

An examination of flexible seating in the higher education classroom from a physical and kinesthetic perspective

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The concept of ‘flexible seating’ has emerged as a possibility to meeting the goals of an active learning classroom. Recent scholarship has suggested that numerous student learning predictors are enhanced when interacting with flexible seating. This study aims to fill a gap in the literature by investigating the effects of flexible seating from a physical perspective in the higher education setting. Seventy-five participants engaged in mixed-method data collection and analysis strategies that included observations and field notes, a validated online survey, and open-ended question prompts. A thematic review and descriptive analysis revealed almost 80% of the respondents indicated that the flexible seating had a positive effect on their experience in the course related to the following themes: (a) Movement Opportunity; (b) Back Pain & Comfort; (c) Anxiety & Restlessness; and (d) Focus & Engagement. This research provides evidence that physically comfortable classrooms promote a sense of well-being, keep minds focused, and limit distractions, and that physically comfortable classrooms with increased movement opportunities for students make possible mental and emotional health benefits, as well. Results indicate the need for campuses to (re)consider the purposes and roles of seating styles within the 21st century classrooms, with seating selection based on principles of universal design.

Introduction

Innovative educators typically seek out ways to improve the teaching and learning experience. Such recent innovations have included digital media and online platforms (Keengwe & Kidd, 2010), “gamification” (Kiryakova et al., 2014), and the flipped classroom model (Cabi, 2018). These innovations have led to increased student engagement (Cronk, 2012), interactivity (Chen Hsieh et al., 2017), and ultimately improved student learning (McBrien et al., 2009). Motivating students and keeping them engaged is a crucial component of creating a successful learning experience, and these new innovations can help create a more interactive and effective learning experience.

Another opportunity to innovate the teaching and learning experience is to literally innovate the physical

learning space. A growing body of studies have explored the impact of the physical environment on teaching and learning (O'Donnell, 2018; Rands & Gansemer-Topf, 2017; Talbert & Mor-Avi, 2018; Taylor, 2009). Some studies suggest that the goal of classroom design is to enrich academic, psychological, and sociological growth (Herman Miller, 2008). As such, learning spaces should be designed with intentionality as to avoid restricting the behaviors of both learners and instructors. When thoughtfully and successfully created, the physical learning space should encourage active and engaged learning. Former studies investigating the effects of comfort in the workspace indicate that giving people some control over their surroundings adds to their sense of well-being (Lee, 2019). “When given ergonomically designed furniture and work areas, their ability to stay focused and on task is improved. In a sense, a comfortable environment clears the mind of the distractions that impede the work or learning that needs to be done” (Herman Miller, 2008).

Flexible Seating Literature Review

One way to innovate the classroom space is through an “active learning classroom.” These spaces are characterized,

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among other features, by a moveable furniture that group students into learning teams (Taylor, 2009). The goal of such a classroom arrangement is to create flexible spaces to support responsive pedagogy and hands-on activities, because high flexibility and mobility provide one of the best opportunities to improve learning outcomes (Talbert & Mor-Avi, 2018). Higher education institutions are increasingly building or remodeling classrooms to become flexible spaces that support learner-centered instruction. However, little is known about the actual impact of these spaces on student outcomes (Adedokun et al., 2017). The limited research on flexible seating in the classroom suggests that flexible space enhances the learning experience by supporting classroom engagement (Adedokun et al., 2017).

Currently, various schools and other educational (including higher educational) institutions have different classroom designs. “Most studies on the relationship between classroom type and student performance have examined the effects of different classrooms on students’ academic performance, motivation, participation, communication, and other aspects” (Xi et al., 2017). This study will seek to explore not just the arrangement of seats within a classroom, but the seats themselves. Within a classroom design, movable chairs afford students the ability to group closer together for collaborative work or discussion. It is assumed that the designed physical environment of the learning space encourages learning behaviors and pedagogical practices that support student engagement in the learning process (Rands & Gansemer-Topf, 2017). Few previous studies have investigated classroom design and its relationship with student learning, including the effect of flexible seating (Lombardi & Wall, 2006; Sanders, 2013). The richness of studies such as these illustrate how classroom design advantages can positively support classroom practices by enhancing student engagement in the learning process.

Former studies investigating flexible seating arrangements have illuminated numerous benefits. Among those benefits are (1) an increased amount of student-choice regarding their work and peer dynamics; this leads to (2) increased opportunity and efficiency of working in small groups and interfacing with classmates and/or instructors who are not in their immediate vicinity (Harvey & Kenyon, 2013); (3) increased opportunity to engage in physical health enhancing behaviors – i.e. moving, rocking, standing – all which increase the flow of oxygen to the brain; this leads to (4) higher perceptions of physical comfort, which has a positive relationship with engagement and productivity; thus, (5) the overall learning experience is improved due to the added activity, engagement, and comfort (Harvey & Kenyon, 2013; Adedokun, et al., 2017).

Rationale

It has been suggested that one primary goal for the physical classroom design is to promote student develop in cognitive, psychological, and academic performance (Smith, 2017). In addressing this goal, the classroom physical plan should reduce features that limit student-student and student-instructor interaction and provide opportunity for movement-based engagement (Talbert & Mor-Avi, 2018). The concept of ‘flexible seating’ has emerged as a possibility to meeting the goals of an active learning classroom. An active learning classroom using flexible seats supplements traditional chairs at desks and tables with seats and/or desks that have ‘movement characteristics’ [i.e., by design, they rock, swivel, wobble, bounce, or provide a standing option. See Appendix A for a visual of each flexible seat used in the study]. Recent scholarship has suggested that numerous student learning predictors [i.e., creativity, motivation, engagement, collaboration, communication, and critical thinking] are enhanced when interacting with flexible seating (Harvey & Kenyon, 2013). The use of – and scholarship on – flexible seating in the K-12 setting has grown in recent popularity (Adedokun, et al., 2017); however, the use and study of flexible seating in higher education has yet to develop. Therefore, this study aims to fill this gap in the literature by investigating the effects of flexible seating from a physical perspective. These effects are believed to ultimately include perceptions of choice, collaboration, communication, creativity, motivation, engagement, academic achievement, and critical thinking.

This article reports the preliminary data of a broader study still in progress. Data is still in the process of being collected, analyzed, and interpreted from both the perspectives of students and instructors learning and teaching in flexible seating classrooms. This particular sub-study is part of a larger project which seeks to explore flexible seating effects on mental and emotional health, social interaction in classrooms, attentiveness and learning, and overall value to the teaching and learning environment. Understanding that physical comfort and movement opportunity in classrooms are linked to student engagement and participation (Zimmermann et al., 2018), the researchers sought to investigate participants’ perceptions on using flexible seating in the college classrooms. Concerning the kinesthetic and physical elements of the flexible seating experience, research questions for this specific study included: (1) What are students’ perceptions of the *physical* benefits of flexible seating? (2) What *physical* effects from flexible seating could lead to student learning outcomes? (3) Do students value the physical characteristics offered by flexible seating? (4) Do students prefer flexible seating to the traditional classroom? (5) What are instructors’ perspectives of the flexible seating experience?

Table 1. Demographic Data of Student Respondents Using Flexible Seating		
Participants	n=	% of total
Total	73	100
<i>Identified Gender</i>		
Female	64	87.7
Male	8	11
Non-binary	1	1.4
<i>Identified Ethnicity</i>		
White	38	52.1
Hispanic/Latino	26	35.6
Black	3	4.1
Asian	1	1.4
Two/more	3	4.1
Abstained	1	1.4
<i>Age</i>		
18-24 years	32	43.8
25-29 years	20	27.4
30-34 years	12	16.4
35-39 years	6	8.2
40-44 years	2	2.7
50+ years	1	1.4
<i>Academic Classification</i>		
Junior Undergraduate	24	32.9
Senior Undergraduate	36	49.3
Graduate	13	17.8

Method

Participants

Participants for this study consisted of instructors (n=2) and students (n=73) who had courses in the classrooms at a regional university in Texas with flexible seating. Preliminary results revealed 73 students responded to the survey. Table 1 illustrates demographic data of student respondents to the survey.

In addition, there were two participants who were instructors: one male and one female, who teach in the College of Education. All students and instructors (n=75) in the classrooms with flexible seating who returned the

consent forms were included in the study. Any student or instructor who did not return the consent form or agree to participate in the study were excluded from the study, although they were participants in course activities.

Procedures

This study was a mixed-methods study that used standardized methods as well as observation and survey data. To collect data, researchers observed selected classrooms on the first day of class with the flexible seating in a naturalistic inquiry and developed an observation framework so that student researchers could observe and help collect observational data. The researchers created diagrams and/or photos of the classrooms on which observers could note differences and movement related to seating (Appendix B). Next, the researchers visited participating classrooms at least once during the semester to collect observational data related to the research questions. Following one semester of use, participating students and instructors in flexible seating classrooms completed a validated survey (via Google Forms) on flexible seating [see Appendix C for a sample of questions included on the student survey]. Then, the research team analyzed and coded observational and open-ended survey data and reported findings using descriptive statistics to analyze numerical survey data.

Results

This article reports on the kinesthetic and physical component of flexible seating as identified by participating students and instructors and observations of the learning environment. Concerning kinesthetic and physical elements of the flexible seating experience, research questions included: (1) What are students' perceptions of the *physical* benefits of flexible seating? (2) What *physical* effects from flexible seating could lead to student learning outcomes? (3) Do student value the physical characteristics offered by flexible seating? (4) Do students preferer flexible seating to the traditional classroom? (5) What are instructors' perspectives of the flexible seating experience?

Seating Selection

Of the 73 participants who completed the validated surveys, the majority of respondents regularly used flexible seating throughout the semester (n=45, 61.6%). Respondents most often sat "near the back" at a rate of 38.4% (n=28); "near the front" at a rate of 37% (n=27), or "in the middle" at a rate of 24.7% (n=18).

Seating options most often selected were the rocking chair (n=29, 64.4%), exercise ball (n=18, 40%), ergo stool (n=15, 33.3%), Hokki stool (n=13, 28.9%), black couch (n=8, 17.8%),

Table 2. Student Respondents to the Prompt: "Why did you choose the seating you did?"	
Theme	Quote
Back Pain & Comfort	<ul style="list-style-type: none"> • I was experiencing lower back pain. • It felt good on hips and back to sit more ergonomically. • It helped my back pain. • I moved to the rocking chair because I need support for my back. • Proper back seat for support. • The ergo stool gave me great comfort for my back pain. I would love to use that stool as my permanent seating. • They looked comfortable. • Very comfortable. • It was more comfortable. • How comfortable they were.
Movement Opportunity	<ul style="list-style-type: none"> • It let me move during class. • Offers me the opportunity to move while I'm sitting instead of getting up and walking out. • I like to rock. • I like to be able to move while I learn and have options for moving around the room while working with others. • I chose the rocking chair so I can move back and forth. I chose the standing desk to help with the amount of space I can utilize without feeling like my stuff is over powering someone else's space. • Allowed for some movement and engagement of other muscles.
Anxiety & Restlessness	<ul style="list-style-type: none"> • If I was feeling tired or anxious, I wanted a seat that could move so I could fidget. • I fidget and also get restless over time. • It helped me from stop getting distracted. • I tend to get anxious and restless when sitting for long periods of time. • It has helped with my anxiety.
Focus & Engagement	<ul style="list-style-type: none"> • It helped move instead of getting distracted. • Because I hate sitting still trying to pay attention, especially in the evening after a full day of work. • It helped me engage with my peers and instructors in various ways!

standup desk (n=7, 15.6%), saucer chair (n=4, 8.9%), bungee chair (n=3, 6.7%), gaming chair (n=2, 4.4%), or none of these options (n=4, 8.9%). Zero respondents selected the floor rocker.

Open-Ended Replies to Prompts via Google Forms

Almost 80% of the respondents indicated that the flexible seating had a positive effect on their experience in the course.

An analysis of the 44 responses to a question about factors that influenced their decision to choose a particular flexible seating option revealed many diverse factors. While responses included several reasons unrelated to kinesthetic movement, there were four main themes that emerged from the data that specifically mentioned kinesthetics/body physicality: (a) *Movement Opportunity*; (b) *Back Pain & Comfort*; (c) *Anxiety & Restlessness*; and (d) *Focus & Engagement*. Table 2 illustrates selected quotes from students in response to the above prompt.

The Impact of Flexible Seating on Physical Comfort

Concerning the responses from a prompt which inquired about students' perceptions of flexible seating's impact on their physical comfort in class, 15 students indicated flexible seating had a "very significant impact" on their comfort, 15 students indicated flexible seating had a "significant impact on their comfort," 7 students indicated flexible seating had a "somewhat significant impact" on their comfort, and 8 students indicated flexible seating had a "little to no impact" on their comfort. This would suggest the vast majority were indeed more comfortable in class using flexible seating, and they attribute their comfort to flexible seating.

Using a five-item, Likert-type scale ranging from "Strongly Disagree" to "Strongly Agree," students responded to prompts investigating their experience using flexible seating. To the prompt, "the flexible seating was uncomfortable" 36 students reported "strongly disagree" or "disagree". To the prompt, "the flexible seating caused pain when I sat in it" 39 students reported "strongly disagree" or "disagree". Nineteen students agreed, "[they] could concentrate well while sitting in the flexible seating"; 29 agreed or strongly agreed that "the flexible seating as more comfortable than other type of classroom seating", and 29 agreed or strongly agreed that "the flexible seating enabled a variety of classroom activities".

Students Compare Flexible Seating to Traditional Classroom Seating

Students were also asked how they thought the active learning classroom with flexible seating compares to traditional/standard classrooms (i.e. "better," "the same," or "worse"). Students indicated flexible seating was overall

better than the traditional classroom seating arrangement regarding (a) *student-student interactions* - better=29, the same=15, or worse=1; (b) *the ability to concentrate* - better=39, the same=6, or worse=0; (c) *the motivation to learn* - better=36, the same=9, or worse=0; (d) *physical comfort in class* - better=38, the same=7, or worse=0; and (e) *overall learning success* - better=31, the same=14, or worse=0.

Students strongly indicated flexible seating was "better than a traditional classroom" in regard to their ability to focus, interact with classmates, self-motivate, and to learn, overall. While these are not kinesthetic movement, physical activity, or otherwise physical variables factors, there is a correlation between physical comfort and student achievement. (Yang et al., 2021; Rosenkranz et al., 2021). At the conclusion of the survey, students were given the opportunity to expand upon their perspectives, experiences, and thoughts on their flexible seating experiences. Sixteen participants took advantage of this opportunity. Table 3 illustrates selected quotes from students in response to said prompt.

Table 3. Student Respondents to the Prompt: "Other comments, stories, or anecdotes on how flexible seating functioned in your course(s)".
I liked that it was simply <i>different</i> .
I loved having options for flexible seating!
It makes me a better student over all.
Love it! It made more of a difference on me individually than in group interaction.
I wish all of the classrooms I have ever sat in had flexible seating like this!
I LOVE FLEXIBLE SEATING!

As evident from the quotes and self-reported data, those who chose to provide remarks on their experience largely viewed the flexible seating arrangement as comfortable and positive.

Interpretive Results via Observation

This study was a mixed-methods study that used observation data. Researchers observed selected classrooms on first day of class with the flexible seating in a naturalistic inquiry. The researchers visited participating classrooms at least once during the semester to collect observational data related to the research questions.

It was observed that more students gravitated towards flexible seating as the class and semester went on. In addition, students using flexible seating options did, in fact, move with the intended characteristics of the seat. For example, students using the rocking chair rocked back and forth, and students using the Hokki stool wobbled accordingly. Interestingly, students *not* using flexible seating moved, as well. However, their movement was categorized by observers as ‘fidgeting’. For example, students sitting in traditional seating swung their legs back side-to-side, ‘played’ with objects at the table stations, tapped their feet on the ground repeatedly, et cetera.

During observations, one student expressed, “I was able to channel my movement to the rocking chair so that it was less disruptive to others in the class.” Another student was quoted saying, “the [couch] gave me different [sitting position] options and helped make a three-hour class more comfortable... it helped my ADD, and I was able to focus”. Based on the above observations and quotes, it is a reasonable conclusion that the flexible seating provided an outlet for movement students naturally build during class activities.

Observations of the Instructors

Furthermore, this study sought to reveal the perceptions held by instructors teaching in flexible seating classrooms. The instructors in the observational setting were particularly active, themselves; they asked students to stand and move [in order to participate]. Instructors used group work which required movement around the classroom space and encouraged the use of flexible seating to meet their objectives of the learning activities. From the perspective of the observers, the instructors [without any training on how to use flexible seating to maximize its benefits] instinctively recognized the value flexible seating added to their classrooms. During an open-ended discussion with the observer, one instructor expressed that, “students using flexible seating were more engaged and ‘explorative’ of the learning activities than students [not using flexible seating options].”

Discussion

This research provides additional evidence that physically comfortable classrooms promote a sense of well-being, keep minds focused, and limit distractions (Herman Miller, 2008). In addition, this research suggests the potential for physically comfortable classrooms with increased movement opportunities [i.e. flexible seating options] for students make possible mental and emotional health benefits.

This study supplements the literature on learning in the higher education setting. The results suggest that flexible

seating could have measurable and a meaningful effect on creativity, motivation, engagement, collaboration, communication, and critical thinking – the ingredients to learning. As has been discussed, motivating students and keeping them engaged is a crucial component of creating a successful learning experience; thus, the introduction of flexible seating into traditional classrooms can be a low-cost and novel way to engage students by reducing physical discomfort and increasing movement and activity-based interactions while engaging with the course content.

Results indicate the need for campuses to (re)consider the purposes and roles of seating styles within the 21st century classrooms, with seating selection based on principles of universal design (Harvey & Kenyon, 2013). This study suggests a need for further studies on the complex relationships among space, student learning and motivation (Adedokun, et al., 2017). An extension of such scholarship could include training material for instructors using flexible seating on how to maximize its value to the learning environment.









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Appendix

Appendix A. Example of Flexible Seating Options

<p>Stand Up Desk [2]</p> 	<p>Rocking Chair [5]</p> 
<p>Accent Chair/Couch [1]</p> 	<p>Hokki Stool [2]</p> 
<p>Stability Ball [5]</p> 	<p>Saucer Chair [2]</p> 
<p>Ergo Stool [2]</p> 	<p>Floor Rocker [2]</p> 

Appendix B.

Observation Protocol for Flexible Seating Research

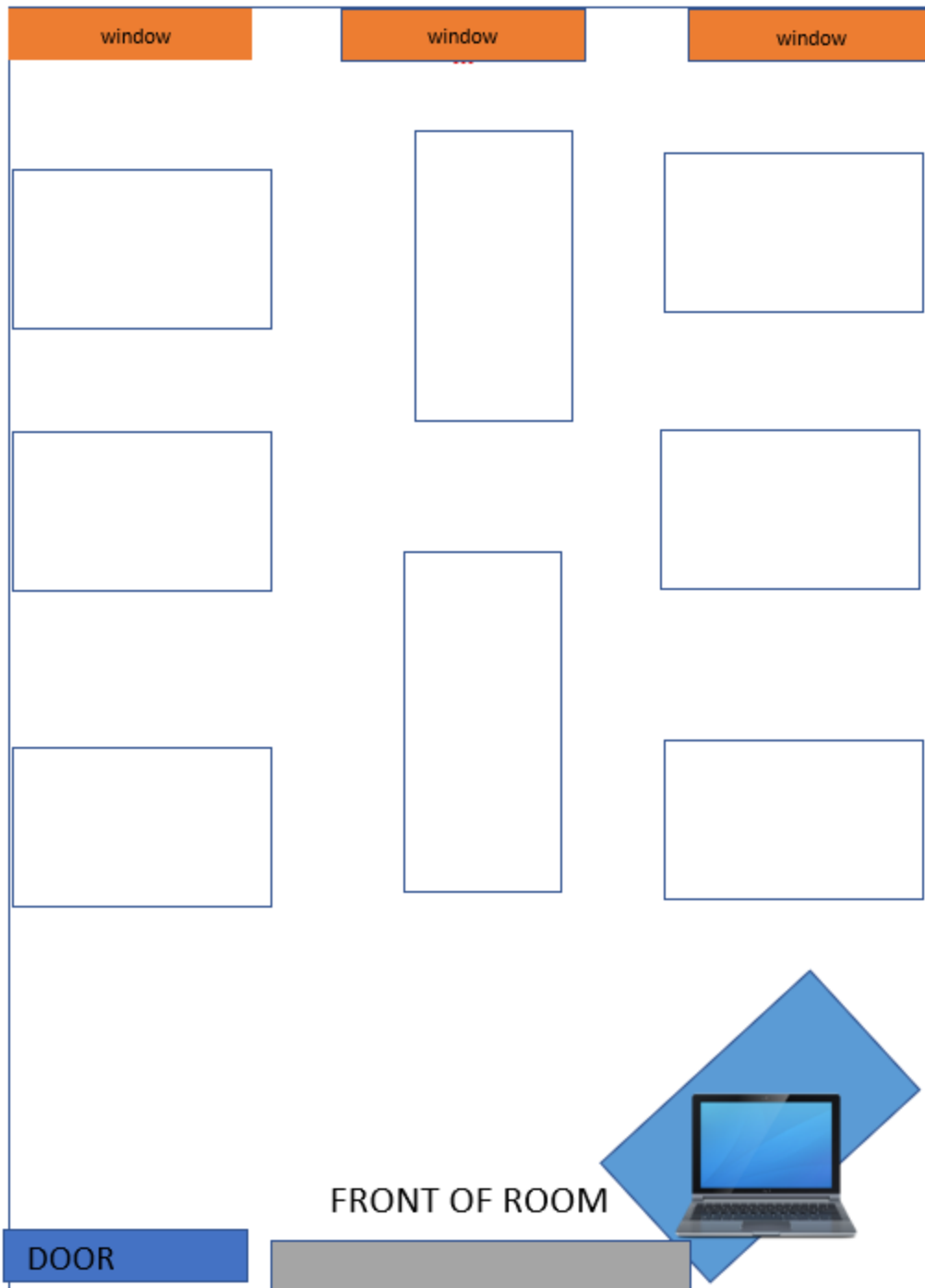
Each active classroom with flexible seating will be observed at least four times each. Hours of observation will vary, based on the instructor’s classroom schedule. The following data will be recorded on an observation worksheet:

1. Classroom Diagram/Photo (record counts, relevant differences, seating locations, movement, sounds etc.)
2. Chart of seating (record quotes, movement, location, interactions, timing, observations, sounds, etc.)
3. Instructor actions/behaviors
4. Student actions/behaviors

Example of Observation Worksheet

Description of the classroom: Record and note counts, course, content, general observations			
Start/end	Instructor behavior	Student behavior (flexible seating)	Student behavior (no flexible seating)
Time record sequences by minute	Describe any relevant actions/behaviors by instructor around flexible seating Describe interactions with students Describe instructional methods	Describe any relevant student actions/behaviors around flexible seating Describe groups or interactions with other students	Describe any relevant student actions/behaviors Describe groups or interactions with other students
9:00 am-9:15 am			
9:15 am- 9:45 am			

Appendix B. Figure 1



Appendix C

Sample of Questions Included on the Student Survey

Open/ended

Did you use the flexible seating regularly throughout the semester?

What factors influenced your decision to choose particular the flexible seating you did? In other words, why did you choose the seating you did?

Likert-scale

The flexible seating was uncomfortable.

The flexible seating was more comfortable than other types of seats in other classrooms.

It was easier to talk to other students when sitting in the flexible seating.

I could engage in learning better/more easily while sitting in flexible seating.

The flexible seating enabled a variety of classroom activities.

I participated more actively in classroom exercises using flexible seating.

Open-ended

What impact did the flexible seating have on student to student interactions in your class?

What impact did the flexible seating have on instructor to student interactions in the class?

What impact did the flexible seating have on your physical comfort in the class?

What impact did the flexible seating have on your motivation to learn in the class?

Open-ended

Opportunities for group work/collaborative learning

Your physical comfort in class

Your overall classroom learning/success