SUNY College Cortland Digital Commons @ Cortland

Master's Theses

5-2022

# The effects of incorporating kinesthetic learning on learning outcomes and on-task behavior

Katherine Sauro

Follow this and additional works at: https://digitalcommons.cortland.edu/theses

Part of the Educational Assessment, Evaluation, and Research Commons, Educational Methods Commons, Health and Physical Education Commons, and the Junior High, Intermediate, Middle School Education and Teaching Commons Movement in the Classroom

A Master's Project

In Partial Fulfillment of the Requirements for the Degree

Masters of Science in Teaching

State University of New York College at Cortland

Katherine Sauro

April 2022

Approved

Kimberly Rombach EDU 698 Course Instructor

Kim Wisczorsk CECE Department Chair

Date\_\_\_\_\_ May 2nd, 2022

## **Table of Contents**

Abstract	3
Literature Review	4
Movement and Brain Functions	5
Influence of Physical Activity on Engagement and On-Task Behavior	7
Physical Activity and Academic Achievement	8
Methods	9
Setting	9
Participants	11
Procedures	12
Materials	14
Timeline	15
Limitations	18
Analysis	19
Findings	21
Purposeful Movement Increases Academic Achievement	21
Students Spent More Time On Task When Provided With Purposeful Movement	24
Student Perceptions Were Positively Affected by Purposeful Movement	27
Discussion	30
Unanticipated findings	34
Conclusion	34
References	36
Appendices	37
Appendix A: On Task Behavior Chart	38
Appendix D: Weekly Survey	40
Appendix E: Student Perceptions Chart	41
Appendix F: Student Survey Samples	43
Appendix G: Ancient Rome Unit Assessment	45
Appendix H: Modified Unit Assessment	50

#### Abstract

This action research study used a mixed methods design to examine the effects of kinesthetic learning on student learning outcomes, and on task behavior in a sixth-grade social studies classroom. Data was collected during a three-week period. The treatment group was presented with kinesthetic lessons, purposeful movement, and brain breaks. The control group remained stationary during their lessons. Findings suggested an increase in both on-task behavior, and learning outcomes. In addition to examining learning outcomes and on task behavior, student's perceptions were also considered through the students' completion of weekly surveys. These surveys suggested that providing movement to students positively affected their perceptions of social studies class.

## The Effects of Incorporating Kinesthetic Learning on Learning Outcomes and On-Task Behavior

In recent years instruction has increased while physical activity for students has waned. There is extensive research suggesting that physical movement and the brain are directly linked. While it would seem the implications of such research would spill over into every classroom via increased physical activity and purposeful movement, this is not the case. In the past few decades, as technology has advanced, students have become more and more sedentary both at home and in the classroom. Since district policy and teacher practice are not aligning with the implication of this research, my goal is to determine how movement in the classroom affects academic achievement and student engagement.

## Literature Review

We are a society that understands the benefits of exercise on our bodies but does not seem as keen on considering whether what is good for the body, is good for the brain. According to a 2014 review in Comprehensive Physiology, a great many of today's diseases are linked to an inactive lifestyle (Booth, et al 2014). We are bombarded in the media by the need to stay fit, with diet and exercise at the forefront of a healthy lifestyle. While mainstream society understands the need for humans to keep moving, the idea somehow gets lost in many classrooms. The pressures of high stakes testing have, in many school districts, lead to the reduction of, or even elimination of recess all together, even though according to the CDC 42% of American students do not get the recommended 60 minutes of physical activity daily, and 20% of students are obese. According to the Educational Advisory Board website, average weekly recess time in schools across America has declined by 60 minutes a week and over 75% of districts have no policy that even requires recess (Buccella, 2019). With no set policy, administrators can eliminate recess to pressure teachers to squeeze in more learning time, and teachers who see fit, can use recess as a management tool, keeping students from recess as a tool to discipline. Physical activity, and in some cases, movement in general, is just not considered as an essential part of the school day even though it may be essential to active engagement, academic achievement, and social emotional health. Therefore, I aim to discover how movement in the classroom affects academic achievement and engagement.

In this literature review, I have portrayed findings from seven articles. Among those seven articles, I noticed three themes that kept coming up within my selected articles. The first theme being movement and brain functions. In this section I will describe the findings from research that links the brain functions to movement, and the ways in which the two are intertwined. My second theme discusses the influence of physical activity on active engagement and on task behavior. In this section I will explain the research conducted that suggests that physical activity influences the effects of on-task behavior and engagement, which will be examined through research found in two articles. My last theme will discuss the impact that physical activity has on academic achievement.

## **Movement and Brain Functions**

There was a common theme of the impact movement and physical activity have on the brain among the articles reviewed. Summerfield proposes that when we look at the interplay between the body and mind, it becomes clear that movement is essential to learning. She argues that every movement is a sensory-motor event, linked to an intimate understanding of our physical world, the world from which all learning derives. Summerfield dives into the actual science that links movement and brain functions. Two areas of the brain that are associated solely with the control of muscle movement, the basal ganglia, and the cerebellum, are also important in coordinating thought. These areas are connected to the frontal lobe area where planning the order and timing of future behavior occurs. Movement is an indispensable part of learning and thinking (Summerfield, 2010).

Furthermore, Trudeau delves into the science of the influence of physical activity on cognitive development. Trudeau says investigations have focused on both physiological and learning/developmental mechanisms. Physiological concerns have included changes in the cerebral circulation, levels of arousal, concentrations of neurotransmitters and neurotrophins, structural changes in the central nervous system, and resulting long-term hippocampal potentiation (LTP). Studies of learning and developmental mechanisms have examined the carryover of physical skills and understanding of spatial relationships into academic learning science that links physical activity to cognitive development (Trudeau, 2009). Not only does physical activity promote cognitive development and brain functions, but Trudeau adds that participation in physical activity also increases student's immediate arousal, this arousal happens through an increase of neural activity, thus arousal, is likely to increase students' attention and facilitate learning (Trudeau, 2009).

#### Influence of Physical Activity on Engagement and On-Task Behavior

Physical activity and its influence on active engagement, and on-task behavior was another common theme found within my research. Mahar and others describe a study conducted of fifteen classes, ranging kindergarten through fourth grade. All students within these fifteen classes participated in a physical activity program called energizers, energizers are short classroom-based physical activities, lasting around 10 minutes. This type of activity allows students to stand and move around during academic instruction, providing students with the opportunity to increase daily physical activity. Students from different classes began these activities at varied baseline periods from four to nine weeks. The results showed that students who began energizer activities after a four week baseline period proved to be more on-task than those who didn't start the energizer activities until after a nine week baseline period. While it was found that all students' on-task behavior increased, those who began energizer activities sooner, were more on-task than those who did not start the energizer activities until weeks later (Mahar, et al 2006).

Similarly, in a study conducted by Snyder and others, the purpose of this study was to evaluate the effectiveness of a teacher-developed purposeful movement teaching strategy on physical activity, on task behavior, and academic achievement. One class of students was immersed in physical activity during their lessons, while the other class of students was receiving general instruction. The findings from this study revealed that physical activity during mathematics did not deter learning, and retention and can increase steps, improve on-task behavior, and decrease off-task motor and passive behaviors. Further, this study found that though there was no direct relationship between academics and physical activity, the students engaged in physical activity were overall more on-task than those who were not engaged in physical activity (Snyder et al 2017). Therefore not only does physical activity not take away from instruction, or deter students learning, of equal importance, it provides several other benefits that aid student success.

Bartholomew and Jowers conducted a similar study, where twenty-two teachers used Texas I-CAN! active academic lessons, aimed at getting students moving while learning. Teachers implemented these lessons for four weeks, and their findings concluded that not only did all students increase their physical activity, but their active engagement, and time on-task also benefited from the physical activity lessons they participated in. This study suggests that participation in these types of lessons/activities result in significant increase in on-task behavior for subsequent, sedentary lessons (Bartholomew & Jowers 2011).

#### **Physical Activity and Academic Achievement**

In a 2012 study of 29 third grade students, Erwin and others evaluated the effectiveness of providing curricular physical activity as an academic intervention to improve both math and reading fluency. Researchers used curriculum based measures (CBMs) to assess students' fluency scores over a 20 week period, with one control and one treatment class. The treatment class received 20+ minutes per day of curricular physical activity that correlated to current classroom instruction in math and reading while the control group was provided content lessons via seat work, partner work at desks, and teacher-led instruction.

The students' CBM scores in the treatment group were significantly higher than those in the control group, indicating a positive correlation between curricular physical activity and students reading and math fluency. Further, because it is likely that CBMs are a strong measure of incremental growth over short periods of time, the research suggests that curricular physical activity serves as a valuable tool for students in need of intervention (Erwin, 2012)

In another study involving purposeful movement and its impact on students' achievement researchers Beaudoin and Johnston found similar results in an inner city high school algebra course. This study also provided a treatment group with physical activity that correlated to classroom instruction while providing the same instruction to a control group with the exclusion of the curricular physical activity. The treatment group had a mean gain of 84% while the control group's mean gain was 65.9% indicating that the treatment group showed a significant gain compared to the control group (Beaudoin & Johnston, 2010).

Research on the academic benefits of physical activity and purposeful movement have been happening for decades, with Piaget, Bruner, and Vygotsky all serving as proponents of movement in one form or another. Still, research remains inconclusive on whether there is a strong link between increased academic achievement and movement. However, given the definitive research on how physical activity positively affects brain function including cognition, and on how PA positively affects the body it would be reasonable to infer that intertwining purposeful movement and/or physical activity into the classroom would have positive impacts on a variety of aspects of learning. Including focus, active engagement, and social emotional health, all of which are vital to academic achievement.

#### Methods

#### Setting

9

The data used for this study was obtained from a school within a small town in Central New York with a population of just over 6,000. As per the latest United State Census Bureau, 22% of the population is made up of people under the age of 18 and 20% is made up of those over 65. The population is not racially diverse as 97% of the towns' inhabitants are white. The median income is approximately \$71,500, and 37% of those 25 or older possess a bachelor's degree or higher level of education. In the center of this rural town is the Village Green, a wide-open park-like space used for community gatherings. In the summer the area is host to festivals, a farmers' market and other warm weather leisure activities. In the winter the town creates an ice-skating rink in the Village Green. There are many historic places in this quaint little town. The main street is host to several small businesses, such as restaurants, a beauty salon and grocery store. Fishing and kayaking are popular pastimes.

The school district has a population of 1,783 students grades K-12, 52% of the students being male, and 48% of the students being female. The district is made up of three schools, a K-5 school, a 6-8 school, and a 9-12 school. The elementary and junior high schools are located on opposite sides of the same building while the high school sits on a separate campus, around the corner. The school is located in an area that is composed of middle to low-income families, which is illustrated by the statistic that 44% of the students are economically disadvantaged. 1,660 students, or 93% of the students in the district are white. Of the 7% of students who are minorities, 3 students, or less than 1% are American Indian or Alaska Native. 8 students, or less than 1% of students are black. 3% or 53 students in the district are multiracial. A wide variety of sports and activities are offered within the district and there is a healthy amount of parent involvement (NYSED, 2020).

The junior high school in which this study takes place is a medium sized Title I school with a population of 474 students grades 6 through 8. The junior high school follows with similar statistics as the district itself. The student body is composed of middle to low-income families, with just a 2% higher rate of economically disadvantaged students when compared with the entire district. The school lacks diversity, as 441 students, or 93% of the student body, is white. Of the 7% of the students who are minorities, 2 students, or less than 1%, are black. Less than 1% of the student body is Asian. 4% of the student body is Hispanic, and 2% of the student body is multiracial. 5 students, or 1% of the student body receives English Language Learner (ELL) services (NYSED, 2020).

#### **Participants**

The participants in this study were made up of two different classes, Class A and Class B chosen for their similarities. Participant demographics were based on gender and IEP designations. Behaviors were based on data for time on task collected for five days before the study began. Academics were based on a pretest including vocabulary and content material. Data collection tools below were utilized to identify behavior and academic similarities to determine which classes were included in the research.

There were four different blocks of students instructed daily within the classroom. Of the four Social Studies classes, the two most similar classes, based on demographics, on task behavior, and academics were chosen for the study. Class A being the control group, and Class B being the intervention group. Class A was made up of 17 students, 8 males and 9 females. There was one student with an IEP. Class B was made up of 16 students. 8 males and 8 females. There were three students with IEPs in this class.

## Procedures

Research was conducted around the evidence-based practice of integrating purposeful movement into instruction. Data was gathered using mixed methods; qualitative data was gathered around student perception and quantitative data was gathered for on task-behavior. This study closely aligns with a study conducted by Snyder, et.al in 2017 titled *Purposeful* Movement: The Integration of Physical Activity into a Mathematics Unit. While there was a 3 year age difference between the students in this research, who were in 6<sup>th</sup> grade, and the Snyder, et.al 2017 study whose participants were in 3<sup>rd</sup> grade, the other demographics are quite closely aligned. Similarly, that study took place in a medium sized, Title I school with same percentage of economically disadvantaged students (44%) and a predominantly white population that participated. As was the case in this research, the Snyder, et.al. study was conducted with two classrooms recruited to participate. One class was the control group and the other class was the treatment group. The treatment group had movement integrated into their mathematics instruction while the other group did not. The Snyder, et.al. studies' post-data collection revealed that the treatment group showed a significant effect for active engagement time when compared to the control group.

To determine time on-task, the recorder was given a student chart with squares representing 5 minute intervals. The role of recorder changed depending on which adult in the room was most available to record. One of three people recorded; the lead teacher, the student teacher, or the teaching assistant. To ensure that students were scored in the same way regardless of the person acting as recorder, all recorders were trained by the student teacher before recording data. After training, recorders calibrated by recording the same group of students during the same time period and comparing results.

At the beginning of each class the recorder scanned the room, starting with student one and following in order, putting a tally mark in the boxes if each student was on task. The recorder repeated this observation every five minutes until the class periods ended. After class, tallies were totaled to determine the number of students on-task and for how long during the period. This procedure took place in the week prior to integration of movement into instruction and continued for two weeks during the integration of movement.

Students were given a pre-assessment on the vocabulary and content of the unit to be taught at the time of the research study. The pre-assessment was used to provide baseline data. The post-assessment, which was exactly the same as the pre-assessment, was used to determine the effectiveness of the intervention, incorporating both curricular physical activity and active brain breaks into the class structure, on academic achievement.

To determine students' perceptions of their own learning and engagement, students were also given a Likert scale survey on Friday of each week asking how they felt about the Social Studies lessons and class in general, including an option to add additional comments. This data was tallied weekly to determine initial baseline data and compare it to the two intervention weeks.

In the two weeks during which movement was integrated into the instruction, two types of physical activities were incorporated into daily lessons. Purposeful movement that connected directly to the vocabulary and/or content, was incorporated when applicable. In instances such as vocabulary introduction, students were taught gestures to associate meaning with a vocabulary word. When studying a span of time in history, a human timeline was created. When studying the

social classes and political systems students participated in simulation and role-play. When lessons did not lend themselves to movement, active brain breaks were incorporated to get students moving, and to increase blood and oxygen flow to the brain. Brain breaks included activities involving quick calisthenics, and scavenger hunts to provide movement in between gathering content information.

#### Materials

To measure students' time on task, an Interval chart was created, see appendix A and B. This chart included one column for student names, followed by 7 columns of blank squares. The squares represented five minute intervals of time. The chart provided the recorder the ability to mark a check, or an "x" in each student's corresponding row every five minutes, dependent on the recorder's observation that the student was, or was not, on task at that time. For example, Student 1 received a check mark if he was on task at 11:15 when class began. If Student 1 was not on task, he received an "x". This same procedure followed for each student in the class, and each student received a mark every five minutes of the class period. Interval charts were made for both the control and intervention group (Appendix A and B).

Academic achievement was assessed using a pre and post test. These tests were exactly the same and included fill in the blank from a word bank, multiple choice, event sequence, and short answer written response questions that were based on the objectives of the Social Studies unit. Tests had a possible total point value of 25 which was converted to a percentage score from 0-100%. See appendix G.

A modified version of this pre and post test was given to two students who required a simplified version based on their IEPs. The modified version contained all the same questions

but in a different presentation. There were fewer word choices broken into two separate word banks, less answer options for multiple choice, true false questions that replaced some multiple choice questions, event sequence, and multiple choice questions that replaced all but two of the written response questions. The modified test had the same possible total point value of 25 which was converted to a percentage score from 0-100%. See appendix H.

Students were given weekly surveys to assess their feelings about social studies. The survey included a likert scale, asking students to choose which image and word most closely related to how they felt about social studies class that week, see appendix D. The scale included five choices ranging from the lowest score for "Awful" and the highest score for "Fantastic." This survey also included an optional section to leave a comment. In an effort to obtain the most honest and accurate information possible students remained completely anonymous, other than their class period as that information was necessary to identify whether the survey was from a student in the control group or the intervention group.

## Timeline

Phases	Description	Dates
Phase One	Students previous unit assessments were compared to identify the two most homogeneous classes based on academic achievement	January 2022
Phase Two	Data was collected via interval chart for one week to confirm that groups were	February 2022

	similar in on-task behavior time. Data was collected via student survey to get a baseline of student perceptions. Data was collected via a pre-assessment to confirm that the control group and the intervention class were indeed the most homogenous academically.	
Phase Three	Intervention was implemented for two weeks. Purposeful movement that connected directly to the vocabulary and/or content, was incorporated when applicable. When lessons did not lend themselves to movement, active brain breaks were incorporated to get students moving, and to increase blood and oxygen flow to the brain. The control group was provided no purposeful movement activities or brain breaks within their lessons	March 2022
Phase Four	Post data was inputted into graphs and analyzed using a double line graph, pie chart, and mean, median, mode chart to display the changes during, and after the study.	March 2022

The research took place over 3 weeks. Participants of the two groups were initially chosen based on similar academic achievement throughout the year based on previous unit test scores. The data collected the first week was used to confirm that the groups were also similar in on-task behavior and to get a baseline of student perceptions. The researcher was prepared to

modify groups if the outcome of week one data collection showed significant differences in on-task behavior between the two groups. Week one data collection ensured that there was a baseline from which to measure growth for both on-task behavior and student perceptions before the intervention began.

Each day the recorder circulated the room, or hallway depending on where the lesson was taking place, marking a check mark to identify if a student was on task, and an "x" for those who were off task. This was done in both class periods, and each student was given a check, or "x" every five minutes. For example, in a 38 minute classroom period, each student would receive either a check mark, or an "x" every five minutes, resulting in seven on-task behavior marks each class period. The amount of time on task was calculated each day, for each student. Time on task behavior was also calculated as an average for each class each day. At the end of the week. Both student and class data were again averaged for all five days. The week one data proved that the participants of the two groups had similar percentages of on-task behavior. This data gave ample credence to similarities between the two groups of students' on task behavior and ensured that the groups were as homogenous as possible given our setting. The remaining two weeks included documentation of on-task behavior in the exact same way as discussed for week one. On-task behavior was then measured and averaged for each student and each group from week one to week three to examine if results showed differences in on-task behavior between the control group and the intervention group.

In each of the three weeks students were given a Student Perception survey on Friday to assess their feelings about social studies for the week. The results of the Likert scale question were tallied for each class, control and intervention, at three different intervals, once at the end of week one, once at the end of week two, and once at the end of week three. Data was evaluated by adding up the number of times each response option was chosen by a respondent and then dividing each response option's total by the total number of respondents in each group to get a percentage of the total respondents who chose each option in each group. After all response options were tallied and converted to percentages the data was used to create pie graphs. Three pie graphs were created for the control group, and three for the intervention group. This represented one pie graph for each group for each week of data collection, see appendix E.

Academic achievement data collection began on Monday of week two. A pre-assessment was given on a social studies topic in which the likely outcome was that both groups had limited knowledge. Student achievement data was collected for each student and a class average was calculated for both groups. At the end of the two weeks, after seven lessons and two review days, the exact same unit assessment was given as a post test. Student achievement data was again collected for each student and a class average was calculated for both groups. Growth was then measured from pre to post assessment for each student and each class to examine if results showed differences between the control group and the intervention group.

#### Limitations

Limitations of this research exist due to the participant pool, the researcher, length of research, and the academic achievement measure used. Students were chosen from one rural elementary school for a three week time period. The pre and post achievement measure was a social studies unit on Ancient Rome. It would have been ideal to have a year-long study in which to measure growth on a standardized achievement test from a beginning of the year benchmark, to an end of the year benchmark. Increasing the participant pool to include students from several different sized schools including rural, suburban and urban, as well a larger range of

socio-economic status, would also have provided more validity to the research. However, this would have created an overwhelmingly lengthy task for one graduate student who was confined to a social studies class. Thus the sample size remained small, the length of time remained short and the achievement was based on one learning content. Perhaps with more time and experience I will be able to undertake similar research on a larger scale to gain insight into purposeful movement and its place in education.

#### Analysis

#### On Task Behavior:

Daily on task behavior data was compiled from each group's Interval chart. To determine the relationship between on task behavior and physical activity over time, the data was entered quantitatively into double line graphs in which the data for both the control and intervention groups were plotted on the same set of axes. This allowed for effective comparison of the two classes over the same period of time. One graph was created to represent baseline data in which both the control and intervention group received the same instruction, exclusive of any brain breaks, kinesthetics, or intentional movement. The other graph represented the two groups for the two weeks during intervention. Each point on the y-axis represented one day. Each point on the x-axis represented the percentage of students on task for 90% or of the class period. On task behavior was analyzed by comparing the percentage of students on task daily throughout the three weeks of baseline and intervention data collection.

## Academic Achievement:

Pre-test responses and scores were analyzed to determine which two classes had the most similar skills and knowledge base, and thus be the classes participating in the study. Assessments were

scored based on 25 possible total points. Scores were converted to percentages based on a 0% to 100% scale. Post-test responses and scores converted in the same way. These responses and scores were analyzed to draw conclusions about the effectiveness of incorporating physical activity on academic achievement. The students' test scores, both pre and post were used to find the mean, median, and mode for both the control and intervention group. This data was then entered into a chart comparing each group's mean, median, and mode scores.

#### Student Perceptions:

The results of the Likert scale student perceptions question were tallied for each class, control and intervention, at three different intervals, once at the end of week one, once at the end of week two, and once at the end of week three. Data was evaluated quantitatively by adding up the number of times each response option was chosen by a respondent and then dividing each response option's total by the total number of respondents in each group to get a percentage of the total respondents who chose each option in each group. The response options were assigned as follows: Awful, Not Very Good, Okay, Really Good, Fantastic. After all response options were tallied and converted to percentages the data was used to create pie graphs. Three pie graphs were created for the control group, and three for the intervention group. This represented one pie graph for each group for each week of data collection

#### **Findings**

#### **Purposeful Movement Increases Academic Achievement**

The two blocks, or class periods, selected have been documented in the chart. One class being the control, and one the intervention. The class averages on the pre-assessment for the two groups only differed by 0.3%, making them quite comparable. Students in both the control, and intervention group were given the same test at the end of the 2 week intervention data collection period. There was a notable increase in mean for both groups from pre to post assessment, but findings show that the intervention group had a slightly higher mean increase than did the control with a 3.6 higher point increase. The intervention group also showed a slightly greater increase, and percent of change, in median scores with 4. higher point increase than the control group. Concerning mode scores, the intervention group showed a significantly higher change in scores and a significantly higher mode than did the control group. While the control group mode was 80, with a +68 change, the intervention group garnered a 100 mode which proved to be a +88  $\pm$ and +84 increase in mode from the pre-assessment. Therefore not only were the average, or mean scores, slightly higher in the intervention group, there were also more students from the intervention group that scored higher on the post test than students in the control group, as documented in the chart below. Students had no prior knowledge when they took the pre test, therefore data shows that the intervention group had a higher rate of growth than on the post test than students in the control group.

Baseli	ne Score	Post Intervention Score	Growth	
Control Group (Mean)	18.1	83.5	+65.4	
Intervention Group (Mean)	17.8	86.8	+69.0	
Control Group (Median)	16	80	+ 64	
Intervention Group (Median)	18	86	+ 68	
Control Group (Mode)	12	80	+68	

# Student test samples:

	Plebeian Triumvirate	Patrician Consul	Pax Romana Republic Latifundia Tribune
1 tr	ibune F	lected officials who	represented the plebeians and military
2. 00	tricians M	embers of the wealt	hier aristocratic class of Rome / The
ruling	class of ancient R	ome	
3	onsul	Government led by e	lected representatives of the people.
4. 7	ium siroute	political group of th	ree people who share equal power
5. 10	utifundia L	arge farming estates	g
3. PI	ebian c	ommoners in Ancier	nt Rome who made up the majority of
Roman	n Citizens		
, DC	romanaT	he 200 year era of p	eace that came about under imperial
rule			
( en	phic c	ne of two elected k	ings of ancient Rome, who commanded
the mili	itany and directed	the government. Ha	ad limited power: one-year terms and
ule min	wore over each o	ther	
veto po	wers over each o	hy Roma tought t	

		me Unit Ass	essment	10
1	brobulary funda to	om the bank b	elow next to the co	orresponding
	ennition. (1pt each = opts)		Roma	Basublia N
	Plebeian Plebeian Plebeian C	atrician onsul	-Latifundia	Tribune
1	Tribune 10 Elected	officials who repr	esented the plebe	ians and military
2.	latricans Members	of the wealthier	aristocratic class	of Rome / The
	ruling class of ancient Rome			and stabelana
3.	Republic Governm	nent led by elec	ted representative	s of the people.
4.	Tribber Frate A politic	al group of three	e people who sha	re equal power
5.	Latifundia Large fa	rming estates		
6	plebeian Common	ners in Ancient I	Rome who made	up the majority of
	Roman Citizens			
15	Pax Ramana The 200	vear era of pea	ace that came ab	out under imperia
1.		to all in		
	rule	Le stad bin	an of ancient Bo	me who commar
8.	<u>Consul</u> One of	two elected kin	gs of ancient ro	no, mar torms ar
	the military and directed the go	overnment. Had	l limited power: o	one-year terms a
	veto powers over each other			
	should two receases why B			

## Students Spent More Time On Task When Provided With Purposeful Movement

The data suggests that students in the control group overall, spent more time off task than the students receiving intervention. Both the control and intervention groups' baseline data suggests that the groups spent a similar amount of time on task each period before intervention, as shown in the line graph below. During the two weeks when intervention was implemented, data suggests that the control group remained relatively constant in comparison to the baseline data. However, data for the intervention group implies that more students were on task for the entire observation interval than they were during baseline data collection. Further, more students in the intervention group were on task for a longer amount of time during the observation interval when compared to the control group. The number of students in the intervention group who were on task at every observation interval ranged from a 4 to 35 percentage point increase each day as compared to the control group. After the two week study, an overall average of 18% more students were on task for every observation interval as compared to the control group. This data suggests that when students were provided with movement in their lessons, they spent more time on task than those not receiving intervention.



STUDENTS ON TASK AT EVERY INTERVAL

Student Data Samples:





## **Student Perceptions Were Positively Affected by Purposeful Movement**

Baseline data suggested that the two groups were similar in their feelings about social studies. Once intervention began, the class receiving the intervention had more positive feelings about social studies class after the first week of intervention, with 81.3% of the class feeling really good or fantastic, compared to the control groups 58.8% feeling really good or fantastic. After the second week of intervention, the gap increased further. As shown in the chart, and student samples below, both groups stayed relatively constant, with a slight downward trend in the control group and upward trend in the intervention group. By the end of the intervention 82.3% of the intervention group reported feeling really good or fantastic while the control group

reported only 50.1% feeling really good or fantastic. These findings suggest that student perceptions are generally more positive when movement is directly built into students' lessons.





## Student Data Samples



Survey: Period 6 Please answer the three questions below
* Required
Which word/image best describes how you felt about social studies class this week?*
Awful
O Not very good
Okay
Really good
○ Fantastic
Do you have any comments or concerns? *
we got to move around

## Discussion

When purposeful movement, brain breaks, and kinesthetic activities are introduced to the classroom and incorporated into student learning, students are more on task for more of the instructional period. During baseline data collection, both the control and intervention groups

proved to be quite similar in the amount of time they exhibited on task behavior. Throughout the two week intervention period, data suggests that the intervention group spent remarkably more time on task during instruction than they had during baseline data collection, as well as more time on task than the control group. The control group remained relatively constant in comparison to baseline data. This is a reasonable outcome considering Mahar's 2006 study, where students were provided with short 10 minute physical activity based energizers throughout the day. One group of students began these energizer activities much sooner than the other group, yet still, all students showed an improvement in on task behavior. Students who participated in the energizers for a longer time period, showed an even greater increase in on task behavior than the class who had begun the intervention at a later date. That study closely matches this intervention in that when lessons did not permit natural movement, students in this current study participated in brain breaks and energizers such as Mahar's study implemented (Mahar, 2006). Further, Snyder's 2017 study evaluated the effectiveness of a teacher-developed purposeful movement teaching strategy on physical activity, on task behavior, and academic achievement. One class of students was immersed in physical activity during their lessons, while the other class of students was receiving general instruction. The findings from Snyder's study were not unlike that of the current study. Snyder's study revealed that physical activity during mathematics did not deter from learning and retention, and improved on-task behavior. Further, while this study found that though there was no direct relationship between academics and physical activity, the students engaged in physical activity were overall more on-task than those who were not engaged in physical activity. In addition to brain breaks, students in this current small scale intervention study were provided with purposeful movement strategies, as were implemented in Snyder's study. Also similar to Snyder's study, this small scale intervention

study included one group receiving intervention, and one group receiving general education. This study mimicked results of Snyder's study, as students provided with movement were far more on task than students receiving lessons with no movement. (Snyder et al 2017).

Findings suggest that purposeful movement and kinesthetics in the classroom plays a significant role in student perceptions of their learning within a social studies classroom. Baseline data collection indicates that both the control and intervention group were very similar in their perceptions of social studies class. After the two week data collection period, students in the intervention group had more positive perceptions than baseline data, as well as more positive perceptions than the control group. These findings seem logical considering Trudeau's research showing that physical activity promotes cognitive development and brain functions. Trudeau says that participation in physical activity increases students immediate arousal, that arousal occurring when an increase of neural activity in the reticular formation of the brain. He argues that a moderate increase of physical activity, thus arousal, is likely to increase students' attention and facilitate learning (Trudeau, 2009). This increase in attention and arousal relates to how students feel about class. It seems plausible that if a student is not aroused, or their attention is faint, that their feelings, or perceptions of class will be lower. A student who is provided with movement, and therefore is being aroused, is likely to have a more positive perception about class.

This increase and activation of neural activity and the immediate arousal that movement causes students is likely to increase the way they feel about class. If students' brains are not being activated and they are not being aroused, it is logical to assume that those students would have less positive perceptions of class than students who are being aroused.

Findings suggested that when purposeful movement was implemented, academic achievement/test scores improved slightly. Baseline data collection suggested that the control and treatment groups were similar in academic achievement, with test scores differing by only 0.3%. While the control group and the intervention group both scored substantially higher on the post test, the intervention group had a 3.6 point higher mean increase. While the 3.6 point increase for the intervention group is not a major increase, it is notable that the intervention group scored higher overall on the test than the control group. It is reasonable to assume that the intervention was the cause for this score increase, with compelling research from Beaudoin and Johnston's study on purposeful movement and its impact on students' achievement to support these findings. Beaudoin and Johnston's study was conducted in an inner city high school algebra course. While this current study was not in the same content area as Beaudoin and Johnston's study, it was, similarly to Beaudoin and Johnston's, conducted in one single content area. Beaudoin and Johnston's study, like this one, had a control and treatment (intervention) group in which the treatment group was provided with physical activity that correlated to classroom instruction. The control group in Beaudoin and Johnston's study received the same instruction as the intervention group with the exclusion of the curricular physical activity. At the end of this study, the treatment group had a mean gain of 84% while the control group's mean gain was 65.9% indicating that the treatment group showed a significant gain compared to the control group. While the difference found in this current study was not as large of a mean increase as Beaudoin and Johnston's study, it was nonetheless an increase, suggesting that purposeful movement, and movement in general, was beneficial for students as far as academic achievement is concerned. This conclusion can be further inferred by comparing this current small scale study to Erwin's study on the effectiveness of providing curricular physical activity as an academic

intervention to improve both math and reading fluency. Erwin's study consisted of a control and treatment group with the treatment group receiving curricular physical activity that correlated to current math/reading instruction while the control group received lessons at their seats through teacher-led instruction. Researchers collected data using curriculum based measures (CBMs) to assess students' fluency over a 20 week period. While the current study was much shorter, the two demonstrated similar outcomes. Erwin found that the students' CBM scores in the treatment group were notably higher than those in the control group, indicating a positive correlation between curricular physical activity and students' math/reading fluency. While the current studies' intervention versus control group scores were not as drastic, it too had intervention group scores that were undeniably higher than the control group scores, suggesting a positive correlation between movement interventions and academic achievement.

It is important to note that regardless of the results of this study, there is no way to prove conclusively that movement in the classroom affects, or does not affect, academic achievement and student engagement. With factors such as socio-economic status, home life, learner ability, and a host of other influences that affect student achievement and student engagement, results could certainly be attributed to other factors as well. Still, the data collected through student perception surveys, pre and post academic achievement assessments, and on-task observation charts provided meaningful and adequate information and insight into students' attitudes towards learning and overall achievement both with and without intervention.

## **Unanticipated findings**

There was one unanticipated finding. Two students in the intervention group who had averages of 48 and 65 average respectively, did very well on their post assessments, with one scoring in the 80's range and the other scoring a perfect 100%. This implies that while purposeful movement does not always correlate with large increases in academic achievement, it could make a significant difference for some, typically low achieving, students.

## Conclusion

Overall, the findings support the use of purposeful movement and kinesthetics within the classroom. Considering this was only a small scale study, it would be ideal to examine the control and treatment group for a longer period of time, to inquire how movement affects students academic achievement, on task behavior, and perceptions long term. While the conclusions drawn from this small scale study cannot be looked at as definite, it can be inferred that providing movement to students is in no way detrimental to their learning, and quite possibly will increase students' perceptions about the lessons they are learning. Looking at the findings from this study, compared with other large scale studies, suggests that movement in the classroom positively affects students academic achievement. Further, this study suggests that students being provided with movement spend notably more time on task than those who are stationary. As mentioned previously, in the past few decades, as technology has advanced, students have become more and more sedentary both at home and in the classroom. With this in mind, and knowing that movement does not negatively affect students, it seems both logical and beneficial to involve movement into students' learning.

## References

- Bartholomew, J, Jowers, E. (2011). *Physically active academic lessons in Elementary Children*. Preventive medicine. Retrieved January 31, 2022, from https://pubmed.ncbi.nlm.nih.gov/21281672/
- Beaudoin, C. R., & Johnston, P. (2010, November 30). The impact of purposeful movement in algebra instruction. Education. Retrieved January 31, 2022, from <u>https://eric.ed.gov/?id=EJ1193628</u>
- Buccella, A. (2020, January 24). *Time to play: Increasing daily recess in elementary schools*. EAB. Retrieved January 31, 2022, from <a href="https://eab.com/insights/expert-insight/district-leadership/time-to-play-increasing-daily-recess-in-elementary-schools/">https://eab.com/insights/expert-insight/district-leadership/time-to-play-increasing-daily-recess-in-elementary-schools/</a>
- Erwin, H. (2012). Student academic performance outcomes of a classroom physical activity intervention: A pilot study. ERIC. Retrieved January 31, 2022 from https://eric.ed.gov/?id=EJ1068595
- Mahar, M.T. Murphy, S.K, Rowe, D.A, Golden, J, Shields, AT, Raedeke, TD. (2006). Effects of a classroom-based program on physical activity and on-task behavior.

Medicine and science in sports and exercise. Retrieved January 31, 2022, from https://pubmed.ncbi.nlm.nih.gov/17146314/

- MJ;, B. F. W. R. C. K. L. (2014). Lack of exercise is a major cause of chronic diseases. Comprehensive Physiology. Retrieved January 31, 2022, from <u>https://pubmed.ncbi.nlm.nih.gov/23798298/</u>
- NYSED. (2020). *Homer CSD at a glance 2019-2020*. NYSED.com. Retrieved March 15, 2022, from

https://data.nysed.gov/profile.php?instid=800000053600

NYSED. (2020). *Homer junior high school at a glance 2019-2020*. NYSED.com. Retrieved March 15, 2022, from

https://data.nysed.gov/profile.php?instid=800000053610

- Trudeau, F. (2009). Relationships of physical activity to brain health and the academic performance of schoolchildren. Retrieved January 31, 2022, from <a href="https://www.researchgate.net/publication/228351606\_Relationships\_of\_Physical\_Act-ivity\_to\_Brain\_Health\_and\_the\_Academic\_Performance\_of\_Schoolchildren">https://www.researchgate.net/publication/228351606\_Relationships\_of\_Physical\_Act-ivity\_to\_Brain\_Health\_and\_the\_Academic\_Performance\_of\_Schoolchildren</a>
- Snyder, K., Dinkel, D., Schaffer, C., Hiveley, S., & Colpitts, A. (2017). <u>Www.ijres.net</u> purposeful movement: The integration of ... - ed. Retrieved January 31, 2022, from <u>https://files.eric.ed.gov/fulltext/EJ1126688.pdf</u>
- Summerfield, J.J., Hassabis, D. and Maguire, E.A. (2010) Differential Engagement of brain regions within a "core" network during scene construction. Neuropsychologia, 48, 1501-1509. references scientific research publishing. (2010). Retrieved January 31, 2022, from

https://www.scirp.org/reference/referencespapers.aspx?referenceid=2790467

# Appendices

# Appendix A: On Task Behavior Chart

			On	ı Task Be	havior Ch	art		
				Period 5	(Control)			
				√ = C	n Task			
L.	7			X = 0	ff Task			
<b>₩</b>	<u>•</u>	5 min (10:40)	10 min (10:45)	15 min (10:50)	20 min (10:55)	25 min (11:00)	30 min (11:05)	35 min (11:10)
	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							
	Student 16							
	Student 17							

Appendix B: On Task Behavior Chart

#### **On Task Behavior Chart**

## Period 6 (Control)

✓ = On Task X = Off Task

	5 min	10 min	15 min	20 min	25 min	30 min	35 min
	(10:40)	(10:45)	<mark>(10:50)</mark>	(10:55)	(11:00)	(11:05)	(11:10
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							
Student 16							

Appendix C: On Task Behavior Chart Samples





Appendix D: Weekly Survey





Appendix E: Student Perceptions Chart



Responses cannot be edited Survey: Period 5
* Required
Which word/image best describes how you felt about social studies class this week? *
Awful       Not very good       Okay       Really good       Fantastic         Awful       Image: Awful       Image
Do you have any comments or concerns? *
It was boring

Appendix F: Student Survey Samples

Survey: Period 6
Please answer the three questions below
* Required
Which word/image best describes how you felt about social studies class this week? $\star$
Awful Not very good Okay Really good Fantastic
Awful
O Not very good
Okay
Really good
O Fantastic
Do you have any comments or concerns? *

Appendix G: Ancient Rome Unit Assessment

Na	me: Class Period:
Vo De	Ancient Rome Unit Assessment cabulary: Write the correct word from the bank below next to the corresponding finition. (1pt each = 8pts)
	Plebeian Patrician Pax Romana Republic Triumvirate Consul Latifundia Tribune
1.	Elected officials who represented the plebeians and military
2.	Members of the wealthier aristocratic class of Rome / The
	ruling class of ancient Rome
З.	Government led by elected representatives of the people.
4.	A political group of three people who share equal power
5.	Large farming estates
6.	Commoners in Ancient Rome who made up the majority of
	Roman Citizens
7.	The 200 year era of peace that came about under imperial
	rule
8.	One of two elected kings of ancient Rome, who commanded
	the military and directed the government. Had limited power: one-year terms and
	veto powers over each other

#### Geography:

 Write the letter that corresponds to the correct location on the map (½ pt each = 2pts)



Rome
The Adriatic Sea
The Alps (Mountains)
Italy

## Short Answer:

 Give two examples of the political differences between the patricians and plebeians in the Roman Republic. (2pts)

1	1.	

2.\_\_\_\_\_

 Explain one way that Rome became a great power during the time of the republic (1pt)

12. Provide two reasons why Rome fought the Punic Wars. (2pts)

1	-

2.\_\_\_\_\_

13. What are the Twelve Tables, and why were the Twelve Tables created? (2pts)

 Name two problems that caused government instability in the Roman Republic (2pts)

<i>3</i>			
1			

2.	

## Multiple Choice:

15. What were the rights and responsibilities of Roman citizens (1pt)

- a. Serve in the Roman Army
- b. Vote
- c. Pay taxes
- d. All of the above

 A form of government in which the leader is put in to office by certain citizens with the right to vote, is called a: (1pt)

- a. Empire
- b. Monarch
- c. Aristocrat
- d. Republic

#### Fall of the Republic:

 Name two problems that caused government instability in the Roman Republic (1pt each = 2pts)

1.\_\_\_\_\_

2.\_\_\_\_\_

#### From Republic to an Empire:

 Think about our timelines. Put the following events in order from 1 to 4 as Rome transitioned from Republic to Empire (1/2pt each = 2pts)

\_\_\_\_\_ Augustus Caesar takes control, establishes an Empire and stabilizes the government.

\_\_\_\_\_ Julius Caesar returns to Rome with his Army and Civil war breaks out.

\_\_\_\_\_ Rome breaks into chaos for 50 years as a series as different leaders try to take control of the republic.

\_\_\_\_\_ Julius Caesar takes control of the Republic and the senate has him killed.

# You're all done! Yay! Write me a note or draw me a picture if you finish early!!

Name:	Class Period:				
	Ancient Rome Unit Assessment (Modified Version)				
Vocabulary: Write the correct word from the bank below next to the corresponding definition. (1pt each = 4pts)					
	Triumvirate	Tribun	Patrician	Republic	
1	Elec	ted officials who rep	resented the plebeians a	and military	
2	Men	bers of the wealthie	er aristocratic class of Ro	me / The ruling class of ancient Rome	
3	Gov	vernment led by elec	ted representatives of th	e people.	
4	A p	olitical group of three	e people who share equa	al power	
Vocabula	ary: Write the corre	ect word from the ba	nk below next to the corr	responding definition. (1pt each = 4pts)	
	Plebeians	Latifundia	Pax Romana	Consul	
5	Lar	ge farming estates			
	0	mmoners in Ancient	Rome who made up the	majority of Roman Citizens	
6	Cor				
6 7	Con	200 year era of pea	ace that came about und	er imperial rule	
6 7 8		200 year era of pea	ace that came about und gs of ancient Rome, who	er imperial rule commanded the military and directed the government.	

# Appendix H: Modified Unit Assessment

#### Geography:

9. Write the letter that corresponds to the correct location on the map (½ pt each = 2pts)



Rome
The Adriatic Sea
The Alps (Mountains)
Italy

#### Multiple Choice: (1 pt. each = 4pts)

10. What were the rights and responsibilities of Roman citizens

- a. Serve in the Roman Army
- b. Vote
- c. Pay taxes
- d. All of the above

11. A form of government in which the leader is put in to office by certain citizens with the right to vote, is called a/n:

- a. Empire
- b. Monarch
- c. Republic

12. What is one way Rome became a great power during the time of the Republic

- a. Augustus Caesar became Emperor
- b. Military expansion drove economic development
- c. Rome befriended the people of Carthage

13. The ancient set of laws inscribed on tablets that defined the laws that applies to Roman citizens

- a. Hammurabi's Code
- b. The Constitution
- c. The Twelve Tables

#### True or False: (1pt. each = 5 pts)

14. Patricians and Plebians had the same political power

- a. True
- b. False
- 15. Julius Caesar named himself "Dictator for Life"
  - a. True
  - b. False
- 16. Julius Caesar was assassinated by the Senate
  - a. True
  - b. False

17. Pax Romana refers to a time period of darkness, and fear.

a. True b. False

18. Rome transitioned from a Republic to an Empire.

- a. True
- b. False

The Punic Wars. (1pt) Provide one reason why Rome fought the Punic Wars.

19.\_\_\_\_\_

#### Fall of the Republic: (1pt)

Name one problem that caused government instability in the Roman Republic

20.

#### From Republic to an Empire: (1pt each = 4pts)

21. Think about our timelines. Put the following events in order from 1 to 4 as Rome transitioned from Republic to Empire

\_\_\_\_\_ Augustus Caesar takes control, establishes an Empire and stabilizes the government.

Julius Caesar returns to Rome with his Army and Civil war breaks out.

\_\_\_\_ Rome breaks into chaos for 50 years as a series as different leaders try to take control of the republic.

Julius Caesar takes control of the Republic and the senate has him killed.

Appendix I: Student Test Samples

