

The Effects of Traditional Seating versus Flexible Seating on Academic Performance in a Selected

Kindergarten Classroom

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Abstract

The purpose of this study was to determine the effects of traditional seating versus flexible seating on academic performance in a selected kindergarten classroom. The sample consisted of students from a kindergarten classroom that contained both flexible and traditional seating options. The students were divided into two groups and were instructed to complete their work sitting in either flexible or traditional seating for one week at a time, then the groups were switched. Each participant experienced both types of seating. The participants were observed to determine their overall academic performance on a given task, whether they mastered the content with a score of 80%, and the time in which the assignment was completed. The data were analyzed using a paired t-test and a chi square “goodness of fit” test. The results revealed no significant difference in academic performance ($P = .561$) and no significant difference in time of completion ($P = .696$). The chi square revealed there was also no significant difference in student mastery ($P = .517$). The results indicate that flexible seating did not significantly increase or decrease the participants’ academic performance in this study.

Key words: Flexible seating, traditional seating, academic performance.

Milligan IRB

Date: December 5, 2018

From: The Institutional Review Board (IRB) at Milligan College

Re: The Effects of Flexible Seating versus Traditional Seating in a Selected Kindergarten Classroom

Submission type: Initial Submission

Dear Macy,

On behalf of the Milligan College Institutional Review Board (IRB), we are writing to inform you that your study *The Effects of Flexible Seating versus Traditional Seating in a Selected Kindergarten Classroom* has been approved as expedited. This approval also indicates that you have fulfilled the IRB requirements for Milligan College.

All research must be conducted in accordance with this approved submission, meaning that you will follow the research plan you have outlined here, use approved materials, and follow college policies.

Take special note of the following important aspects of your approval:

- Any changes made to your study require approval from the IRB Committee before they can be implemented as part of your study. Contact the IRB Committee at IRB@milligan.edu with your questions and/or proposed modifications.
- If there are any unanticipated problems or complaints from participants during your data collection, you must notify the Milligan College IRB Office within 24 hours of the data collection problem or complaint.

The Milligan College IRB Committee is pleased to congratulate you on the approval of your research proposal. Best wishes as you conduct your research! If you have any questions about your IRB Approval, please contact the IRB Office and copy your faculty advisor if appropriate on the communication.

Regards,
The IRB Committee

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Chapter 1

Introduction

Flexible seating is one of the latest trends in pre-kindergarten through twelfth grade classrooms. Flexible seating (known colloquially as “flex seating”) has no formal definition but involves abandoning traditional classroom arrangements such as desks in rows and columns. Flexible seating can include from lawn chairs and milk crates to specifically marketed flexible seating pieces such as wobble stools, floor desks, and medicine ball chairs. Flexible seating has become a lucrative industry in educational supplies and though there is no empirical data on exactly how many individual classrooms have full or partial flexible seating options, the ubiquity of online resources, do-it-yourself projects, and flexible seating options available for purchase speaks to the current popularity and enduring nature of the practice (Hanover Research, 2011).

Flexible seating markets itself as an enhancement to the classroom experience (Brooks, 2012). It is said to foster greater sense of self-regulation and personal responsibility because choice inherently accompanies flexible seating (Barrett, Zhang, and Barrett, 2015). Certain flexible seating options can be soothing for students with autism spectrum disorder or attention deficit hyperactivity disorder because they promote controlled movement and non-disruptive fidgeting (Umeda and Dietz, 2011). Proponents of flexible seating who have outfitted their own classrooms anecdotally report higher levels of student engagement and fewer instances of disruptive behaviors. Classroom design elements such as light, temperature, and seating options have a significant effect on the student’s classroom experience. Classrooms that offered alternative seating and the choice to use those options increased student motivation and significantly decreased disruptive behavior (Barrett, Zhang, and Barrett, 2015).

Problem Statement

Flexible seating has a clear and studied link to behavior management, but there is no evidence (thus far) that it improves academic performance. Do students exhibit stronger academic performance when seated in an alternative spot of their choice or made to sit in a traditional desk or at a table? The problem of this study is to examine the effect of flexible seating versus traditional seating on student academic performance.

Purpose of Study

The purpose of this study is to examine whether or not there is a difference in student academic performance when they are using flexible seating versus traditional seating.

Significance of Study

Though it claims success and empowerment on many fronts, flexible seating is not a practice thoroughly based in research for academic purposes yet. This is significant and somewhat alarming because individual teachers, schools, and districts are already implementing partial of full flexible seating spaces and classrooms (Delzer, 2016). If the practice proves to be widely ineffective, it could cost public schools thousands of dollars. Flexible seating could also impact students with special needs and how educators approach specific learning needs (Umeda and Dietz, 2011). In an educational sphere dominated by standards and academic objectives, schools have to meet benchmarks, and classroom environment can heavily influence student behavior and performance (Wadlow, 2015).

Limitations

The limitations for this study are as follows:

1. Time: the study will only take place for the amount of time the students are in kindergarten in a flexible seating classroom.

2. Size: the sample consists of twenty students in one classroom. Therefore, the results cannot be generalized to a larger population.

Operational Terms and Definitions

1. On-task behavior: This will be defined as keeping hands, feet, and all parts of body to self. Talk will be limited to discussion of assignment.

2. Mastery: This will be defined as 80% accuracy on the given assignment. The observation will take place during the students' center time. 80% accuracy will consist of 8 out of 10 sight words spelled correctly, 8 out of 10 letters written and sounded out correctly, and proficiency on the standard writing rubric (see "Appendices.")

3. Flexible seating: any seating option that differs from a desk or table.

4). Traditional seating: desks and tables typical of a K-12 classroom.

5). Academic performance: the ability to complete academic tasks with mastery and on-task behavior.

Overview

This study is composed of five chapters. The first chapter covers the statement of the problem, background on the study, significance of the study, and limitations. Chapter two is a review of relevant literature to the research topic. Chapter three contains the methodology and procedures for the study. Chapter four consists of analysis of the data. Chapter five examines recommendations for future research.

Chapter 2

Review of the Literature

“Flexible seating” (or “flex seating”) has become a popular phrase in education over the last several years. Classrooms across the country are switching from traditional desks and tables to medicine balls, floor cushions, beanbags, milk crates, and numerous other forms of non-traditional seating (Fernandes, 2011). The trend is driven by student choice and is rooted in constructivist theory (Duffy, 1992). Students, regardless of academic ability, are allowed to choose which seating options best suit their individual learning needs. Flexible seating is being implemented at all levels, from pre-kindergarten classrooms to twelfth grade classrooms. Flexible seating finds its root in abandoning the traditional “row and column” seating arrangements that have been a staple in classrooms for many years and trading them in for group-oriented arrangements (such as desk clusters or table groups) and even standing work stations (Hinckson, 2013). Many online blogs, Pinterest boards, and teachers in school systems across the country anecdotally claim that flexible seating has shifted their students’ behavior, academic achievement, and overall bettered their classroom environment. Individual teachers are spending thousands of dollars out of pocket each year to outfit their classrooms with more choice and more variety in seating and table types as the prevalence of flexible seating continues to grow.

Research on flexible seating is relatively emergent. Studies that serve as background knowledge examine the effects of classroom environment on student learning. Such research measures the effects of factors such as lighting, temperature, number of windows in a given classroom, and other environmental factors (Harvey, 2013). Other studies argue for the possible effects flexible seating can have on student behavior and overall classroom management (Bicard, 2012). A third area of interest is the effect of flexible seating as an occupational therapy tool or non-

disruptive method of fidgeting for students with disabilities, particularly medicine balls (Bagetell, 2010). The following review of the literature will examine the present research on how the physical classroom environment affects student learning, then narrow in focus to cover flexible seating, its effects on student behavior, on students with disabilities, and on student perception of flexible seating.

Physical Classroom Environment

Current research is grappling with how specific classroom design can affect student learning (Harvey, 2013). However, more broad studies have examined how environmental factors in the physical structure of the classroom can affect and predict student learning outcomes. In a study conducted by Hill and Epps (2010), two-hundred and thirty-seven undergraduate students were surveyed on their perceptions of two different classroom environments. One environment consisted of a traditional classroom with row and column seating arrangements, outdated and wobbly desks, and poor lighting (referred to in the literature as a “standard classroom.”) The other classroom featured tiered and group seating arrangements, new chairs, greater access to technology, and improved lighting (referred to in the literature as the “upgraded classroom.”) The results found that students tended to prefer and have better perceptions of the upgraded classroom and tended to rate course satisfaction higher when placed in an upgraded classroom. However, there was no significant difference in student satisfaction between the classroom in terms of projector visibility, ability to hear the professor, number of students in the classroom, or computer/technology access. The researchers recommend that university administrators pay careful attention to the factors that students deemed significant on their surveys (Hill, 2010).

Physical classroom design can not only have an impact on the student’s mental and cognitive functions but also their physical health. In a study by Chung and Wong (2007), schoolchildren in Hong Kong were reported to be suffering musculoskeletal problems at an alarming rate. The

researchers wanted to determine if the musculoskeletal issues were caused by lack of adequate seating in public schools. Out of 214 schoolchildren (ages 10-13 years old and mixed genders) who were observed, none of the students had chairs of “an appropriate seat height” for their BMI and musculoskeletal dimensions (Chung, 2007). The girls who were observed tended to have “lower BMIs and longer lower limbs,” which could contribute to greater musculoskeletal discomfort and long-term musculoskeletal deformities. The researcher found that the girls tended to be more distracted and exhibited more obvious signs of physical discomfort throughout the school day, even though the seat depths were deemed appropriate for all students. The researchers recommend that schools strongly consider student body dimensions when purchasing classroom furniture in the future (Chung, 2007).

Another study similarly examined the effects of student seating in groups versus traditional table and chair arrangements on student’s physical and intellectual health. Wingrat and Exner (2005) studied fourth graders as they were seated in the traditional arrangement and when they were seated in “smaller, appropriately sized desks and chairs” (henceforth referred to also as “treatment furniture”) and implemented a correlated group design to compare the seating arrangements in practice (Wingrat, 2005). The purpose of this study was to look at how school furniture design can impact student learning and how it can affect musculoskeletal growth and strain. The researchers also examined whether or not seating choice can impact on-task behavior and observed students with this in mind. The results found that students tended to be more on-task during independent seat work when utilizing the appropriately sized desk and chairs than when utilizing the traditional seating options. There was no significant difference in on-task behavior when the appropriately sized furniture was arranged in rows versus group clusters. Boys tended to have a lower rate of improvement in on-task behavior when using the treatment furniture than girls did, but both groups

sat for longer amounts of time during independent work and showed fewer signs of physical discomfort when using the treatment furniture (Wingrat, 2005).

Physical spaces that are designed around active learning also play a role in overall classroom designs and its effects on student learning. One study by Blake, Benden, and Wendel (2012) examined classrooms where students were given the choice between sitting and standing workstations. The purpose of the study was to see if students were less sedentary when using standing tables as schools continue to pour funds into programs that combat childhood obesity and examine whether or not this type of intervention disrupts day-to-day activities. In addition, the study looks specifically at classroom transition between workstations to see if standing impeded transition. The researchers dubbed classrooms with standing workstations “stand-biased classrooms” while classrooms without such workstations were the controls (Blake, 2012). Students were given the opportunity to work in both kinds of classrooms, and their productivity and behaviors in each were compared. The researchers found that students who worked in the “stand-biased classrooms” had significantly higher caloric expenditure rates than students who worked in the traditional classrooms. There was no reported disruption to transitions between activities or other day-to-day academics. This comparative study also showed potentially positive benefits to overall student behavior while using standing workstations for both group work and independent work. Students who worked at standing workstations tended to complete work more efficiently and tended to be more on-task for the duration of the assignment. Overall, this study demands further research into “stand-biased classrooms” as an intervention for childhood obesity, but also stressed the importance of its potential behavioral, academic, and classroom management effects (Blake, 2012).

The physical classroom environment can have a profound effect on student-teacher relationships (Fernandes, 2011). Fernandes, Huang, and Rinaldo (2011) examined how physical classroom environment can potentially change the dynamic between students and teachers. The

researchers qualitatively observed various classroom with different types of seating configurations and surveyed students and teachers on the effects of the environment. The researchers found the “semi-circle” or u-shaped arrangements can positively affect student-teacher relationships as well as student-student relationships (Fernandes, 2011). This format also lends itself to more accessible class discussion and participation among students and can foster more positive social interactions between classmates both inside the classroom and beyond (Fernandes, 2011).

The final piece in the literature related to physical classroom environment examines flexible seating as a “design feature” in a traditional classroom. Castelluci, Arezes, and Molenbroek (2016) examined the effects of flexible seating integrated into traditional classroom furniture by implementing a systematic review of existing studies. The students the researchers observed had the choice to sit in traditional chairs and desks or to utilize flexible seating options such as, “high furniture, sit-stand furniture, and tilt tables and seats” (Castelluci, 2016). The researchers also examined the dimensions of each seat in comparison to student’s body dimensions. The researchers found that flexible seating options tended to have a greater percentage of positive effects on student response to teacher instruction and independent seatwork. The students tended to be more on-task when using flexible seating, and teachers tended to use traditional seating as a deterrent for poor behavior. If students were not using flexible seating options appropriately, students would lose the privilege of flexible seating (Castelluci, 2016).

Student Behavior and Academic Performance

The majority of research on flexible seating in a classroom environment revolves around student routines and behaviors. One aspect of flexible seating includes student choice. Bicard, Ervin, and Blaylot-Casey (2012) measured the effects of seating choice on student behavior versus teacher-assigned seating. The researchers observed one fifth grade classroom at a parochial primary school in the southeastern United States and set the following criteria for measuring instance of disruptive

behavior: “talking without permission or touching another student” (Bicard, 2012). The researchers implemented an ABA reversal design wherein the students were permitted to choose their own seats for one week, the teacher would assign student seating the next week, and the students would be permitted to choose their own seats the third week of the cycle (Bicard, 2012). The results showed that when students were allowed to choose their own seats, their average rate of disruptive behavior was between 0.82 to 1.82 per minute ($M=1.31$ per minute, $SD=0.37$.) When the teacher chose individual student seating, instances of disruptive behavior were decreased by approximately one third or .33 to .67 per minute ($M= 0.44$ per minute, $SD=0.13$.) During the third phase, instances of disruptive behavior were similar to the first phase. Students tended to complete tasks in a less disruptive manner when seated according to teacher preference and had no choice in where they would sit for that week. Students also tended to be less disruptive when seated in individual seats as opposed to group arrangements or “clusters” (Bicard, 2012).

Bicard, Ervin, and Blayot-Casey’s research study yields results that might caution teachers against using flexible seating and fits into the canon of research on the subject of student’s choice in school seating arrangements. However, the results are limited in that the participants were derived from only one fifth grade classroom in one school. The results also did not examine the quality of the work for each phase or take academic performance into account. Overall, this study is critical of flexible seating’s component of student choice and emphasizes the role teacher can play in student seating and classroom management (Bicard, 2012).

Academic performance and flexible classroom design make up another piece of the puzzle, albeit the connection is less researched than flexible seating’s effects on student behavior. The largest study to date was conducted by the University of Salford in 2015. Barrett, Davies, Zhang, and Barrett examined classroom environments in 153 classrooms across 27 different primary schools in the United Kingdom. The researchers observed the physical structures and layouts of each

classroom and assessed them using the SIN model (the titular holistic criteria for the study), which consists of stimulations, individuality, and naturalness (SIN) of the given space. The study also evaluated other environment indicators such as light, temperature, air quality ownership, flexibility, complexity, and color. The study found that out of the 3766 of the pupils observed, specific aspects of school design had a 16% positive effect on academic performance with all ten environment indicators positively correlated with 1% and 5% with pupil progress (Barrett, 2015). Of those indicators, naturalness was the parameter most strongly correlated with student academic growth with 50% effectiveness. Stimulation and individuality followed with 25% effectiveness each. While results are the first of their kind in classroom design, the naturalness indicator seems to be the most beneficial to students in terms of overall academic performance and on-task behavior (Barrett, 2015). This study is pivotal for research into flexible seating because it has the largest scale to date for studies of its kind, and the SIN model possesses succinct validity and reliability measure that other researchers can easily replicate (Barrett, 2015).

Student academic performance hinges not only *what* kind of seat a student sits on, but *where* the student sits, and this fact can directly affect student performance. Perkins and Wieman (2005) studied how students at the undergraduate level self-select seating in either the front or back of the classroom. The researchers examined an undergraduate physics class for non-science or math majors and was comprised of 201 students (Perkins, 2005). The purpose of the study was to examine the differences (if any) between student performance engagement based on where they chose to seat. Students self-selected their seats at the beginning of the term and were then instructed to switch seats for the remainder of the term. The researchers found that students who sat in the back of the class during the first stage were, “attending more regularly and asking significantly more questions than those sitting in the front” (Perkins, 2005, p. 3). When those students were moved to the front by the professor, their grades tended to drop, and their attendance become more infrequent. When

surveyed, students reported significantly less satisfaction with the course despite engaging lectures and rapport with the professor. The researcher attributed this dramatic drop in satisfaction to the student's lack of choice in where they sat. The students who were moved from the front to the back exhibited no significant difference in grades, attendance, or course satisfaction (Perkins, 2005). One of flexible seating's tenants is student choice, and this study demonstrates support for students choosing their own seat. However, this study only examines undergraduate students while the majority of the literature revolves around K-12 students (Perkins, 2005).

Student academic performance also relates to interaction and collaboration among students. The research collective Hanover Research (2011) conducted a study on whether or not flexible classroom arrangements can affect communication between students during whole group and small group instruction. The researchers studied this phenomenon through a case study of one elementary classroom. The researchers measured standard environmental concerns in classroom design such as lighting, temperature, and number of windows. The researchers also observed how students interacted with both the teacher and one another when sitting in arrangements designed for discussion, such as in clusters or table groups. Students tended to engage with the lesson itself when seated in group-oriented configurations at higher levels throughout (Hanover Research, 2011). The students also exhibited higher rates of participation and partner discussion without prompting from the teacher. Classroom design can have a direct effect on student participation, and seating arrangements must be conducive to 21st century skills such as collaboration (Hanover Research, 2011).

Student academic performance and behavior in the classroom can inform each other (Wannaka, 2008). Wannaka and Ruhl (2008) observed how students behaved in different seating arrangements based on the task or format of the assignment they were completing. The researchers found that students tended to be more "on-task" in traditional row and column arrangements in

terms of talking and out of seat behavior (Wannaka, 2008). However, these arrangements were not conducive to assignments that demanded high levels of participation or collaboration, such as group projects or discussions. Students tended to participate at higher levels in group-oriented arrangements but had higher levels of “off-task” behavior. The research suggests that teachers and student be willing to reconfigure classroom set up for various different types of assignments (Wannaka, 2008).

Students with Disabilities

Students with disabilities comprise 13% (or 6.7 million) of K-12 students in the United States according to the National Center for Educational Statistics. Students with specific learning needs and disabilities should be heavily considered when examining flexible seating and overall classroom environment because most students who receive special education services are included in mainstream classrooms for the majority of the school day. The current research reflects the use of flexible seating either as an occupational therapy tool or as a behavioral intervention. One study conducted by Umeda and Deitz (2011) examined how classroom behaviors of kindergartners with autism spectrum disorder were altered and/or improved by flexible seating options. The researchers observed a kindergarten classroom and focused their observation on two participants with ASD diagnoses. Both participants had cognitive and auditory processing delays as well as exhibiting self-soothing behavior such as bouncing, rocking, and other repetitive motions (Umeda, 2011). The flexible seating the students used were disc cushions. The results yielded that there were no significant changes or improvements of both participants’ classroom behavior when utilizing the disc cushions. The teachers reported only slight improvements in on-task behavior. The researchers noted in commentary that the disc cushions did not provide the sensory stimulation necessary to engage a student with ASD and the repetitive motions that often accompany it. The researchers referenced studies where medicine balls produced a more favorable outcome in functional changes

for students with ASD and suggested further research into specific types of flexible seating options that would be advantageous to students with autism spectrum disorder (Umeda, 2011).

Proponents of flexible seating claim it can have significant academic and social benefits for children with autism spectrum disorder (ASD). Schilling and Schwartz (2004) tested this notion by studying children with ASD. The researchers observed the participants as they utilized two different seating options in the classroom: their normal arrangements (which consisted of benches, chairs, and carpet squares) and a therapy ball. The researchers implemented a single subject, withdrawal method to observe the changes between seating types (Schilling, 2004). Therapy balls were used during the intervention phase. The results of the study found that students with ASD tended to improve sitting and on-task behavior during the intervention phase. The researchers also examined teacher perception of the therapy balls through observation and exit survey. Teachers reported a significantly higher level of satisfaction when students utilized the treatment furniture (Schilling, 2004).

Therapy balls have been the most widely studied flexible seating option as therapeutic tool for students with autism spectrum disorder (Bagatell, 2010). In a similar study to Schilling's, Bagatell, Mirigliani, Patterson, Reyes, and Test (2010) examined the effects of therapy balls as a classroom behavioral intervention for students with autism spectrum disorder. The researchers implemented a single subject design with six participants who were male, and each had a documented diagnosis of ASD. The participants sat in chairs during the baseline phase and therapy balls during the treatment phase, and the behavior was monitored during whole group "circle time" (Bagatell, 2010). The results, unlike Schilling's, were mixed. Some students were more able to maintain focus for the duration of the lesson while using a therapy ball while others were more distracted by the change in seating. Students who exhibited "poor postural stability" had the most difficulty utilizing the therapy balls (Bagatell, 2010). The researchers noted that autism spectrum disorder should not be treated as

a one-size-fits-all disability. Though therapy balls may be effective for some students with ASD, flexible seating should not be used as a blanket treatment or therapeutic tool in the classroom (Bagatell, 2010).

Flexible seating claims to calm students with attention and hyperactivity disorders (such as ADD or ADHD) and tendencies. Fedewa and Erwin (2011) examined how stability ball seats (medicine balls that cannot be rolled or moved other than vertical bouncing) affect these students. Like many aforementioned studies, the researchers implemented a single subject design with an AB baseline and treatment. The researcher observed fourth and fifth grade students with documented attention and hyperactivity disorders and found that these students had increased periods of both “in seat and on task” behavior while using the stability balls (Fedewa, 2011). The researchers also found that students had higher rates of attentive behavior and lower rates of hyperactivity throughout the lesson. When teachers were surveyed, they unanimously tended to prefer when students used the stability balls instead of traditional seats. Teachers also gave qualitative feedback, and the only concern they voiced was the cost of maintaining stability balls for each student since they are less durable than traditional chairs. Stability ball chairs can range from sixty to one-hundred dollars per chair from various retailers. The monetary cost of flexible seating for a teacher to pay and maintain out of pocket could deter them from purchasing it. The researchers caution that the quality of academic work was not analyzed during the study and further research must link on-task behavior and academic performance (Fedewa, 2011).

Another specific type of flexible seating that claims to soothe students who are hyperactive are disc cushions or “Disc ‘O’ Sit” cushions. Disc cushions are defined as inflated disks that can be used on a chair or in the floor (Stapp, 2018). Pfeiffer, Miller, and Witherell (2008) studied the effects of disc cushions (utilized both in chairs and on carpet) as an occupational therapy tool in the classroom. The researchers implemented a randomized control trial design in which thirty-one

second grade students were sorted into a control group and thirty-two students were sorted into a treatment group (Pfeiffer, 2008). This differs from other similar studies in the literature in that it was designed as a “one shot” study. The participants were pretested and post tested in an AB fashion. After initial observation, students in the treatment group tended to sit for increased periods of time and were observed to be more engaged throughout the lesson (Pfeiffer, 2008). However, it is unclear whether specific students with “attention difficulties” were targeted for intervention. The sample was significantly larger than other studies on similar topics, but the study does not specify whether or not every participant had a documented attention or hyperactivity disorder (Pfeiffer, 2008). While this research does support for flexible seating, it fails to account for specific attention and hyperactivity concerns.

Student Perception

Student perception is a key component of flexible seating. If students are given the choice on where to sit, they will take more ownership of their individual learning over time (Schoolcraft, 2018). In a study by Harvey and Kenyon (2013), the researchers surveyed students to explore what types of seating high school students preferred in an undergraduate lecture hall. The sample consisted of high school students in an urban setting (Harvey, 2013). Student rated five different types of seating arrangements which included, “modern mobile chairs; tablet arm chairs; fixed tiered seating with tablet arms; rectangle tables with standard chairs; and trapezoid tables with chairs on casters” (Harvey, 2013). The students rated each configuration on comfort, learning potential, engagement, and interactivity. The results showed that students tended to prefer the modern mobile chairs and the trapezoid tables with chairs on casters on every indicator. The students tended to rate more traditional seating arrangements such as the fixed tiered seating and standard chairs much lower than more modern seating (Harvey, 2013). While this study does not measure student

academic performance, behavior, or effect on specific learning needs, student choice is an integral piece to overall student satisfaction in the classroom (Harvey, 2013).

Another study examined the student motivation and self-perception, but within the context of flexible seating. Stapp (2018) found alternative seating can facilitate higher rates of “on task” behavior than off-task. The study referenced several forms of flexible seating but focused on only one: disc cushions. Disc cushions are defined by the researcher as inflatable, circular cushions that can be used in a chair or on the floor (Stapp, 2018). One side of the cushion is smooth while the other side has raised, rounded pegs to support it. Either side is suitable for use on the floor or in a chair. Students were observed utilizing both traditional seating arrangements and the disc cushions during independent work. The students were observed for thirty minutes at a time and using the flexible option for various periods. Stapp found that on-task behavior was observed at much higher rates when students could choose to utilize the flexible option (Stapp, 2018). The results were statistically significant ($p > /05$). The differences between how different genders performed in both kinds of seat was not statistically significant, but it did account for overall more on-task behavior when seated on disc cushions. A brief exit survey was given to students following the study that asked them to evaluate their perception of the seating arrangements. Students reported higher levels of personal satisfaction in their academic work when seated on the disc cushions and higher levels of ownership when they were given the option to sit on disc cushions (Stapp, 2018). Students also rated their comfort level with both the physical and social environment. Students who regularly utilized the flexible seating options reported significantly higher levels of physical and emotional comfort in the classroom and tended to perceive the environment as “low-risk” (Stapp, 2018).

In one of few qualitative studies on flexible seating, Schoolcraft (2018) examined student and teacher perception of stability balls as a flexible seating option in a first-grade classroom. Schoolcraft was able to gauge what students and teachers preferred in terms of seating and learning. The selected

classroom was first observed by the researcher to examine procedures and routines that involved the use of stability balls. Both selected students and the teacher were interviewed about their levels of satisfaction with flexible seating. Students reported high levels of satisfaction when they were allowed to choose their own seats (Schoolcraft, 2018). In terms of movement, some students reported that they benefitted from using stability balls during instruction as they were able to fidget without disruption. However, some students found the stability to be more of a hindrance and a distraction than a learning tool. Students completed an open-ended survey asking what they liked or disliked about the stability balls. Most students reported that they enjoyed bouncing on the stability balls, and that using them helped students to focus for longer periods of time and refocus when distraction did arise. Students tended to value the choice to use the stability balls the most out of the factors (Schoolcraft, 2018). As previously mentioned, some students found the stability balls distracting and reported that they enjoyed getting to choose. This study presents a unique finding on flexible seating. Though the students overall enjoyed using the flexible seating, the most important factor was the choice to use it in the first place (Schoolcraft, 2018).

Students tend to rate “alternative” or flexible seating higher than traditional in terms of perception and satisfaction (Hinckson, 2013). Hinckson et al. examined the “acceptability” (or perception) of standing work stations for fourth and fifth grade students. Student’s health and sedentary behavior was also monitored throughout the independent work stations. When surveyed, students tended to be more excited about completing assignments while using the standing work stations, and their behavior tended to be less disruptive when using the standing workstations (Hinckson, 2013). Students also tended to burn more calories per class session and experience decreased heart rates (which are both markers of overall physical fitness) when using the standing work stations (however, steps taken throughout the lesson were not monitored.) Teachers and other school staff were also surveyed about their perceptions of the work stations. School staff tended to

rate the work stations favorably and noted that students were noticeably more engaged while using the standing work stations (Hinckson, 2013).

Conclusion

Flexible seating is still new to systematic research but is not a trend that seems to be diminishing. This literature outlines the various aspects that go into flexible seating. Physical classroom environment can affect several aspects of student learning and behavior (Hill, 2010). Students tend to participate and be engaged at higher levels when utilizing group seating arrangements and clusters (Wannaka, 2008). However, students tend to be more on-task and complete independent work more efficiently when seated in teacher assigned, row and column arrangements (Bicard, 2012). In terms of student academic performance and behavior, students collaborate and participate more while using flexible group arrangements (Hanover Research, 2011). Integrating elements of flexible seating into a traditional classroom can be an effective behavioral incentive for students who struggle to stay on task (Castellucci, 2016). Students with disabilities or specific learning needs such as autism spectrum disorder, ADD, and ADHD can use flexible seats such as stability balls, disc cushions, and therapy balls as occupational therapy tools in the classroom (Umeda, 2011, Fedewa, 2011). Students tend to perceive flexible seating options more positively than traditional seating and so do teachers (Hinckson, 2013).

There are gaps in the literature in terms of academic performance and flexible seating. While some studies focus on how academic performance is indirectly affected by student behavior, there is little research about how flexible seating and all its components directly affect academic performance either in a positive or negative manner. The measure for academic performance is also unclear in the existing literature. “On-task” behavior is often used as a measure of flexible seating’s success but is rarely defined in a tangible way. Further research is necessary to determine whether or not there is a clear connection between flexible seating and academic performance.

Chapter 3

Methodology and Procedures

Flexible seating is becoming more and more popular in schools around the country and across grade levels. The purpose of this study was to determine whether flexible seating affects academic performance when compared to more traditional seating arrangements. Based on a review of the literature, there is evidence that flexible seating can increase focus, help students regulate their own behavior, and serve as occupational therapy tools for students with disabilities, but there is no suggested link between flexible seating and academic performance. This chapter includes information about the population of the school in which this study was conducted as well as procedures for selecting participants. This chapter also includes methods, procedures for the study, and descriptions of data collection instruments and procedures.

Population

The population for this study was comprised of elementary school students from a Northeast Tennessee public school. The school was made up of 493 students from kindergarten to fifth grade. 81.9% were white, 8.7% were black/African American, 4.5% were Hispanic or Latinx, and less than 1% were Asian. 13.6% of student had a documented disability, and 30.8% of students were economically disadvantaged. 2% of students were English language learners.

Sample

The sample for this study was comprised of students in a selected kindergarten classroom. This classroom was self-contained, and the same teacher taught all subjects. The class was comprised of eighteen students, nine boys and nine girls. Students were randomly selected from the class to form experimental and comparison groups. Students in both groups received the same

quality and duration of instruction and completed the same assignments. However, the control group was instructed to use a traditional seat while the experimental group was allowed to choose a flexible seating option. Each group got to experience both types of seating. Both groups' academic performance was evaluated while using both types of seating.

Data Collection Instruments

The data collection instrument used in this study was a checklist that measured students' academic performance using the following indicators: completion of the assignment, mastery of the content, and time of completion. The assignment both groups completed was designed to be completed in class. They had to earn a grade of at least 80% accuracy (or four out of five correct answers) to achieve mastery. The checklist also measured the amount of time the student took to complete the assignment. Students were allotted roughly thirty minutes to complete their independent work. Early finisher activities were available to students who completed their work before the allotted time was up. The survey also provided a checklist for indicators of "on-task" behavior, which included sitting in their seat appropriately, working quietly, and maintaining focus on their work.

Procedures

Before this study began, all participants had permission to participate via an informed consent form signed by a parent or legal guardian. This form explained that all student records would be kept confidential, that no mental or physical harm would come to their student, and explained the key points and purpose of the study. Parents and guardians were also informed of their right to withdraw their students' participation at any point and that their student would not be penalized. The Milligan College Institutional Review Board reviewed the study and approved its progression. The classroom teacher, school, and school system also approved the study prior to data collection.

The experimental group used flexible seating options of their choice while completing their classwork assignments. The control group used traditional chairs at a kidney-shaped table to complete their classwork. Then, the groups were switched so the researcher could compare each student's performance while using both types of seating. Students were allotted thirty minutes to complete their work and assignments were graded for accuracy upon completion. Students' "on task behavior" was also observed and recorded on the checklist while students worked.

Research Question and Hypotheses

Research Question 1: Is there a difference in students' academic performance when utilizing flexible seating versus when they are using traditional seating?

Research Hypothesis 1: There is a difference between students' academic performance when utilizing flexible seating versus traditional seating.

Null Hypothesis 1: There is no difference between students' academic performance when utilizing flexible seating versus traditional seating.

Research Question 2: Is there a difference in student mastery (80% accuracy) while using flexible seating versus traditional seating?

Research Hypothesis 2: There is a difference in student mastery while using flexible seating versus traditional seating.

Null Hypothesis 2: There is no difference in student mastery while using flexible seating versus traditional seating.

Research Questions 3: Is there a difference in time of assignment completion while using flexible seating versus traditional seating?

Research Hypothesis 3: There is a difference in time of assignment completion while using flexible seating versus traditional seating.

Null Hypothesis 3: There is no difference between time of assignment completion while using flexible seating versus traditional seating.

Chapter 4

Results

Data Analysis

Flexible seating has become a trend in classrooms across the country. The purpose of this study is to measure the effects of flexible seating versus traditional seating on academic performance with indicators such as student mastery, time of assignment completion, and academic performance overall. This study was conducted at a public Northeast TN elementary school in a selected kindergarten classroom outfitted with both flexible and traditional seating options.

Collection of Data

Data for this research were collected at a public Northeast TN elementary school. This selected kindergarten classroom consisted of nineteen total students who were assigned to their teachers before the school year began. This data were collected in four stages. In the first stage, students A-E were assigned to sit in traditional seating and students F-I were allowed to choose flexible seating. In the second stage, every student was allowed to choose flexible seating. In the third stage, students A-E were allowed to choose flexible seating while student F-I were assigned to sit in traditional seating, and the fourth stage returned to the baseline of all students choosing flexible seating. Each students' scores, indications of mastery (80% or above), and time of completion (in minutes) were recorded each observation.

Table 1
Demographic profile of participants

<i>Students</i>	<i>Frequency (f)</i>	<i>Percent (%)</i>
Gender		
Males	9	50%
Females	9	50%
<i>Total</i>	<i>18</i>	<i>100%</i>
Ethnicity		
White/Caucasian	14	77.8%
African-American	2	11%
Asian	1	5.6%
Hispanic	1	5.6%
<i>Total</i>	<i>18</i>	<i>100%</i>

Research Questions and Related Hypothesis

To guide the analysis of the data for this study, three research questions were considered. Each question preceded the related research hypothesis and the null hypothesis. All data were analyzed using a .05 level of significance.

Results for Research Question 1

Research Question 1: Is there a difference in academic performance when using flexible seating versus traditional seating?

In order to answer Research Question 1, the scores from each student from each observation were averaged. The average score on assignments (in percentages) for traditional seating was .76. The average score for flexible seating was .77.

Research Hypothesis 1: There is a difference in academic performance when using traditional seating versus flexible seating.

Null Hypothesis 1: There is no difference in academic performance when using traditional seating versus flexible seating.

To determine the significance of the seating type's effects, a paired t-test was conducted on the data set. There was no significant difference found in the means of traditional seating and flexible seating scores ($P = .561$). The mean score for traditional seating ($M = .76$, $sd = .159$) was no different from all flexible seating ($M = .77$, $sd = .145$). The null hypothesis was retained, and the results are displayed in Table 2.

Table 2

Paired t-test for Academic Performance: Traditional Seating vs. Flexible Seating

Seating Type	M	SD	df	Sig. (2-tailed)
Traditional Seating	.76	.159	18	.561
Flexible Seating	.77	.145		

Results for Research Question 2

Research Question 2: Is there a difference in student mastery (80% accuracy) while using flexible seating versus traditional seating?

In order to answer Research Question 2, a chi-square “goodness of fit” test was conducted. The test evaluated the significance of the expected value, which is the number of instances students

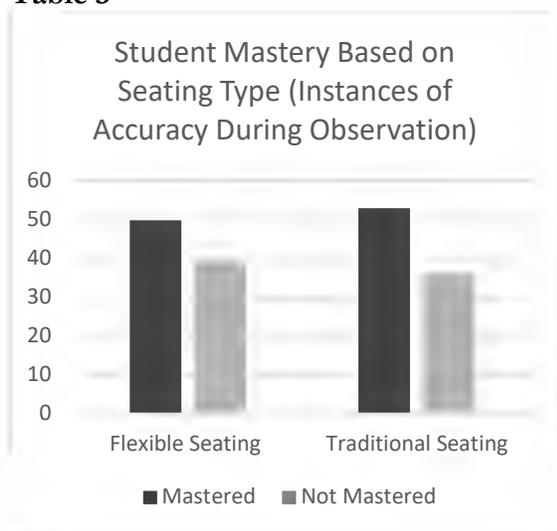
mastered the assignment while using regular seating, and the actual value, which is the number of instances students mastered the assignment while using flexible seating.

Research Hypothesis 2: There is a difference in student mastery while using flexible seating versus traditional seating.

Null Hypothesis 2: There is no difference in student mastery while using flexible seating versus traditional seating.

According to the chi square “goodness of fit” test, there was no significant difference found between student mastery using traditional seating versus flexible seating ($P = .517$). Of the 178 scores observed, 50 met the score for mastery of above 80% and 39 were below mastery while using flexible seating. 53 of the scores met the score for mastery and 36 of the scores did not meet the score for mastery. Therefore, the null hypothesis was retained. The results are displayed in Table 3.

Table 3



Results of Research Question 3

Research Question 3: Is there a difference in time of assignment completion while using flexible seating versus traditional seating?

In order to answer Research Question 3, the time of student completion was averaged for each seating type. If the time of completion was recorded at 30 minutes, the student did not complete the assignment in the allotted time. The average completion time for traditional seating was 25.6 minutes, and the average completion time for flexible seating was 25.4 minutes.

Research Hypothesis 3: There is a difference in time of assignment completion while using flexible seating versus traditional seating.

Null Hypothesis 3: There is no difference between time of assignment completion while using flexible seating versus traditional seating.

A paired t-test was conducted to determine the level of significance between these averages. There was no significant difference found in the completion time between seating types ($P = .696$). The mean completion time for traditional seating ($M = 25.6, sd = 4.524$) was no different than the mean completion time for flexible seating ($M = 25.4, sd = 4.194$). The null hypothesis was retained, and the results are displayed in Table 4.

Table 4

Paired t-test for Completion Time: Traditional Seating vs. Flexible Seating

Seating Type	M	SD	df	Sig. (2-tailed)
Traditional Seating	.76	.159	18	.561
Flexible Seating	.77	.145		

Chapter Five

Discussion

The purpose of this study was to determine the effects of traditional seating versus flexible seating on academic performance in selected kindergarten classroom. The results were examined using paired t-tests and the chi square “goodness of fit” test. This chapter contains a summary of the findings, interpretation of findings, limitations, recommendations, and conclusions from this study.

Summary of the Findings

The first research question, “Is there a difference in academic performance when using traditional seating versus flexible seating?” was analyzed using a paired t-test. The results indicated that participants’ academic performance did not significantly differ while using either seating type ($P = .516$). Therefore, the null hypothesis was retained. The results are not found to be consistent with current literature that suggests flexible seating can make a significant difference for students with disabilities and as a classroom management tool (Bagatell, 2010). No participant suffered a dramatic drop in overall academic performance while using one seating type over the other.

The second research question, “Is there a difference in student mastery when using traditional seating versus flexible seating?” was analyzed using a chi square “goodness of fit” test. The results indicated that participants’ instances of mastery (with a score of 80% or above) did not significantly differ while using either seating type ($P = .517$). Therefore, the null hypothesis was retained. The participants who were able to meet mastery on a consistent basis did not improve or worsen, and the students who were unable to meet mastery on a consistent basis did not improve or worsen. Participants continued to perform at their own levels regardless of seating type.

The third research question, “Is there a difference in time of completion when using traditional seating versus flexible seating?” was analyzed using a paired t-test. The results indicated

that participants' time of completion did not significantly differ while using either seating type ($P = .696$). Therefore, the null hypothesis was retained for this research question. The results are inconsistent with literature that suggests students can improve academic efficiency when using non-traditional seating (Blake, 2012). The participants time of completion on given assignments did improve in a significant manner, but it also did not suffer as a consequence of either seating type.

Interpretation of Findings

The existing body of literature does not contain significant research devoted to measuring flexible seating's effects on academic performance. While there is a multitude of research on flexible seating as an occupational therapy tool, flexible seating as a behavior management system, and flexible seating's potential benefits for students with disabilities, there are gaps in the literature in terms of academic performance. One aspect of this study that differed from current literature was the completion of assignments in a fixed amount of time. According to Blake (2012), students who utilized non-traditional seating (in the form of standing workstations) tended to increase their productivity and efficiency while completing assignment when compared to traditional seating (Blake, 2012). However, the results of Research Question 3 do not offer a significant difference between completion of assignments. A standing workstation was a flexible seating choice, but there were many other options for flexible seating in this selected kindergarten classroom, which could account for this difference.

The current literature also suggests that student choice in seating can indirectly contribute to higher academic achievement. A study conducted by Perkins and Wieman (2005) suggests that having students choose their own seats can increase attendance and class average. While this study examined a post-secondary classroom (attendance for undergraduate students is a personal choice whereas attendance for K-12 students typically depends on parents/guardians), the increase in academic performance is worth noting when interpreting the findings of this study. Individual

students rarely deviated from their typical academic performance when using either seating type, and the results of Research Question 1 and Research Question 2 offered no significant difference in academic performance and level of mastery. However, this selected classroom contained students who had never experienced a fully traditional classroom. The traditional options were available amongst a myriad of flexible seating choices. The novelty of choice or lack of choice could be another factor in academic performance.

Limitations of the Study

One limitation that remained consistent throughout this study was time. The students are only in this kindergarten classroom for one school year, and the duration of the study consisted of 178 observations over a three-month period. While this period of time spent on observations helps to solidify trustworthiness in this study, it could make it difficult to assess the long-term effects of flexible seating on academic performance. Students also only had thirty minutes to complete assignments. This could affect the internal validity of the study as time constraints often do.

Another limitation was the size of the sample. This selected kindergarten classroom was the only kindergarten classroom outfitted with flexible seating, which means only eighteen of the almost eighty kindergarteners in the school experienced flexible seating. This sample size could interfere with the generalizability of this study as this sample size is relatively small. The checklist for indicators of performance, mastery, and time of completion was consistently reliable in terms of measuring the indicators it needed to, but it is difficult to know whether or not these results would be replicated in a similar study based on the size of the sample.

Recommendations

1. This study should be replicated across a wide variety of age groups and grade levels to determine how these populations perform while using flexible seating versus traditional seating.

2. This study should take place over a longer period of time to determine long-term effects on academic performance when using traditional seating versus flexible seating. This would improve accuracy and reliability of the results.
3. Teachers should still seek out flexible seating because of its physical and behavioral benefits, especially for students with disabilities. It also does not have a negative effect on academic performance as demonstrated by this study.

Conclusions

The purpose of this study was to determine the effects of traditional seating versus flexible seating on academic performance in selected kindergarten classroom. Results of the various tests indicated that flexible seating does not have any significant difference on academic performance, student level of mastery, or time of completion on given assignments in this given study. The null hypothesis was retained for all three research questions. However, educators should consider the positive influences that flexible seating can have for student behavior and for students with disabilities as cited in the current literature.

References

- Baepler, P., Brooks, D. C., & Walker, J. D. (2014). *Active learning spaces: New directions for teaching and learning*. San Francisco, CA: Jossey-Bass.
- Bagatell, N., Mirigliani, G., Patterson, C., Reyes, Y., & Tests, L. (2010). Effectiveness of therapy ball chairs on classroom participation in children with autism spectrum disorders. *American Journal of Occupational Therapy, 64*, 895–903. doi: 10.5014/ajot.2010.09149.
- Barrett, P., Davies, F., Zhang, Y., and Barrett, L. (2015). The impact of classroom design on pupils' learning: Final results of a holistic, multi-level analysis. *Building and Environment, 89*, 118-133. doi: <https://doi.org/10.1016/j.buildenv.2015.02.013>.
- Bicard, D., Ervin, A., Bicard, S., & Baylot-Casey, L. (2012). Differential effects of seating arrangements on disruptive behavior of fifth grade students during independent seatwork. *Journal of Applied Behavior Analysis, 45*(2), 407-411. Retrieved from 10.1901/jaba.2012.45-407.
- Blake, J., Benden, M., and Wendel, M. (2012). Using Stand/Sit Workstations in Classrooms. *Journal of Public Health Management Practice 18*(5). doi: 412–415.10.1097.
- Brewe, E., Kramer, L., & Sawtelle, V. (2012). Investigating student communities with network analysis of interactions in a physics learning center. *Physical Review Special Topics-Physics Education Research, 8*(1). doi: 10.1103/PhysRevSTPER.8.010101
- Brooks, D. (2012). Space and consequences: The impact of different formal learning spaces on instructor and student behavior. *Journal of Learning Spaces, 1*(2). Retrieved from <http://libjournal.uncg.edu/jls/article/view/285/282>.
- Castellucci, H.I, Arezes P., Molenbroek, J.F. M, de Bruin, R. & Viviani, C. (2016). The influence of school furniture on students' performance and physical responses: results of a systematic review. *Ergonomics, 60*(1). <https://doi.org/10.1080/00140139.2016.1170889>.

- Chung, J. W. Y., and Wong, T. K. S. (2007). Anthropometric Evaluation for Primary School Furniture Design. *Ergonomics* 50(3). doi: 323–334.10.1080/00140130600842328
- Delzer, K (2016). Flexible Seating and Student-Centered Classroom Redesign. *George Lucas Educational Foundation*. Retrieved from <https://www.edutopia.org/blog/flexible-seating-student-centered-classroom-kayla-delzer>.
- Duffy, T. *Constructivism and the Technology of Instruction: A Conversation*. (1992). New York, NY: Routledge.
- Fedewa, A. L., & Erwin, H. E. (2011). Stability balls and students with attention and hyperactivity concerns: Implications for on-task and in-seat behavior. *American Journal of Occupational Therapy*, 65, 393–399. doi: 10.5014/ajot.2011.000554.
- Fernandes, A.C., Huang, J., Rinaldo, V. (2011). Does where a student sits really matter? - The impact of seating locations on student classroom learning. *International Journal of Applied Educational Studies*, 10(1), 66. Retrieved from <https://pdfs.semanticscholar.org/b653/f362b5201ca792c9c5256ed7aeb25de12c00.pdf>.
- Goodwin, B., Lefkowitz, L., Woempner, C., & Hubbell, E. (2011). *The future of schooling: Educating America in 2020*. Bloomington, IN: Solution Tree Press.
- Hanover Research (2011). School Structures That Support 21st Century Learning. Washington, DC, 6. Retrieved from https://www.apsva.us/wp-content/uploads/legacy_assets/www/bda59d16b8-School_Structures.pdf.
- Harvey, E. J. & Kenyon, M. C. (2013). Classroom seating configurations for 21st century students and faculty. *Journal of Learning Spaces*, 2(1). Retrieved from <http://libjournal.uncg.edu/index.php/jls/article/view/578/454>.
- Hill, M. and Epps, K. (2010). The Impact of Physical Classroom Environment on Student Satisfaction and Student Evaluation of Teaching in the University Environment. *Academy of*

- Educational Leadership Journal*, 14(4). Retrieved from <https://digitalcommons.kennesaw.edu/cgi/viewcontent.cgi?referer=https://scholar.google.com/&httpsredir=1&article=2311&context=facpubs>.
- Hinckson, E., Aminian, E., and Stewart, T. (2013). Acceptability of Standing Workstations in Elementary Schools: A Pilot Study. *Preventive Medicine* 56(1). doi: 82–85.10.1016/j.ypmed.2012.10.014
- National Center for Educational Statistics. (2018). *Children and Youth with Disabilities*. Retrieved from https://nces.ed.gov/programs/coe/indicator_cgg.asp.
- Perkins, K. and Wieman, C.E. (2005) The Surprising Impact of Seat Location on Student Performance. *The Physics Teacher* 43(1). doi: 10.1119/1.1845987.
- Pfeiffer, B., Henry, A., Miller, S., & Witherell, S. (2008). The effectiveness of Disc ‘O’ Sit cushions on attention to task in second-grade students with attention difficulties. *American Journal of Occupational Therapy*, 62, 274-281. doi:10.5014/ajot.62.3.274.
- Sanders, M. (2013). Classroom design and student engagement. Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2013 57: 496. doi: 10.1177/1541931213571107
- Schilling, D. L., & Schwartz, I. S. (2004). Alternative seating for young children with autism spectrum disorder: Effects on classroom behavior. *Journal of Autism and Developmental Disorders*, 34, 423-432. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/15449517>.
- Schoolcraft, N. (2018). Student and Teacher Perceptions of Stability Balls as Alternative Seating in a First Grade Classroom. *The Journal of Teacher Action*, 4(3). Retrieved from <https://eds-a-ebshost-com.milligan.idm.oclc.org/eds/pdfviewer/pdfviewer?vid=5&sid=e5db7f55-b745-42b0-b7fb-7839702429c8%40sessionmgr4008>.
- Stapp, A. (2018). Alternative seating and students' perceptions: Implications for the learning environment. *Georgia Educational Researcher*, 14(2), Article 4. doi: 10.20429/ger.2018.140204.

Tomlinson, C. (1999). *The Differentiated Classroom: Responding to the Needs of All Learners*. Alexandria, VA: Association for Supervision and Curriculum Development.

Umeda, C., & Deitz, J. (2011). Effects of therapy cushions on classroom behaviors of children with autism spectrum disorder. *The American Journal of Occupational Therapy*, 65(2), 152-159.

Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/21476362>.

Wannakara, R. and Ruhl, K. (2008). Seating arrangements that promote positive academic and behavioural outcomes: a review of empirical research. *Support for Learning* 8(2). Retrieved from http://www.corelearn.com/files/Archer/Seating_Arrangements.pdf.

Wingrat, J. K., & Exner, C. E. (2005). The impact of school furniture on fourth grade children's on-task and sitting behavior in the classroom: A pilot study. *Work*, 25, 263-272. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/16179775>