of physical activities with the academic lesson content.

Physically active lessons are also referred to as active classrooms and differ from stand-alone activity breaks within the school day. Stand-alone activity breaks, also called brain breaks, also offer opportunities for PA during the school day. However, these stand-alone breaks are not usually connected to academic outcomes, whereas PALs maintain a connection to the curricular outcomes and do not interrupt the flow of teaching (Bedard et al., 2019). Because they do not interrupt the flow of teaching, PALs can be an intriguing option for teachers who want to add more PA but feel bound by academic requirements.

Physically active lessons can and should be differentiated based on classroom or individual student needs and have been found to be effective across demographic groups (Daly-Smith et al., 2021). Teachers who implement PALs introduce or review academic content in ways that encourage or require students to be physically active and offer students opportunities to get more PA and learn in novel ways (Kvalø et al., 2017). As a result, participating in PALs increases behavioral engagement by improving students' attitudes toward school. Students generally have more fun during a PALs lesson, which increases their attentiveness, thus increasing emotional engagement (Schmidt et al.,

2016). Attitudes and situational interest can be important first targets for increasing academic engagement.

Incorporating academic instruction with PA has been shown to have important impacts on brain activity. When students participate in cognitively demanding tasks during PA, it is suggested that there is greater prefrontal brain activity, which could lead to higher academic achievement (Bedard et al., 2019). Higher academic achievement is the goal of instruction.

When designing PALs, it is important for the teacher to consider the cognitive and physical demands of the lesson. Schmidt et al. (2016) found that it is important to optimize and balance the PA and cognitive demands of PALs. If the activities are too cognitively difficult, students tend to have lower engagement levels. Physically active lesson activities can include moving from one location to another to answer questions in each location, answering questions while performing various aerobic exercises, or other types of activities that require cognitive engagement while being physically active (Kvalø et al., 2017).

There is a lack of definitive research on the optimal duration, intensity, and frequency for PALs (Bedard et al., 2019). The studies reviewed by Bartholomew et al. (2018), include active learning portions of PALs that are generally between five and fifteen minutes in length. Daly-Smith et al. (2018) suggested at least ten minutes of PA. The recommendations by Daly-Smith et al. (2018) came from reviewing 18 studies in which they compared studies using PALs to those using movement breaks with no cognitive link to the lesson material. The results of Daly-Smith et al.'s (2018) review were most applicable to this study.

Researchers such as Daly-Smith et al. (2018) have begun to investigate the efficacy of PALs compared to PA-only breaks. As with other types of studies, it is noted that it is difficult to directly compare results of studies due to the wide variety of designs and contexts (Bartholomew et al., 2018; Daly-Smith et al., 2018; Mavilidi et al., 2020). However, some researchers suggested that are greater academic benefits when teachers incorporate PALs compared to teachers offering more PA without a cognitive purpose (Have et al., 2018). Taking time to design PALs activities, which have a cognitive link to the lesson, could have a greater academic benefit than incorporating stand-alone PA breaks.

A study by Have et al. (2018) also noted a possible connection between PALs, working memory, and academic achievement. Physically active lessons have been shown to increase executive functioning skills, and it is known that executive functioning skills are closely related to academic success (Egger et al., 2019; Kvalø et al., 2017; Tottori et al., 2019). Even if direct correlation between PA and academic success is difficult to prove, it could be surmised that using PALs to improve executive functioning skills could eventually lead to higher rates of academic success (Egger et al., 2019). Physically active lessons could be an important first small step in improving the achievement of students in the classroom- especially those with learning differences.

The use of PALs has become more prevalent in recent years, and as a result, there has been an increase in research on the subject. Bedard et al. (2019) noted that while it is difficult to properly compare different types of studies, the association between PALs and academic achievement is positive. This finding agreed with others, who also suggested that more specific research needed to be done to determine the effects of PALs on

engagement and academic success (Bartholomew et al., 2018; Daly-Smith et al., 2018; Mavilidi et al., 2020). The current study was an important addition to the body of research because it evaluated the effects of PALs on academic engagement levels, with a specific focus on behavioral and emotional engagement.

An important first step in increasing academic achievement is to increase student engagement levels (Harvey et al., 2018). This study investigated the effect of PALs on student engagement levels in a fifth- and sixth-grade classroom. Because engagement levels typically drop as students approach middle school (Parsons et al., 2014), a fifth- and sixth-grade classroom was an ideal setting to research methods of retaining student engagement with the hopes of increasing academic success leading into adolescence and the high school years.

Summary

Physical activity is critical for overall student health and wellness and can also affect students' engagement levels in the classroom. Across the United States, including within WELS schools, there are a high number of students who do not receive enough daily PA. Increasing PA levels can increase academic engagement, and high levels of academic engagement have been shown to increase academic success. Incorporating PALs, which connect lesson material to PA with a cognitive purpose, could be a way to increase PA, engagement, and academic success in the classroom.

Chapter III: Implementation

Introduction

Teachers strive to ensure the academic success of each student. Because engagement is so closely linked with academic success, teachers continue to search for ways to increase engagement levels in their classrooms. At the same time, students routinely fall short of their daily recommended amount of PA. As researchers have shown, important first steps in the process of ensuring academic success are finding ways to increase the engagement levels of all students and incorporate more PA into daily classroom schedules. Physically active lessons were chosen for this study because of their promise in increasing student engagement and PA in the classroom.

A fifth- and sixth-grade classroom was a logical choice for implementing PALs because students in these grades are approaching adolescence, and PA is of increasing importance during this phase of development (Owen et al., 2016). During adolescence, a period of rapid growth, there are great physical, cognitive, and emotional changes that occur in the student. Students' perspectives on learning and self significantly change, but PA initiatives within schools don't always account for such changes (Zarrett et al., 2021). Developing PALs specifically for fifth- and sixth-grade students ensures that students continue to have opportunities for PA in developmentally appropriate ways.

Additionally, concerning for the fifth- and sixth-grade age group, when students are preparing for middle school, is that engagement levels start to decrease (Parsons et al., 2014). Paying close attention to engagement levels at this age ensures that students do not begin a gradual decline in connecting with school as they progress through middle

school and beyond (Appleton et al., 2008). Maintaining a strong connection to school ensures long-term academic success.

This study sought to answer the question:

How does the implementation of PALs affect academic engagement in the fifth- and sixth-grade classroom?

Goals of the study:

- Understand the impact of 40-minute PALs on students' academic engagement with a specific emphasis on the behavioral and emotional aspects of academic engagement.
- Discover whether PALs were viable options for increasing academic engagement, specifically in a combined fifth- and sixth-grade classroom.

This study was carefully designed to be reliable and focused. The results of this study added to the current body of knowledge and would be repeatable in similar educational settings as called for by Owen et al. (2016). The results of the study are of significance to other educators in similar settings.

This study focused specifically on the behavioral and emotional engagement aspects of academic engagement. Physical activity increases emotional engagement because students' situational interest is piqued through novel, engaging activities. If situational interest is held long-term, there will be a better chance of increasing personal interest in the subject (Lindt & Miller, 2017). If students are interested in and behaviorally engaged in an activity, and the activity has a strong cognitive base, there is a better chance of building the habits and skills which lead to long-term academic success. Long-term academic success is the goal of education.

In the current study, engagement levels were recorded for a two-week control period and a two-week test period. During the test period, PALs were incorporated into reading instruction. The engagement levels of students during traditional lessons were compared to the engagement rates during PALs lessons. The rest of this chapter will discuss the procedures used to design the control and test periods, the project's participants, the process of implementation, and the results of the study.

Procedures

Study design

This project was conducted using a quasi-experimental method. A quasi-experimental method was chosen because the students were already assigned to a pre-existing classroom, and the study was designed to identify the effects of PALs on the academic engagement of a specific classroom of students. An A-B design was chosen to first obtain baseline data for the group of students and then document any changes in behavior during the trial period (Mertler, 2018). A quasi-experimental method using an A-B design was the best choice for this project because it allowed for observation of the effects of the control and the treatment on the same group of students.

In the classroom being studied, the school day began at 8:00 a.m. Each day started out with morning motion- a short physical activity with a duration of five minutes or less. After morning motion, there was no scheduled physical activity for the students until a 15-minute outdoor morning recess at 9:40 a.m. The teacher had control over her classroom schedule and could investigate places in the daily schedule when students spend long periods of time without PA. Physically active lessons were a viable option for

the teacher to implement, thus providing the students with more movement without sacrificing academic instruction time.

Physically active lessons were implemented during reading class. As Bartholomew et al. (2018) noted, teachers should provide students with opportunities for movement during times that the students would otherwise be sedentary. Reading class was chosen for PALs implementation because it takes place in the middle of a block of time where students do not otherwise have an opportunity for PA.

The length of the study was an important consideration during study design. In a study on the effects of different types of activity breaks, Mavilidi et al. (2020) used a four-week implementation period. During the four weeks, the control and test groups were conducted simultaneously in different classrooms. While the use of a four-week implementation period was feasible for the current study, it was not practical to conduct this preliminary research on PALs in a fifth- and sixth-grade WELS classroom in more than one school building.

While studying the incorporation of movement into lessons, Lindt and Miller (2017) chose to use one-week control and test periods in which the test period was implemented before the control period. In the study, the classroom teachers implemented both test periods with the same groups of students. Using the format of same-classroom implementation was a logical one for the current study as well.

For the current study on the effects of implementing PALs in a fifth- and sixth-grade classroom, a two-week control period and a two-week trial period were chosen. Five observational periods can be enough to obtain reliable data during a control or trial period, but recording observations over a longer period of time is better (Fiske &

Delmolino, 2012). Egger et al. (2019) used a 20-week trial period but cautioned that the longer the implementation period, the less fidelity of implementation.

Two-week periods were chosen because they provided more data, but they still allowed the study to be carried out in the span of approximately one month. One month allowed for additional observation time but did not introduce the variable of student growth or require the study to include more than just one academic content unit. Additionally, two-week periods allowed for a higher chance of remaining faithful to study implementation protocols.

During the first two-week experimental period, students received reading class instruction using the same methods that the classroom teacher typically used to teach reading class prior to the research study. In a typical lesson, the teacher used an opening question to connect previous knowledge and shared the learning targets for the day. She then introduced the new material for the day's lesson and gave opportunities for whole-group practice. After whole-group practice, the teacher gave opportunities for students to practice in table grouping pairs or as individuals. Activities during this type of lesson were designed for students to remain seated throughout the entire lesson.

During the second two-week experimental period, students were exposed to reading classes designed in the style of PALs. Reading class was held in the fifth- and sixth-grade classroom for both the control and trial periods. The teacher designed each PALs lesson to include a total of ten minutes of PA during the lesson. The PA was designed to introduce or reinforce academic instruction and always maintained a connection to academic content.

A total of ten minutes of PA was chosen based on the work of researchers. The work of Bartholomew et al. (2018) suggested that most PALs incorporate between five and 15 minutes of PA. Daly-Smith et al. (2018) completed a systematic review of studies and suggested that PA of greater than or equal to ten minutes to be the most effective at increasing engagement levels. Ten-minute PA interventions were chosen for the current study because a 10-minute time period fell within the recommendations of researchers and did not account for more than one-fourth of the lesson.

Definitions of classroom-based PA differ across studies (Watson et al., 2017). Many researchers in these studies incorporated varying types of simple aerobic exercises not requiring additional physical education equipment. One study example featured the Walkabouts program. Although designed for younger students, the Walkabouts program, which integrates PA with academic outcomes, requires students to perform simple exercises such as lunging or jumping in the area next to their desks (Vazou et al., 2021). Daly-Smith et al. (2018) reviewed similar studies in which PALs activities at a minimum involved simple movements integrating the whole body. Design choices were made for the current study based on the information taken from the referenced similar studies.

In the current study, an activity was considered a physical activity if the activity was designed for students to be out of their chairs and moving their bodies. Activities included walking from station to station, hopping to retrieve an item, or dashing from a home base to the center of the classroom (Bex, 2019; Gold, 2022; O'Connor, 2022). Running, jumping, and body-weight exercises were incorporated, which are appropriate for students in fifth- and sixth-grade (Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, 2022).

An attempt was made to include activities that would ensure aerobic activity. As also noted by Egger et al. (2019), PA intensity was often limited due to the space limitations of the PA taking place in the classroom.

For the student to be considered engaged, the student's movements needed be in-line with the expectations of the teacher for the designated activity. One activity in this study was designed for the students to be seated, but students were asked to move both arms and move their bodies from side to side in exaggerated motions. For the seated activity, the arm motions required students to remain balanced on their chairs while crossing the midline. Even though this activity did not require vigorous effort, crossing the midline and paying attention to balance control has links to improving executive function (Diamond, 2015).

Integrating at least ten minutes of moderate to vigorous PA during a lesson is best (Campbell & Lassiter, 2020; Daly-Smith et al., 2018). In a traditional classroom setting, however, it is difficult to ensure that students achieve PA at a moderate to vigorous level. Because most studies evaluating PALs interventions do not assess intensity levels of PA (Daly-Smith et al., 2018), and because of space and budget limitations, the intensity of the PA was not measured in the current study. In addition, replicating the study would be easier in similar locations and contexts with similar space and budget parameters.

Activities for the PALs were researched, modified to fit instruction, and included in the two-week trial period. Four sample activities are listed below. A complete list of included activities is found in Appendix F.

- Four corners – Four answers were posted at different corners of the classroom. Students were given a question to answer, and then they moved to the corner with the correct answer (O'Connor, 2022; Tallman, 2017).
- Running dictation – A student read a definition for a reading vocabulary word. The student remembered the definition and walked or ran to a different location where his partner wrote down the dictated definition. Once the partner finished writing, she became the runner, and the game continued (Bex, 2019).
- Q and A match-up – Students were given cards. Some cards had a vocabulary word, and some cards had a definition. The students did some sort of movement around the classroom to find the student with the card that matched theirs (Tallman, 2017).
- Sack race scavenger hunt – Students worked in groups to collect one example of each type of figurative language. A student hopped in a potato sack to find examples of figurative language scattered on slips of paper on the floor. Once the student found an example, the student hopped back to his group and switched with another group member (Gold, 2022).

In the current study, one or two different PALs activities were used during a daily lesson to achieve a total of ten minutes of PA. At least ten minutes of PA are recommended during a physically active lesson (Bartholomew et al., 2018; Daly-Smith et al., 2018). If the duration of the PALs activity would not equal ten minutes, a second PALs activity was planned for the lesson. Using two activities in these cases kept the

students engaged in activities that seemed novel, and behavioral issues were less likely to occur (Campbell & Lassiter, 2020).

One challenge of incorporating more than one PALs activity during a single lesson was the increased transition time required for students to move between activities. The more time spent in transition, the less time available for academic instruction (Campbell & Lassiter, 2020). To minimize these transition times in this study, lesson plans were written to give a clear agenda for the class period, activity instructions were given before the students were asked to move about the room, and a classroom timer was used to communicate with students how much time was left in the activity.

During both the control and the intervention periods, the lessons were presented as part of a whole text structure unit. To attempt to control curriculum variables, the first two-week (control) period focused on the structures of description and problem and solution. The second two-week (trial) period focused on the structures of cause and effect and compare and contrast. In this way, the two-week periods focused on similar levels and types of instruction, and there was a parallel learning progression throughout each two-week period.

One text structure was taught at a time, based on the recommendation of Dymock (2007). Recommendations varied for the order in which to teach text structure, and some authors suggested that the description and compare and contrast structures are slightly easier for students to learn (Wijekumar & Beerwinkle, 2018). Because description and compare and contrast were identified as easier text structures to learn, description was placed in the control period, and compare and contrast was placed in the trial period. An

additional text structure was then paired with one of the easier structures with the goal of introducing two text structures during each experimental period.

In similar form to the studies of Mavilidi et al. (2020) and DeWitt (2018), all students in the classroom were invited to participate in the study. Parents of fifth- and sixth-grade students were informed of the research plan via email and paper letter. The paper letter was sent home with the students. Through the letter (Appendix A), parents granted permission for their students to participate.

In the two weeks preceding the control trial, the teacher briefly explained the study to the students. She explained that she would be recording four weeks of reading class using a video camera to help her learn more about teaching reading using different types of methods. All relevant details of the study were included in the letter sent home with the students (Appendix A). However, the teacher did not elaborate on the details of the study in the classroom. Other studies involving students and PA in the classroom mentioned informing the students of the study but did clarify details of briefing sessions.

During the week before the study, the teacher placed the video camera in its position in the classroom with the goal of starting to desensitize students to its presence. Additionally, in the week prior to the study, the teacher video recorded a reading lesson to further desensitize students prior to the study and remove some of the novelty from the process in the hopes that the students would be more likely to display typical behaviors from the first day of actual recording.

Participants

The students participating in this study were fifth- and sixth-grade students attending a WELS elementary school in a suburb of a large Midwestern city. Fifteen

students participated in the study. Six of the participating students were fifth graders, and nine of the students were sixth graders. Of the fifteen students, seven were female and eight were male. No students in the classroom had an Individualized Education Plan or required documented academic supports, no students' physical abilities limited them from full participation in activities, and all students spoke English as a primary language.

Efforts were made to protect students' privacy. Students were assigned a number code. The number codes were shared only with the second rater for the purposes of labeling students for engagement recording. The list connecting student names and number codes was destroyed after the completion of the study.

During the implementation of the study, video recordings of reading class were uploaded to the GoPro cloud for ease of sharing between raters. After the study was completed, videos were removed from the GoPro cloud and stored in a fire-proof safe on a memory stick. The video recordings on the memory stick will be destroyed five years after the study's completion.

Assessment

Students were given a Likert scale survey to fill out before the control period and at the end of the treatment period (Appendix B). Students were asked to respond to the following statement:

I enjoy reading class.

The students were given this survey to assess their feelings toward reading class. Feelings toward a class or subject matter can be a predictor of emotional engagement (Lindt & Miller, 2017).

Survey answers were assigned a score of 1 (I really disagree!) to 4 (I really agree!). The data from the two surveys were compared using a repeated measures *t*-test. Isaac (2014) and Have et al. (2018) used similar *t*-test comparisons to test the null hypothesis of no behavioral change after an intervention period. An increase in students' scores could indicate higher levels of situational interest, which is a marker of emotional engagement. Results from the survey served as one measurement of the effect of PALs on engagement in the fifth- and sixth-grade classroom.

The Likert scale was designed for this study and was written to be comprehensible to fifth- and sixth-grade students. Based on the research of Mellor and Moore (2014), three steps were taken to ensure a quality rating scale that would accurately measure the feelings of the students in the study. First, students circled worded responses rather than numerical responses because worded responses have been shown to produce more accurate results in children in this age range. Second, the Likert scale only included four choices, which reduced confusion and ensured a more precise response to the questions. Third, special care was taken to make the survey question clear and concise, including declarative response choices. Likert scales have been shown to be used successfully with children when the survey author is careful to use statements that accurately reflect the students' feelings (Mellor & Moore, 2014).

Mavilidi et al. (2020) also used a four-point Likert scale to assess nine- to ten-year-old students' attitudes toward mathematics class. Like the current study, the Likert scale was given to students before the study to determine baseline data. It was also given to students after the completion of the study to obtain post-study data. Mavilidi et al.'s Likert assessment differed from the current study, however, because it included 22 items

for the students to evaluate. The current study only included one item in order to simplify the assessment process.

To ensure accuracy of assessment, each of the reading lessons was recorded. A GoPro video camera was placed on a tripod above the television in the front corner of the classroom so that each student was clearly visible in the video frame. A test recording was made the school day prior to the start of the study to ensure that each student would be visible during the video review. Videos were stored to the GoPro online cloud, which allowed the raters to pause and zoom in on individual students during the reviewing process.

To increase the reliability of the engagement recording results, both the teacher and a second rater viewed the videos of the reading lessons. The use of a second rater allowed for additional insight and perspective when evaluating the student behaviors (Mertler, 2018). The second rater was an educator with classroom teaching experience and had no previous knowledge or interactions with the students being studied, except for one student.

The second rater was trained by the researcher. This process of norming included sharing examples and non-examples of engaged behaviors (Appendix C). Training the second rater prior to the study helped to increase inter-rater reliability and agreement (Graham et al., 2012).

The researcher and the second rater separately viewed the recordings and recorded student engagement. The list of behaviors was developed based on the research of McIntyre et al. (1983). Similar examples of engaged behaviors were used by Bartholomew et al. (2018) to rate engaged behaviors of fourth-grade students after active

learning lessons. A span of so many years between studies lends reliability to the definitions of engaged and unengaged behaviors.

The researcher and the second rater compared results after separately reviewing two class periods of data and discussed any inconsistencies they found in their ratings. Discussion between the two raters allowed for a common frame of reference and allowed the reviewers to have a clearer picture of examples of engaged and non-engaged behaviors (Graham et al., 2012). Due to collaboration between raters, there was a clearer understanding of what constituted an engaged and an unengaged behavior when reviewing the videos.

The researcher and second rater continued to discuss inconsistencies between their ratings periodically throughout the entire review process. They jointly compared the evidence against the reference criteria in Appendix C and came up with final ratings that were best determined by the reference criteria. As a result, the two reviewers' rate of agreement was 100%. Other studies referenced by the researcher did not measure inter-rater reliability or did not use more than one reviewer.

When recording behaviors for study purposes, researchers choose between continuous and discontinuous recording. Continuous duration recording is recommended because it ensures the highest level of accuracy (Radley et al., 2015). When using continuous duration recording, observers record every instance that the data occurs during the recording period (Fiske & Delmolino, 2012). With continuous duration recording, every incidence of a behavior is recorded, but the process is time-consuming. Because the current study was designed with the intent of observing and recording

behaviors of 15 students for a total of sixteen 40-minute class periods, continuous duration recording was ruled out.

Even though continuous duration recording is the most reliable, many researchers choose instead to use a discontinuous form of recording due to time and logistical constraints. Discontinuous recording allows researchers to look at smaller samplings of behaviors rather than the entire recording period (Fiske & Delmolino, 2012; Radley et al., 2015). As a result, while using discontinuous recording, not every incidence of the behavior is recorded. However, many studies, including the current study, are designed to use discontinuous recording because it is a more practical method of getting a sampling of behavioral occurrences. Through using discontinuous recording methods, data could be obtained intermittently from all students throughout all sixteen of the class periods.

Incidences of engaged behaviors were recorded using a combination of momentary time sampling (MTS) and partial interval recording (PIR). In MTS, the researche breaks an observation down into intervals and records whether the behavior occurred at the exact moment of the interval (Radley et al., 2015). For this study, an MTS style was chosen with the purpose of breaking a relatively long observation period into smaller sections.

Partial interval recording is used when a researcher wants to document whether a behavior has occurred at any time during a defined observation period. If the behavior occurs at any time during the period, even briefly, the behavior is documented as having occurred (Radley et al., 2015). Because of the desire to capture a small picture of behaviors throughout the lesson, PIR was also chosen for this study.

It has been well-documented that short of using continuous documentation, there is no method of assessment that can assure 100% accuracy. Partial interval recording has been documented to over-estimate incidences of behavior. This overestimation, however, is consistent throughout recording periods. In studies, MTS has been shown to both over- and underestimate the occurrence of behaviors but is more accurate, with smaller margins of error, than PIR (Fiske & Delmolino, 2012; Radley et al., 2015). Even though MTS is generally chosen over PIR, PIR remains a valid option because it more easily allows for recording multiple behaviors and increases agreement between raters (King et al., 2021). Due to the advantages of PIR and MTS a combination of both was chosen for this study.

Using the principles of MTS, class periods were broken down into 10-minute intervals (:0, :10, :20, :30). Ten-minute intervals were chosen to give an overview of engagement trends throughout an entire lesson. Other studies (Bartholomew et al., 2018; Findley, 2017; Parsons et al., 2014) used a different method of observation in which observers did not pay attention to the whole class, but rather spent shorter periods of time constantly sweeping observations from an individual student to another. Interval observations were chosen for this study because the goal was to gather whole-class engagement trends during a lesson.

For MTS, engaged behaviors would be recorded immediately at the beginning or end of each interval. However, the intervals for this study were significantly longer than the five-second intervals used by Bartholomew et al. (2018) or the ten-to fifteen-second intervals used by Radley et al. (2015).

In a study by King et al. (2021) PIR was chosen to document behaviors in five-minute videos. In the study, the interval lengths were 15 seconds. Because the video

lengths for the current study were longer, intervals were placed every ten minutes within the lesson in the style of MTS, and the PIR technique was then used to document the behaviors that occurred at any time during the first ten seconds of the interval. Ten-second intervals were chosen because it has been suggested that shorter intervals can be more accurate (Ferguson, 2014).

During the review process, raters marked an X to denote on-task behavior and O for behavior that was off-task (Appendix D). A student's behavior was considered on-task if the on-task behavior occurred at any point during the ten-second period. Even though the PIR technique has been shown to overestimate the occurrence of behaviors, using a form of PIR was a logical choice for this study because the overestimations remain consistent throughout the recording periods. Additionally, the sheer number of students being observed at each time interval would make a strict MTS technique impractical for this study. Therefore, a blended version of the two methods was chosen.

The rates of students' on-task behavior were averaged for the week at each interval by dividing the number of students on task by the total number of students and then multiplying by 100. At the end of the treatment period, repeated measures *t*-tests were used to compare engagement levels between the control and treatment periods. Similar averaging, histogram, and *t*-test processes were used by Isaac (2014).

Homework completion is one marker of academic engagement (Appleton et al., 2008). Additionally, homework is an important marker of academic success (Regueiro et al., 2018). A student who completes homework is behaviorally engaged and will be more likely to be academically successful. Because behavioral engagement was a focus of this

study, homework completion rates were studied to determine a possible correlation between PALs and homework completion rates.

A checklist was chosen to document rates of homework completion (Appendix E). This document was a simple yes-no form used to track whether students had completed daily homework assignments and illustrated whether there is a correlation between types of physical activity and homework completion rates. Averages were calculated for daily completion rates. A histogram was used to display the data, and a repeated measures *t*-test was used to compare homework completion rates during the control and test periods.

Artifacts

Quantitative data was collected from the student survey (Appendix B). The survey was given to the students before the beginning of the control period. When presented with the prompt, "I enjoy reading class," 47% (seven) of the students responded with a score of 4, "I really agree," and 47% (seven) of the students responded with a score of 3, "I agree a little." One student responded with a score of 2, "I disagree a little," and zero students responded with a score of 1, "I really disagree."

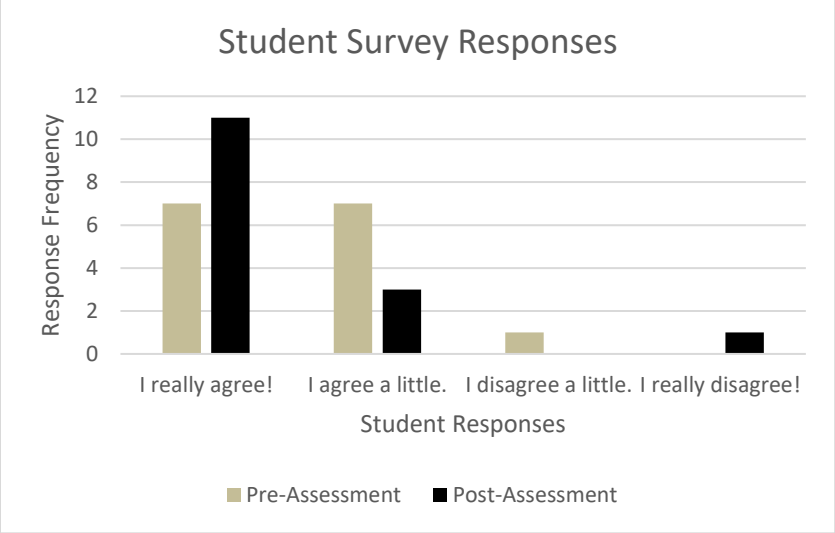
After the completion of the trial period, the student survey (Appendix B) was administered a second time. When presented with the same prompt, 73% (11) of the students responded with a score of 4. Three of the students (20%) responded with a score of 3, and one student responded with a score of 1. The comparison of pre- and post-survey responses from the beginning to the end of the study is shown in Figure 1.

Figure 1 shows results from student survey responses. Student responses from prior to the control period are shown next to the responses from after the trial period. In

the “I really agree!” column, there is a distinct rise in student responses. This is an increase from 7 to 11 students. Similarly, there is a decrease in the “I agree a little” column, from 7 to 3 students. The increase in “I really agree!” and the decrease in “I agree a little” student responses show that after the implementation of PALs, there was an increase in the students’ emotional engagement levels. After being offered lessons that included PA, the number of students who responded, “I really agree!” rose from 47% to 73%.

Figure 1

Pre- and post- survey responses



Quantitative data was collected from the on-task behavior checklists (Appendix D). The number of on-task students (denoted by an X) in each time interval were averaged. The averages were then multiplied by 100 to form percentages.

Table 1 shows the percentages of engagement for each interval separated by week. In weeks one and two, which represent the control period, the lowest percentage of engagement was 88.2% and the highest was 98.3%. In weeks three and four, which

represent the test period, the lowest level of engagement was 89.3%, and the highest was 100.0%. An engagement level of 100% occurred three times in weeks three and four.

Table 1

Engagement Levels by Interval

	:00	:10	:20	:30
Week 1	88.2%	93.4%	88.2%	93.1%
Week 2	83.9%	88.2%	98.3%	96.4%
Week 3	92.1%	100.0%	89.3%	97.7%
Week 4	94.7%	100.0%	95.0%	100.0%

Total engagement levels for each week were averaged to obtain an overall engagement level for the week. Week one, there was 90.7% engagement. Week two, there was 91.7% engagement. These first two weeks represent the control period. Weeks three and four represent the trial period. Week three, there was 94.8% engagement, and week four, there was 97.4% engagement.

Figure two represents the engagement levels across weeks, by interval. The figure shows an increase in engagement from the beginning to the end of the lesson. For all four weeks, engagement levels rose from 90% during the :00 interval to 97% during the :30 interval. On average, the highest levels of engagement are present in the :30 interval.

Figure two also shows a general increase in engagement from week one to week four of the study. The :30 interval most clearly shows this increase in engagement. Week one, during the :30 interval, student engagement levels were 93%. By week four,

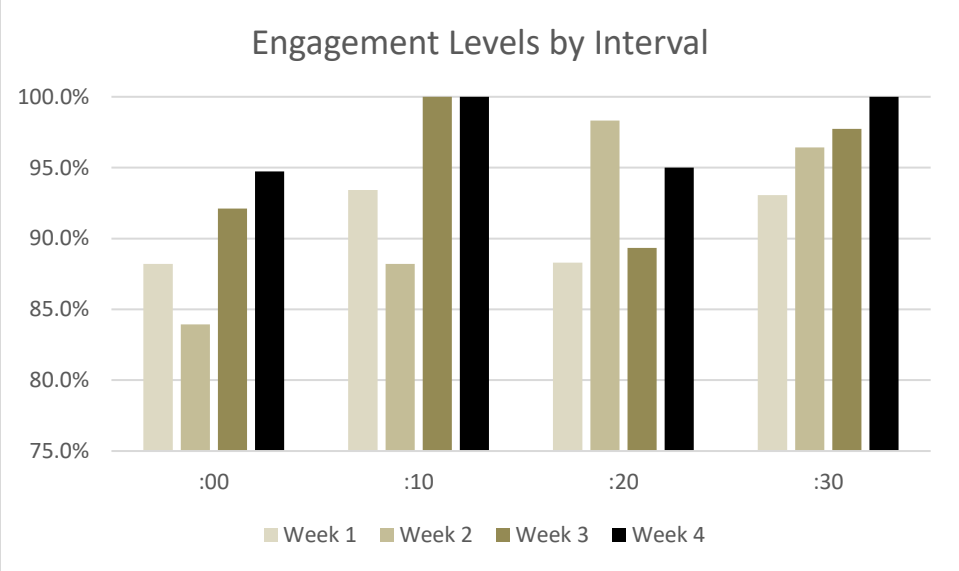
engagement levels in the same interval rose to 100%. This increase in engagement is especially notable because it occurs toward the end of the lesson.

Weeks three and four show 100% engagement in the :10 interval. For half (four) of these recording periods, students were engaged in a PALs activity when the :10 recording interval took place. Other lessons in weeks three and four at the :10 interval period found students preparing to participate in a PALs activity, taking notes/annotating, or listening to a humorous anecdote related by the teacher.

During week three at the :20 interval the lowest engagement levels were recorded throughout the trial period. For two of the days, 100% engagement was recorded. However, for the remaining two days, the :20 interval recording period came during transition times within the lesson. During these transition times, the students were less likely to be focused clearly on the instructions for that time period, and as a result, fewer students were recorded as engaged.

Figure 2

Engagement Levels by Interval

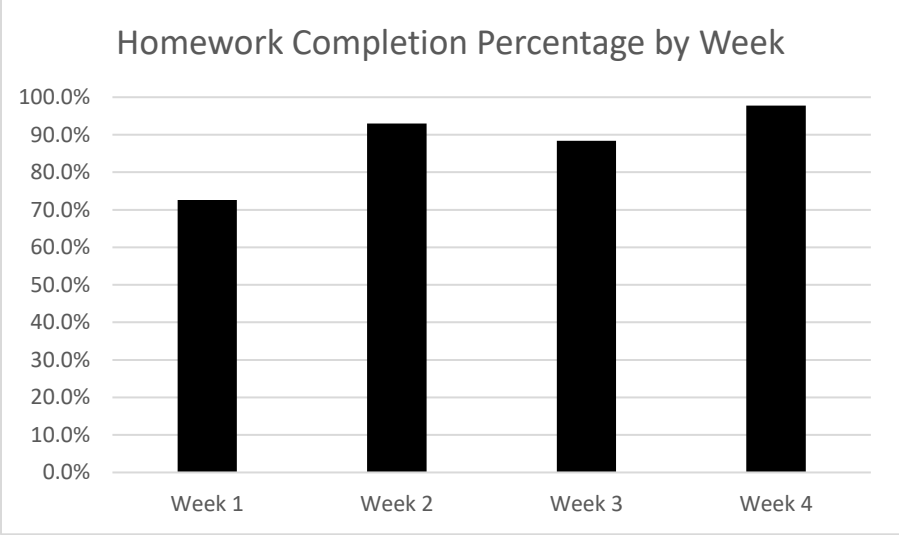


An independent samples *t*-test was used to compare engagement levels during the control period (M = 0.91) and the trial period (M = 0.96). Using an alpha level of 0.05, the mean difference was found to be statistically different, t(60) = -2.18, p = 0.03. Because the p-value was less than the alpha level of 0.05, there is evidence that the increase in mean engagement levels after the implementation of PALs lessons was significant. There was a positive correlation between the implementation of PALs and increased academic engagement levels.

Quantitative data from the homework completion checklists (Appendix E) was used to assess rates of homework completion. During week 1, 73% of students turned in homework on time. During week 2, 93% of students turned in homework on time. Week three, 88% of students turned in homework on time, and during week 4, 98% of students turned in homework on time. This data is represented in Figure 3.

Figure 3

Homework Completion Percentage by Week



An independent samples *t*-test was used to compare the homework completion rates during the control period (M = 0.81) and the trial period (M = 0.92). Using an alpha level

of 0.05, the mean difference was not found to be statistically different, $t(12) = -1.61$, $p = 0.13$.

Results

This study sought to answer the question:

How does the implementation of PALs affect academic engagement in the fifth- and sixth-grade classroom?

Goals of the study:

- Understand the impact of 40-minute PALs on students' academic engagement with a specific emphasis on the behavioral and emotional aspects of academic engagement.
- Discover whether PALs were viable options for increasing academic engagement, specifically in a combined fifth- and sixth-grade classroom.

Quantitative data was gathered from three different sources. Students were given self-assessment surveys both before the control period began and after the trial period was complete. Before the control period, 47% of students indicated that they really enjoyed reading class. After the trial period was complete, the number of students who indicated that they really enjoyed reading class was 73%. The number of students who responded to the survey with a 3 or 4 (I really agree! or I agree a little.) stayed the same (93%) across both surveys. The increase in students who responded that they really enjoyed reading class indicated that after the implementation of PALs there was an increase in the students' levels of emotional engagement.

Behavioral engagement levels were recorded and evaluated using averages. Engagement for the control period was reported at 90.7% for week one and 91.7% for

week two. Engagement for the trial period was reported at 94.8% for week three, 97.4% for week four. A *t*-test was used to compare total engagement between the control and trial periods. The p value was 0.03, suggesting a statistically significant difference between the trial and control periods. This difference indicates that there was an increase in the students' levels of behavioral engagement after the implementation of PALs.

Homework completion rates were recorded and averaged. A *t*-test was used to compare completion rates between the control and test periods. With a p-value of 0.13, the results are not found to be statistically significant. This p-value indicates that there was no documented change in this area in the students' levels of behavioral engagement.

This study was carefully designed to determine whether PALs were a viable option for increasing engagement in a fifth- and sixth-grade combined classroom. Steps were taken to ensure a design that could be replicated in similar settings and could be implemented with fidelity within the span of one calendar month. Quantitative data was gathered from three sources to ensure reliability and reduce the bias of results.

Previous research was used as a basis for determining the details of the control and test periods and the recording and analyzing of the data. A concerted effort was made to build upon the work of others to contribute more information to the body of existing research. Adaptations were made to best fit the setting and obtain a reliable response to the research question.

The results of this study were mixed. Homework completion rates rose from 91% during week one of the study to 97% during the final week. This is an increase in homework completion from the beginning to the end of the study, but because the p-value was 0.13 and there were so few data points, the results were not found to be

statistically significant. Meanwhile, a statistically significant increase was found in behavioral and emotional engagement in the areas of on-task behavior and situational interest. Physically active lessons were found to be a viable option for increasing academic engagement in a fifth- and sixth-grade combined classroom by improving on-task behaviors and situational interest.

Chapter IV: Reflective Essay

Introduction

Academic engagement is a critical component of teaching and learning. One of a teacher's highest priorities should be planning for and increasing students' engagement. Additionally, giving students more opportunities for physical activity (PA) remains important for the overall health and well-being of students. Because engagement and PA are so crucial, this project was designed to explore the possible connection between physical activity and increased academic engagement.

Conclusions

Attitudes Toward Reading Class

Academic engagement is affected by a student's buy-in to classroom activities. The more the student is actively involved in classroom activities, the more engaged he or she will be (Ulmanen et al., 2014). Furthermore, when students judge the academic content to be personally relevant and interesting, the students will be more likely to be engaged and learning the material (Gettinger & Walter, 2012). The student's desire for relevant and interesting material is evidence of a need for both personal and situational emotional engagement.

Students were given a self-assessment survey to report their feelings about reading class. Students filled out the survey two times- once before the control period and once after the trial period. In both surveys, the total percentage of participants reporting that they either really agreed or agreed a little with the statement "I enjoy reading class" stayed the same (93%). Based on this data, the students in the classroom already had a

positive perception of reading class- most likely due to personal and/or situational behavioral engagement.

However, between the two surveys, the breakdown of students within the two categories changed. Before the control period of this study, 47% of the participants reported that they "really agree" with the statement "I enjoy reading class." After the completion of the trial period, the number of participants reporting "I really agree" rose to 73%. The rise in percentage suggested that the students were more likely to be willing to be engaged in reading class after the PALs lessons.

The finding of improved attitudes toward reading class was contrary to the findings of Mavilidi et al. (2020), who found no change in students' attitudes toward mathematics after implementing different types of activity breaks in mathematics class. Some reasons for this discrepancy could be a difference in subject matter, age level, implementation protocol, and survey techniques. Mavilidi et al. (2020) studied 9 and 10-year-old students. While the study also used a Likert scale, the scale was much longer (22 items).

The improvement in student perceptions of reading class suggests that at the very minimum, students enjoyed reading class more after the implementation of PALs. As suggested by Gettinger and Walter (2012), if the students enjoyed the activities offered through PALs lessons, they would be more willing to be engaged in the classroom. As situational interest is held, there is a higher chance of increasing personal interest over time (Lindt & Miller, 2017). Implementing PALs activities is a logical first step in increasing engagement levels in the classroom by increasing situational engagement levels.

In this study, students self-reported that they enjoyed reading class more after the implementation of PALs. These findings were in line with the research of Lindt and Miller (2017) and Kvalø et al. (2017). Most students have more fun when they are physically active. Because students are active and enjoying themselves during PALs, they will be more attentive during the lesson (Schmidt et al., 2016). Students in the classroom in this study did enjoy themselves more during the PALs and were more engaged as a result.

Engagement Levels After PALs

Other researchers have suggested that behavioral engagement levels in the classroom can average as low as 45%, and levels as low as 80% are a cause for the implementation of new strategies (Findley, 2017; Gettinger & Walter, 2012). During the first week of the control period, the behavioral engagement for the classroom in this study was measured at 91%. After the trial period, behavioral engagement levels rose to 96%. This was a strong increase in engagement in a classroom that already was experiencing a higher level of engagement.

During the implementation of PALs, when the engagement recording interval fell during one of the designated PALs activities, engagement was generally very high. These high levels of engagement were in line with other research. Lindt and Miller (2017) found that student interest increases emotional, and as a result, behavioral engagement. In the current study, students were physically active during a lesson and demonstrated higher levels of academic engagement due to an increase in situational interest.

During one recording interval, the ten-second recording period fell during a time when the teacher was setting up a PALs activity. The total transition between activities

took less than 30 seconds, but the teacher hadn't given the students specific instructions of what they should be doing during that transition time other than standing and waiting for the teacher to turn on music. As a result, based on the engagement criteria in Appendix C, raters recorded disproportionately low engagement levels during this recording period (73%). Past researchers also found that transition times before and after PA can be a challenge in the area behavior management (Campbell & Lassiter, 2020).

It should be noted that engagement levels were also typically very high (often 100%) during the control period when the students were taking notes. Even though the students were not physically active during the note-taking period (notetaking does not meet the requirements set for PA in this study), the students were engaged in the lesson. They were participating in the lesson by completing the tasks that the teacher required of them.

While students' engagement levels were high behaviorally during these periods of notetaking, the cause of the engagement is unknown. Behavioral engagement levels can be high due to compliance in classrooms where a teacher has a successful command of behavior management techniques (Lekwa et al., 2019). A focus needs to be placed, however, on ensuring that lessons are also cognitively and emotionally engaging (Parsons et al., 2014). The current study did not determine whether the high behavioral engagement was due to sustained levels of emotional engagement (situational and/or personal interest) or a result of behavioral compliance in the classroom.

Physically active lessons, by nature, incorporate more activities in which students are required to move their bodies and move away from their normal desk locations in the classroom. Activities that incorporate this movement around the classroom demand more

transition time during a class period. Moving from one space to another or moving classroom furniture to make room for the physically active activity incorporates the whole body and allows for physical activity but also takes more time out of the class period than would be required in a typical lesson where students remain seated in their desks.

During the trial period of this study, PALs were designed to incorporate ten minutes of physical activity during each lesson. Physical activity was defined as an activity requiring students to be out of their chairs and moving their bodies. Because of study limitations, heart rate and intensity of movement were not monitored. While the students received an extra ten minutes of movement each day, the intensity of the movement was not guaranteed, as was measured by other studies (Bartholomew et al., 2018; Have et al., 2018).

Homework Completion Rates

Homework completion is one marker of academic engagement (Appleton et al., 2008). Additionally, homework is an important marker of academic success (Regueiro et al., 2018). A student who completes homework is behaviorally engaged and is more likely to be academically successful. Because behavioral engagement was a focus of this study, homework completion rates were studied to determine a possible correlation between PALs and homework completion rates.

During week one of the study, homework completion rates were recorded at 91%. During the final week of the study, homework completion rates were recorded at 97%. Because the p-value was 0.13 and there were so few data points, the results were not found to be statistically significant.

Before and during the study, homework completion rates in all subject areas were very low. During the study, the teacher and the school principal were forced to implement a new policy in the classroom to combat the low homework completion rates. While overall homework completion rates rose for all classes (including reading class), it could not be determined whether the rise in homework completion was due to PALs or due to the additional policy put in place. Even though adding a new policy in the classroom during the study was not optimal, as noted by the researchers, general classroom management strategies needed to remain a high priority before, during, and after the study (Parsons et al., 2014).

As noted by DeWitt (2018), more research needs to be done to learn about the duration of the benefits of PA in the classroom. DeWitt (2018) found that the benefits of PA were less as soon as 40 minutes after the completion of the PA. It is possible that the positive effects of PALs during reading class on behavioral engagement do not extend to later in the day when students are completing their homework.

Recommendations

A teacher's role in the classroom is of utmost importance. Each day a teacher assumes dozens of different responsibilities, all with the ultimate goal of student academic success. Because student engagement is so closely intertwined with academic success, a teacher needs to keep engagement at the forefront when planning instructional activities.

This study found that PALs increased some forms of academic engagement in the fifth- and sixth-grade classroom. Students' emotional engagement increased through the exposure to and participation in novel activities. The activities, which allowed them to

move around the classroom, increased situational interest, which is a form of emotional engagement. Anecdotal observations noted that students were excited to hear that games were going to be included in the lesson for a day, and students were quicker to participate in those activities.

Behavioral engagement also increased after the implementation of PALs. While increases in homework completion rates were not statistically significant, students' on-task behaviors were higher during the trial period. Exhibiting on-task behaviors (Appendix C) is a marker of behavioral engagement. Because PALs improve both emotional and behavioral engagement, they serve as positive additions to a teacher's lesson planning resources.

Quantitative data was proof of increased academic engagement during PALs lessons compared to the traditional reading lessons during the control period. However, during the control period when students were seated and taking notes, engagement levels were also very high. It is unknown whether the students' emotional engagement was high during these times, or if the observed behavioral engagement was due to enforced classroom expectations. In future studies, more detailed self-assessments should be created for the students to better determine the types of academic engagement present during each of these periods.

For PALs lessons to be successful, the teacher needs to be incredibly intentional about designing the instructional time to be used as carefully as possible. Physically active lessons allow for more PA during the school day without sacrificing instructional time as long as the inclusion of PALs activities does not result in academic time lost due to long transitions or behavioral management issues.

When just beginning to implement PALs, more planning time is required of the teacher. Planning and developing cognitively based physical activities that relate to daily instructional outcomes require additional resources which are not necessarily included in pre-existing curriculum materials. This additional time required may be a deterrent to teachers who feel that their planning time is already lacking.

Resources are available for planning cognitively based PA for the classroom. Especially helpful to the planning of this study were resources from Bex (2019), Gold (2022), and Tallman (2017). These authors have designed and shared activities for increasing engagement in the classroom through movement or PA. Resources designed for physical education and lists of indoor recess games can also be helpful for developing PALs activities for implementation in the classroom.

As shown in this study, PALs are a viable option for teachers in a WELS multi-grade setting. A teacher could design PALs activities for different age levels in the classroom based on different learning targets or outcomes. For example, in a running dictation activity, students could be grouped by age level or learning outcome. The sentences being transcribed could be different for the different group based on the outcomes for that group. In this way, all students in the classroom are moving with a cognitive purpose, but the teacher can differentiate between different learning levels.

It is documented that students do not routinely get the recommended 60 minutes of moderate to vigorous PA (Daly-Smith et al., 2018). In this study, students did receive an additional ten minutes of PA during each of the trial period lessons. This PA, however, was not necessarily completed at a moderate to vigorous level. As defined by this study, the PA included does work to get students moving more, but it does not necessarily meet

the moderate to vigorous requirements. When implementing PALs, it is important to determine the goal of the PA and design the intervention to meet the requirements of the PA (Daly-Smith et al., 2018).

Similar studies should be designed in the future to replicate this PALs intervention with the inclusion of a moderate to vigorous PA requirement. These additional studies would further contribute to the research necessary to determine the optimal amount of time, the type, and the frequency of PALs (Bedard et al., 2019). These future studies should be designed with clear parameters and should be able to be repeated in similar educational settings (Owen et al., 2016). Specifically, studies taking place in fifth- and sixth-grade combined classrooms would confirm the reliability of this study (Schanzenbach, 2012).

Informal comments from the students in the study after the study was complete revealed that the students did enjoy the PALs lessons more because the activities were new and novel, and the students felt like they got to play more games. Additional qualitative research could be done to infer the thoughts, feelings, and attitudes of the students before, during, and after a study. The results of this qualitative research could help to find a connection between the piqued situational interest and a longer-term personal interest.

While the results of this study show an increase in situational interest and engagement levels, it has been shown that interventions evolve over time. The results of such interventions can also change over time, as short-term results aren’t necessary predictors of similar results in the future (Schanzenbach, 2012). Long-term studies could

be done to determine the effects of PALs on engagement, as well as their effects on personal (behavioral), cognitive, and agentic engagement.

This study found no direct correlation between PALs and homework completion rates. Future studies should be designed to investigate more thoroughly the duration of the positive benefits on PALs and their broader effects on academic engagement, including homework completion. Completing homework is a sign of behavioral engagement and is correlated with higher academic success (Regueiro et al., 2018).

This study sought to answer the question:

How does the implementation of PALs affect academic engagement in the fifth- and sixth-grade classroom?

Goals of the study:

- Understand the impact of 40-minute PALs on students' academic engagement with a specific emphasis on the behavioral and emotional aspects of academic engagement.
- Discover whether PALs were viable options for increasing academic engagement, specifically in a combined fifth- and sixth-grade classroom.

Physically active lessons were shown to increase emotional and behavioral engagement levels in fifth- and sixth-grade students. This increase in emotional and behavioral engagement could be a first step in improving overall academic engagement, and in turn, academic success. Ensuring academic success is a primary goal of education.

The implementation of PALs provided students with more cognitively based PA during the school day. While the PA included in this study did not necessarily meet the recommendations for moderate to vigorous activity, it did allow students to add

movement during periods which would otherwise be sedentary. Physically active lessons provide teachers opportunities to evaluate classroom schedules to find times when they can reduce sedentary time without sacrificing instruction.

Teachers play a vital role in ensuring the academic engagement and success of their students. Because their role is so vital, they should continually be looking for ways to improve their practices. Implementing PALs, especially in a fifth- and sixth-grade classroom, is one viable way teachers can increase academic engagement and help students find academic success.

References

Abid, N., & Akhtar, M. (2020). Relationship between academic engagement and academic achievement: an empirical evidence of secondary school students. *Journal of Educational Research*, *23*(1), 48.

Akpur, U. (2021). Does class participation predict academic achievement? A mixed-method study. *English Language Teaching Educational Journal*, 4(2), 148-160.

Appleton, J. J., Christenson, S. L, & Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools*, *45*(5), 369–386.

Bartholomew, J. B., Golaszewski, N. M., Jowers, E., Korinek, E., Roberts, G., Fall, A., & Vaughn, S. (2018). Active learning improves on-task behaviors in 4th grade children. *Preventive medicine*, *111*, 49-54.

Bedard, C., St John, L., Bremer, E., Graham, J. D., & Cairney, J. (2019). A systematic review and meta-analysis on the effects of physically active classrooms on educational and enjoyment outcomes in school age children. *PLoS ONE*, 14(6), 1–19. https://doi-org.emil.mlc-wels.edu/10.1371/journal.pone.0218633

Bex, M. (2019, October 5). *Running dictation relay race*. The Comprehensible Classroom. Retrieved July 25, 2022, from https://comprehensibleclassroom.com/2011/06/29/running-dictation/

Caldas, S. J., & Reilly, M. S. (2019). The mediating influence of physical activity levels on 3rd-grade academic achievement. *Journal of Research in Childhood Education*, *33*(2), 271–289.

Campbell, A. L., & Lassiter, J. W. (2020). Teacher perceptions of facilitators and barriers to implementing classroom physical activity breaks. *Journal of Educational Research*, *113*(2), 108–119. https://doi-org.emil.mlc-wels.edu/10.1080/00220671.2020.1752613

Chacón-Cuberos, R., Zurita-Ortega, F., Ramírez-Granizo, I., & Castro-Sánchez, M. (2020). Physical activity and academic performance in children and preadolescents: a systematic review. *Apunts Educación Física y Deportes*, *139*, 1-9.

Daly-Smith, A. J., Zwolinsky, S., McKenna, J., Tomporowski, P. D., Defeyter, M. A., & Manley, A. (2018). Systematic review of acute physically active learning and classroom movement breaks on children's physical activity, cognition, academic performance and classroom behaviour: Understanding critical design features. *BMJ Open Sport & Exercise Medicine*, *4*(1). https://bmjopensem.bmj.com/content/bmjosem/4/1/e000341.full.pdf

Daly-Smith, A., Morris, J. L., Norris, E., Williams, T. L., Archbold, V., Kallio, J., Tammelin, T., Singh, A., Mota, J., von Seelen, J., Pesce, C., Salmon, J., McKay, H., Bartholomew, J., & Resaland, G. K. (2021). Behaviours that prompt primary school teachers to adopt and implement physically active learning: a meta synthesis of qualitative evidence. *International Journal of Behavioral Nutrition and Physical Activity*, 18(1), 1-20.

DeWitt, B. (2018). *Effects of aerobic physical activity on student engagement: can 20 minutes of moderate to vigorous physical activity affect on-task classroom behavior immediately following?* (Publication No. 1161) [Doctoral Dissertation,

University of Massachusetts Amherst]. https://scholarworks.umass.edu/dissertations_2/1161

Diamond, A. (2015). Effects of physical exercise on executive functions: going beyond simply moving to moving with thought. *Annals of sports medicine and research*, 2(1), 1011.

Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion. (2022, June 3). *What counts for children and adolescents?* Centers for Disease Control and Prevention. https://www.cdc.gov/physicalactivity/basics/children/what_counts.htm

Donnelly, J. E., Hillman, C. H., Castelli, D., Etnier, J. L., Lee, S., Tomporowski, P., Lambourne, K., & Szabo-Reed, A. N. (2016). Physical activity, fitness, cognitive function, and academic achievement in children: a systematic review. *Medicine and science in sports and exercise*, *48*(6), 1197.

Dymock, S. (2007). Comprehension strategy instruction: Teaching narrative text structure awareness. *Reading Teacher*, 61(2), 161–167. https://doi-org.emil.mlc-wels.edu/10.1598/RT.61.2.6

Egger, F., Benzing, V., Conzelmann, A., & Schmidt, M. (2019). Boost your brain, while having a break! The effects of long-term cognitively engaging physical activity breaks on children's executive functions and academic achievement. *PLoS ONE*, *14*(3), 1–20. https://doi-org.emil.mlc-wels.edu/10.1371/journal.pone.0212482

Ferguson, T. D. (2014). *Examining the influence of interval and observation length on the dependability of data*. Northeastern University.

Findley, J. (2017). *Effects of recess on student engagement* (Master's thesis). Northwestern College. https://nwcommons.nwciowa.edu/cgi/viewcontent.cgi?article=1061&context=ed

Fiske, K., & Delmolino, L. (2012). Use of discontinuous methods of data collection in behavioral intervention: Guidelines for practitioners. *Behavior Analysis in Practice*, 5, 77-81.

Gettinger, M., & Walter, M. J. (2012). Classroom strategies to enhance academic engaged time. In Handbook of research on student engagement (pp. 653-673). Springer, Boston, MA.

Graham, M., Milanowski, A., & Miller, J. (2012). Measuring and Promoting Inter-Rater Agreement of Teacher and Principal Performance Ratings. Online Submission.cation_masters

Gold, O. [@distinguishedenglish]. (2022, August 27). Ok this is one of my favorite lessons ever. Make them race to find examples of different types of figurative. Instagram. Retrieved August 27, 2022, from https://www.instagram.com/reel/ChyJF08gdEC/?igshid=YmMyMTA2M2Y=

Harvey, S. P., Lambourne, K., Greene, J. L., Gibson, C. A., Lee, J., & Donnelly, J. E. (2018). The effects of physical activity on learning behaviors in elementary school children: A randomized controlled trial. *Contemporary School Psychology*, *22*(3), 303-312.

Have, M., Nielsen, J. H., Ernst, M. T., Gejl, A. K., Fredens, K., Grøntved, A., & Kristensen, P. L. (2018). Classroom-based physical activity improves children's

math achievement – A randomized controlled trial. *PLoS ONE*, 13(12), 1–14. https://doi-org.emil.mlc-wels.edu/10.1371/journal.pone.0208787

Havik, T., & Westergård, E. (2020). Do teachers matter? Students' perceptions of classroom interactions and student engagement. *Scandinavian Journal of Educational Research*, 64(4), 488–507. https://doi-org.emil.mlc-wels.edu/10.1080/00313831.2019.1577754

Isaac, C. K. (2014). *The relationship between morning physical activity and student engagement in an elementary school setting* (Master's thesis). University of Manitoba. https://mspace.lib.umanitoba.ca/bitstream/handle/1993/30145/isaac_cheryl.pdf?sequence=3

King, S. A., Dzenga, C., Burch, T., & Kennedy, K. (2021). Teaching partial-interval recording of problem behavior with virtual reality. *Journal of Behavioral Education*, 30(2), 202–225. https://doi-org.emil.mlc-wels.edu/10.1007/s10864-019-09363-4

Kong, R., Hu, X., & Yuen, A. H. (2020). *Understanding academic engagement and context through multimodal data*. 3357–3365. https://scholarspace.manoa.hawaii.edu/server/api/core/bitstreams/f2bbeee3-3325-47b9-8cb8-f40ddd499b77/content

Kreider, C. (2019). Physically active students learn better: Finding new ways to implement movement in the elementary classroom. *Childhood Education*, 95(3), 63-71.

Klemenčič, M. (2015). What is student agency? An ontological exploration in the context of research on student engagement. *Student engagement in Europe: Society, higher education and student governance*, 11-29.

Kvalø, S. E., Bru, E., Brønnick, K., & Dyrstad, S. M. (2017). Does increased physical activity in school affect children's executive function and aerobic fitness?. *Scandinavian journal of medicine & science in sports*, *27*(12), 1833-1841.

Lei, H., Cui, Y., & Zhou, W. (2018). Relationships between student engagement and academic achievement: A meta-analysis. *Social Behavior and Personality: an international journal*, *46*(3), 517-528.

Lekwa, A. J., Reddy, L. A., & Shernoff, E. S. (2019). Measuring teacher practices and student academic engagement: A convergent validity study. *School Psychology*, 34(1), 109.

Lindt, S. F., & Miller, S. C. (2017). Movement and learning in elementary school. *Phi Delta Kappan*, 98(7), 34-37.

Mavilidi, M. F., Drew, R., Morgan, P. J., Lubans, D. R., Schmidt, M., & Riley, N. (2020). Effects of different types of classroom physical activity breaks on children's on-task behaviour, academic achievement and cognition. *Acta paediatrica*, *109*(1), 158-165.

McIntyre, D. J., Copenhaver, R. W., Byrd, D. M., & Norris, W. R. (1983). A study of engaged student behavior within classroom activities during mathematics class. *Journal of Educational Research*, 77(1), 55–59. https://doi-org.emil.mlc-wels.edu/10.1080/00220671.1983.10885495

Mellor, D., & Moore, K. A. (2014). The use of Likert scales with children. *Journal of pediatric psychology*, 39(3), 369-379.

Mertler, C. A. (2018). *Introduction to educational research*. SAGE Publications.

O'Connor, A. (2022, January 12). *Blog*. Middle School Math Man. Retrieved July 25, 2022, from https://www.middleschoolmathman.com/middleschoolmathmanblog

Olson, A. (2022). *An overall look at the health and wellness of WELS elementary school students* [Unpublished master's thesis]. Martin Luther College.

Owen, K. B., Parker, P. D., Van Zanden, B., MacMillan, F., Astell-Burt, T., & Lonsdale, C. (2016). Physical activity and school engagement in youth: A systematic review and meta-analysis. *Educational Psychologist, 51*(2), 129–145. https://doi-org.emil.mlc-wels.edu/10.1080/00461520.2016.1151793

Parsons, S. A., Richey Nuland, L., & Ward Parsons, A. (2014). The ABCs of student engagement. *Phi Delta Kappan*, 95(8), 23–27. https://doi-org.emil.mlc-wels.edu/10.1177/003172171409500806

Pruitt, M., & Morini, G. (2021). Examining the role of physical activity on word learning in school-aged children. *Journal of Speech, Language & Hearing Research*, 64(5), 1712–1725. https://doi-org.emil.mlc-wels.edu/10.1044/2021_JSLHR-20-00359

Radley, K. C., O'Handley, R. D., & Labrot, Z. C. (2015). A comparison of momentary time sampling and partial-interval recording for assessment of effects of social skills training. *Psychology in the Schools*, 52(4), 363–378. https://doi-org.emil.mlc-wels.edu/10.1002/pits.21829

Regueiro, B., Núñez, J. C., Valle, A., Piñeiro, I., Rodríguez, S., & Rosário, P. (2018).

Motivational profiles in high school students: Differences in behavioural and emotional homework engagement and academic achievement. *International Journal of Psychology*, 53(6), 449–457. https://doi-org.emil.mlc-wels.edu/10.1002/ijop.12399

Salmela, A. K., Tang, X., Symonds, J., & Upadyaya, K. (2021). Student engagement in adolescence: A scoping review of longitudinal studies 2010–2020. *Journal of Research on Adolescence (Wiley-Blackwell)*, *31*(2), 256–272. https://doi-org.emil.mlc-wels.edu/10.1111/jora.12619

Schanzenbach, D. W. (2012). Limitations of experiments in education research. *Education Finance and Policy,* 7(2), 219-232.

Schmidt, M., Benzing, V., & Kamer, M. (2016). Classroom-based physical activity breaks and children's attention: Cognitive engagement works!. *Frontiers in Psychology*, *7*, 1474.

Tallman, M. (2017). *Blog*. Teacher Thrive. Retrieved July 25, 2022, from https://teacherthrive.com/blog/

Tottori, N., Morita, N., Ueta, K., & Fujita, S. (2019). Effects of high intensity interval training on executive function in children aged 8–12 years. *International Journal of Environmental Research and Public Health*, *16*(21), 4127.

Ulmanen, S., Soini, T., Pyhältö, K., & Pietarinen, J. (2014). Strategies for academic engagement perceived by Finnish sixth and eighth graders. *Cambridge Journal of Education*, 44(3), 425–443. https://doi-org.emil.mlc-wels.edu/10.1080/0305764X.2014.921281

Vazou, S., Long, K., Lakes, K. D., & Whalen, N. L. (2021). “Walkabouts” Integrated Physical Activities from Preschool to Second Grade: Feasibility and Effect on Classroom Engagement. *Child & Youth Care Forum*, 50(1), 39–55. https://doi-org.emil.mlc-wels.edu/10.1007/s10566-020-09563-4

Watson, A., Timperio, A., Brown, H., Best, K., & Hesketh, K. D. (2017). Effect of classroom-based physical activity interventions on academic and physical activity outcomes: a systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 1-24.

Wijekumar, K., & Beerwinkle, A. (2018). *Implementing the Text Structure Strategy in Your Classroom*. Reading Rockets. Retrieved February 4, 2023, from https://www.readingrockets.org/article/implementing-text-structure-strategy-your-classroom

Yang, Y., Yuan, Y., Tan, H., Wang, Y., & Li, G. (2021). The linkages between Chinese children’s both cognitive engagement and emotional engagement and behavioral engagement: Mediating effect of perceptions of classroom interactions in math. *Psychology in the Schools*, 58(10), 2017–2030. https://doi-org.emil.mlc-wels.edu/10.1002/pits.22571

Zarrett, N., Law, L. H., Wilson, D. K., Abraczinskas, M., Taylor, S., Cook, B. S., & Roberts, A. (2021). Connect through PLAY: a randomized-controlled trial in afterschool programs to increase adolescents’ physical activity. *Journal of Behavioral Medicine*, 44(3), 379–391. https://doi-org.emil.mlc-wels.edu/10.1007/s10865-021-00206-0

Appendix A: Parent Permission Letter

October 12, 2022

Dear Parents,

It is my goal as your child's teacher to ensure that my classroom is a place where he or she can grow physically, emotionally, spiritually, and academically. One way that I can try to help ensure this growth is through incorporating opportunities for physical activity in my classroom. It's my hope that keeping students physically active and engaged in my classroom will lead to growth in other areas, including academics.

I am approaching the completion of my Master of Science in Education program through Martin Luther College. To finish my program, I am working on a capstone project which studies how physical activity affects students' attitudes toward and on-task behaviors during reading class. I will compare our normal reading class lessons to reading lessons where I incorporate physical activity in the lessons.

Attached to this letter is a permission form for your student to participate. If you give your permission, I will record three types of data to use in my project: on-task behaviors at intervals during reading lessons, perceptions of reading class, and daily homework completion rates. Your child's name and any identifying information will not be used in my project. Participation is completely voluntary, and I will not collect data on your student if you do not give your permission.

Please read the attached information. If you are willing to grant permission for your child to participate, please return the signed form to me as soon as possible. As always, thank you for your continued support.

Sincerely,

Anne Zeitler

Parental Permission Form

Title: The Effects of Physically Active Lessons on Engagement in a 5th and 6th Grade Classroom

Faculty Advisor: Professor Jon Schaefer

I. Purpose

Your child is invited to participate in a research study that looks at how physically active reading lessons affect on-task behaviors. I am completing this project as part of my Master of Science in Education program through Martin Luther College. As a result of this study, I hope to learn about how different types of physical activity affect behavioral engagement and academic success in my classroom.

II. Procedures

For two school weeks starting November 7, 2022, students will be given "normal" reading class lessons. Then, for two school weeks starting November 28, 2022, the students will receive reading lessons that will include ten minutes of physical activity within the lesson. I will make a video recording of each of the reading lessons so that I will be able to assess students on-task behaviors without interrupting any instruction. I will also keep track of students' daily homework completion rates.

After we finish the two weeks of "normal" lessons and again after we finish the two weeks of physically active lessons, I will give the students a survey to assess their overall perceptions of reading class.

Your permission grants me the ability to use information from the checklists and surveys in my report.

III. Risks

Participation in this study does not pose any greater risk than a child's participation in normal school day activities.

IV. Benefits

Your child may not directly benefit from participating in this research study. This research study is designed to give information to me and to other educators who want to learn more about how physical activity can affect engagement and academic success.

V. Voluntary Participation

Participation in this research study is completely voluntary. You may choose whether to allow your child to participate. Participation will not affect your child's standing or grades in my classroom. Participations my drop out of the study at any time.

VI. Confidentiality

Students' survey data will remain anonymous, and on-task behavior reports will remain confidential. I will destroy all data from this study at the completion of the study. No identifying information will be used in my report.

VII. Copy of Permission Form

If you are willing to give your child permission to participate in this study, please fill out the form below. You will receive a copy of the completed permission form.

Child's Name:	
Parent Name: (Please Print)	
Parent Signature:	
Date:	

If you have any questions about this project, please contact:

Anne Zeitler
763.222.4559 (Cell)
Anne.Zeitler@HolyTrinityNewHope.org

Appendix B: Student Survey

Circle the answer that shows how you feel about what the sentence is saying.

I enjoy reading class.	I really agree!	I agree a little.	I disagree a little.	I really disagree!

Appendix C: Engaged Behaviors – Examples and Non-examples

Examples of engaged behaviors:	Examples of non-engaged behaviors:
• Listening to instructions • Eyes focusing on the teacher or partner • Body facing the teacher/partner • Body moving in a way appropriate for the assigned activity • Reading, writing, or participating in academic behaviors appropriate for the assigned activity • Asking or answering questions appropriate for the lesson/activity focus	• Eyes drifting and/or focused away from teacher or partner • Head down on desk • Doodling or drawing in a way that is distracting from lesson focus • Body moving in a way that is inappropriate for the assigned activity • Acting in a way that is uncooperative to the directions of the teacher • Talking with the teacher or a partner about topics not related to the lesson focus

Appendix D: On-task Behavior Checklist

An X in a box signifies that at the designated time interval, the student is demonstrating engaged behaviors appropriate to the expectations for him or her at that point of the reading lesson. An O signifies that the student's behaviors are off task.

	:00	:10	:20	:30
Student 1				
Student 2				
Student 3				
Student 4				
Student 5				
Student 6				
Student 7				
Student 8				
Student 9				
Student 10				
Student 11				
Student 12				
Student 13				
Student 14				
Student 15				

Appendix E: Homework Completion Checklists

An X in a box signifies that an assignment has been turned in for the date listed. An O signifies that homework was missing or incomplete.

	11/7	11/8	11/9	11/10	11/14	11/15	11/16	11/17
Student 1								
Student 2								
Student 3								
Student 4								
Student 5								
Student 6								
Student 7								
Student 8								
Student 9								
Student 10								
Student 11								
Student 12								
Student 13								
Student 14								
Student 15								

	11/28	11/29	11/30	12/1	12/5	12/6	12/7	12/8
Student 1								
Student 2								
Student 3								
Student 4								
Student 5								

Student 6								
Student 7								
Student 8								
Student 9								
Student 10								
Student 11								
Student 12								
Student 13								
Student 14								
Student 15								

Appendix F: Complete List of Physically Active Lessons

Four corners	Four answers will be posted at different corners of the classroom. Students will be given a question to answer, and then they must move to the corner with the correct answer (Tallman, 2017; O'Connor, 2022).
Beach ball toss	This is an activity that can be applied to various lessons. Students stand in a circle and toss a beach ball to one another. The person who catches the beach ball must give an answer to the question or say pass and pass the ball to the next person.
Cake walk	The cake walk game is played in a similar fashion to the carnival game of the same game. In this version, questions or topics are put on cards and placed on the floor. Students walk around the circle, stepping from card to card. When the music stops, the student must answer the question listed on the card. The game repeats as long as desired.
Physical movements corresponding to annotation	The teacher will assign physical movements to key words or other text structure descriptors. As the teacher and students are annotating a text as a large group, the students will perform whole-body movements that correspond to the actions taken during annotations.
Steal the bacon	This game is played in a similar fashion to the physical education game of the same name. Students are placed in teams, and each team is assigned a different location around the perimeter of the playing area. Each team member is assigned a letter. The teacher reads/displays a multiple-choice question. The student on each team whose letter corresponds to the correct answer must race to the center of the room to be the first to grab the item designated as "the bacon."
Running dictation	A student will read a definition for a reading vocabulary word. The student will remember the definition and walk or run to a different location where his partner will write down the dictated definition. Once the partner has finished writing, she will become the runner, and the game will continue (Bex, 2019).
Q & A Match-up	Students will be given cards. Some cards will have a vocabulary word and some cards will have a definition. The students will have to do some sort of movement around the classroom to find the student with the card that matches theirs (Tallman, 2017).
Sack race scavenger hunt	Students work in groups to collect one example of each type of figurative language. A student hops in a potato sack to find examples of figurative language scattered on slips of paper on the floor. Once the student has found an example, the student hops back to his group and switches with another group member (Gold, 2022).
Scavenger hunt	Students will be given a question to start. They will answer the question and then run to different locations to find the paper that

	has the correct answer for their question. The paper with the answer has the next question. They answer the question, and the game continues (O'Connor, 2022).
Minefield game	Cards are placed in a grid pattern on the floor. Students must follow a path on the cards, only stepping on correct answers (for example, words that are part of a related set). If a student steps on a card with an incorrect answer, the student must go back to the beginning.
Gallery Walk	Posters or cards are placed around the room. Students must move around the room from poster to poster to answer questions or complete activities as designated by each poster ("Gallery Walk for language classes," 2019).
Snowball fight	Problems or questions are written on sheets of paper. One problem or question is written on each sheet of paper. The sheets are then crumpled up into snowballs. Students are allowed to have a "snowball fight" until the timer beeps. When the timer beeps, the students grab a snowball, uncrumple the paper, and solve the problem or answer the question.