

Exploring the Role of Seating Layouts in Enhancing Elementary Students' Learning Motivation: Evidence from a Controlled Study

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ARTICLE INFO

Keywords:

seating position;
learning motivation;
student engagement;
classroom design;
education

Article history:

Received 2025-02-08

Revised 2025-03-12

Accepted 2025-06-23

ABSTRACT

Classroom seating arrangements have long been considered influential in shaping students' learning experiences, particularly in terms of motivation. This study investigates how seating positions impact students' learning motivation and explores the associated dynamics of social interaction within the classroom setting. A quantitative quasi-experimental design (Nonequivalent Control Group Design) was employed. The study involved 80 fourth-grade students from classes 4A and 4B, selected using a saturated nonprobability sampling technique. Data were gathered through the Motivated Strategies for Learning Questionnaire (MSLQ) and the Classroom Seating Rating Scale for Students (CSRS-S). Data analysis included validity, normality, and linearity tests, followed by hypothesis testing using simple regression. Findings indicated that students seated in the front and middle rows exhibited significantly higher motivation levels than those in the back rows. Contributing factors included increased teacher interaction, stronger peer support, and fewer environmental distractions. Additionally, group seating arrangements were more effective in enhancing motivation compared to individual seating. The results suggest that both seating position and arrangement significantly influence learning motivation. Classroom designs that promote interaction and reduce distractions can positively affect student engagement and motivation. Seating configurations that encourage proximity to the teacher and social interaction, such as group seating in the front or middle rows, enhance students' motivation. These findings have practical implications for optimizing classroom layouts to foster a more engaging learning environment.

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1. INTRODUCTION

Primary education plays a crucial role in shaping the foundational knowledge, skills, and attitudes that students need for their future lives (Chen et al., 2022; Xue et al., 2023). At this level, learning is about transferring information and developing deep cognitive and social skills. Learning motivation becomes a key factor influencing how effectively students engage in the learning process and to what

extent they succeed in mastering the material. Various studies show that learning motivation can significantly impact students' academic achievement, especially at younger ages, where learning habits and attitudes toward education are being formed. However, while the influence of motivation on scholastic success has been extensively studied, little attention has been given to the physical environmental factors in the classroom that play a role in supporting or hindering students' motivation to learn (Gherghel, Yasuda, & Kita, 2020; Lovren & Jablanovic, 2023).

Learning motivation is highly complex and influenced by various internal and external variables. To understand how seating arrangements may affect students' learning motivation, it is essential to refer to several key theories in educational psychology that explain aspects of motivation that can be encountered in a classroom context (Perez-Aranda, Medina-Claros, & Urrestarazu-Capellán, 2024). Generally, learning motivation is divided into two main categories: intrinsic and extrinsic. Each category provides different perspectives on how the physical environment—including seating arrangements—can influence students' learning behaviors. The theories of intrinsic and extrinsic motivation were first proposed by Deci and Ryan in their Self-Determination Theory (SDT) in 1985. According to this theory, intrinsic motivation arises from within the individual, such as curiosity or satisfaction in completing a task, while external factors like rewards, praise, or pressure from the environment influence extrinsic motivation (Gao, Rahaman, Shao, Ji, & Salim, 2022; Hardiansyah, Sukitman, Wahdian, & Hodairiyah, 2024).

The physical environment, including classroom layout and seating positions, is a factor that is often overlooked in educational design, even though it can significantly impact students' learning atmosphere (Bowles et al., 2022; Hardiansyah & Zainuddin, 2022). Various physical environment elements, such as lighting, noise, temperature, and seating distribution, can affect students' comfort, concentration, and social interactions. Seating arrangements, in particular, can influence various aspects of students' learning experiences, including interactions with the teacher, focus abilities, and feelings of acceptance within their learning group. While a substantial body of research reveals the importance of the physical environment in affecting learning outcomes, very few studies specifically investigate how seating arrangements can impact learning motivation at the primary school level. This creates an interesting gap to explore, given the importance of motivation as a primary driver in the learning process during early childhood education.

As educational and psychological theories have developed, classroom seating arrangements have evolved far beyond merely serving practical needs to facilitate the physical flow of students (Mammadov & Tozoglu, 2023). Numerous studies suggest that proper classroom arrangements increase student engagement, improve social interactions, and reduce distractions that could hinder learning. Students seated closer to the teacher tend to have higher engagement levels, while those seated farther away or isolated may feel less involved or ignored. (Langley, Van Horik, Whiteside, & Madden, 2018) research revealed that seating arrangements that support group work or discussion can increase social motivation and collaborative learning, while arrangements that focus more on individual instruction or one-way teaching may reduce students' motivation to participate actively. Therefore, the impact of seating arrangements on learning motivation is highly relevant for research, particularly in primary education, where learning habits and motivation are being formed at a critical stage.

However, despite existing research on seating arrangements, most of these studies have been limited to higher education contexts or studies that do not specifically focus on learning motivation. Furthermore, existing findings often contradict each other or provide only general insights without identifying more specific variables that might influence motivation at the primary school level. Most research has also utilized qualitative approaches or case studies with limited samples, making the results less generalizable or applicable in broader contexts. Additionally, cultural differences and educational systems across countries suggest that what applies in one country or region may not necessarily be relevant or effective in another. Although research on the relationship between seating layout and students' motivation to learn at the elementary school level is limited, this study has several

aspects that make it unique and different from previous studies. First, this study used a controlled research design, which allowed for more accurate and reliable measurements of the effects of seating layout on students' motivation to learn, unlike many previous observational or less structured studies (Noetel et al., 2023). Second, this study did not focus on just one type of seating layout but explored various classroom configurations, including the effects of student spacing, seating orientation, and the social arrangements resulting from these arrangements (Bowles, Scull, & Jimerson, 2022). This aspect is essential because many previous studies have only discussed seating layouts in general terms without detailing the specific elements that potentially influence the dynamics of motivation to learn. Third, this study focused on elementary school students, who are often more sensitive to their physical environment than students at other levels of education (Tekman & Yeniasir, 2023). This makes this study relevant in elementary education and provides new insights for educators to create more supportive learning spaces. Thus, this study not only broadens our understanding of the influence of the physical environment on learning motivation but also offers more applicable, practical recommendations for educators and classroom designers at the elementary school level.

The primary goal of this research is to analyze the impact of seating arrangements on primary school students' learning motivation. The study explores how seating arrangements can influence student motivation, including their engagement in lessons, social interactions, and the level of attention given during the learning process. Specifically, this research will examine the relationship between seating positions closer to the teacher and those farther from the learning center and the differences in motivation that arise in each arrangement. This study examines whether classroom seating positions affect students' motivation levels. Students who sit in the front or middle rows often have better access to instructional attention and direct engagement with the material being taught. Sitting closer to the teacher and the board makes them more engaged in classroom interactions and helps them acquire information more quickly. In contrast, students sitting in the back rows may feel isolated or have a more challenging time focusing on the material, reducing their motivation. This study will evaluate the motivation differences between these two groups to see if seating positions can significantly increase or decrease students' motivation to learn.

Group and individual seating arrangements can have different impacts on student motivation. Group seating allows for social interaction, which can stimulate discussion, collaboration, and the exchange of ideas among students, increasing their confidence and engagement in learning. Students who work in groups may feel more motivated because they feel supported by their classmates and more accountable for their group's contributions. On the other hand, individual seating tends to minimize distractions and allows students who may be more introverted to focus more on the subject matter without social distractions. This study will compare these two seating arrangements to see which is more effective in increasing student motivation in elementary schools, considering how group dynamics and individual needs play a role in the context. This study will also investigate whether external factors, such as gender and personality, play a role in moderating the effect of seating on learning motivation. For example, students with an extroverted personality may find it easier to interact with their classmates, regardless of their seating position, and may be more motivated in a group setting. Conversely, students with an introverted personality may feel more comfortable and focused when sitting alone, without the distraction of social interaction. Likewise, gender differences may influence how students interact in the classroom. Several studies have suggested that males and females may respond differently to social settings in the school. Therefore, this study will explore how these factors may moderate or influence the relationship between seating and learning motivation to provide a more holistic understanding of the factors that influence student motivation.

Furthermore, this research will assess whether other external factors, such as gender, age, or personality type, influence students' reactions to particular seating arrangements. This is important because previous studies have shown that individuals with extroverted personality types may be more motivated in social seating arrangements, while introverted students might feel more comfortable in isolated or individual setups. This study will also examine whether the effects of seating arrangements

on learning motivation persist over the long term or are only temporary, such as during the first session or for a few weeks. Therefore, the findings from this study are expected to provide new insights into how classroom layouts can be adjusted to enhance student motivation in the long run.

A critical contribution of this research is to fill the gap in the literature regarding the impact of seating arrangements on learning motivation at the primary school level. While many studies discuss various aspects of the physical environment in education, very few explicitly test the relationship between seating placement and motivational factors, particularly at the primary school level. This research will also introduce new variables that may not have been fully explored, such as the physical proximity of students to the teacher and its impact on their sense of involvement in the learning process. Moreover, the research will employ a more structured and analytical methodology, namely a quantitative approach, allowing for more valid and generalizable results for a broader population.

Additionally, this research holds significant practical relevance for educators and education designers. By clarifying the relationship between seating arrangements and learning motivation, the findings of this study can provide a strong foundation for policymakers and educators to design more effective classrooms that support students' learning motivation. This knowledge can be used to create seating arrangements that help focus and physical comfort and enhance social engagement and academic motivation. For instance, the research results may show that strategically distributed group-based seating arrangements can improve social dynamics and collaboration, while more individualized seating arrangements may be more suitable for tasks that require higher concentration.

By identifying factors that contribute to improved learning motivation through appropriate seating arrangements, this research also has the potential to offer valuable insights for schools with limited resources to optimize their classroom spaces without requiring significant investment in physical infrastructure. This research also aims to deepen our understanding of how students interact with their physical environment and how such arrangements can be leveraged to achieve better educational outcomes. Therefore, this study will contribute significantly to developing academic theory and practice and offer potential practical solutions that can be applied in many primary schools worldwide. Enhancing learning motivation through better seating arrangements can have long-term effects on students' academic achievement and the overall quality of education, making it a highly relevant and important topic to continue exploring in modern education.

2. METHODS

This study uses a quantitative approach with a quasi-experimental design, specifically the Nonequivalent Control Group Design. This design was chosen to allow for a comparison between two non-randomly selected groups: the experimental group, which is given a specific seating arrangement treatment, and the control group, which does not experience any changes in seating positions. This study will test different classroom seating arrangements to evaluate their impact on student motivation. The seating arrangements tested fall into three main categories: Front Row: Students seated in the front row will have direct access to the teacher's instructional attention and interaction. Middle Row: Students sitting in the middle row can engage in more balanced interactions with the teacher without being too close to the primary instructional source. Back Row: Students seated in the back row will be further away from the teacher and the board, which may affect their attention and motivation levels. In addition, the study will compare group seating (where students sit in small groups or pairs) with individual seating (where each student sits alone at a separate table). This aims to test how social interaction and collaboration in group seating arrangements affect student motivation compared to the more private and focused individual seating.

The intervention in this study will last four weeks, with each student experiencing a predetermined seating arrangement during this period. Each class session will last 90 minutes, with the survey conducted twice a week. Measurements of student motivation will be conducted before and after the intervention period to see significant changes. With this duration, the study is likely sufficient to identify differences in learning motivation that may arise from different seating arrangements.

Students will be rotated to different seating positions throughout the study to control for bias due to individual seating preferences and various learning styles. Each week, students will be moved to a different seating position (e.g., from the front to the middle or back row) and experience group and individual seating arrangements. This ensures that the effect of seating on learning motivation can be tested objectively without being influenced by students' preferences for certain seating positions. Teachers will be given standardized instructions for consistent teaching throughout the study. These instructions will include standard teaching techniques and emphasize equal interaction with all students, regardless of their seating position. This will help reduce potential bias in teacher-student interactions based on seating position. By ensuring that the teaching approach remains consistent, the study can isolate the effects of seating layout as a pure independent variable without being influenced by differences in teacher teaching styles.

The population for this study consists of all 80 students in the 4th grade, divided into two classes, namely class 4A and class 4B, each containing 40 students. This study used a saturated sample, meaning all students in grades 4A and 4B would be involved. This saturated sample was chosen to increase internal validity, given that this study focused on a specific classroom, and the results could provide a deeper understanding of the effects of seating in that classroom context. However, the external validity of the findings of this study is limited to the context of a similar classroom environment, so the study's results may not be widely generalizable to other educational environments that differ in physical or demographic settings. Therefore, although this study provides valuable insights, it is essential to consider that the results are more relevant to classroom environments similar to the 4A and 4B classes tested.

Data collection is carried out using a questionnaire consisting of two main instruments: the Motivation Strategy Learning Questionnaire (MSLQ), which has been adapted to measure overall student learning motivation, including factors related to intrinsic and extrinsic motivation (Soemantri, Mccoll, & Dodds, 2018). This instrument has been adjusted to the context of primary education, with language and questions tailored to the age of the 4th-grade students. The second instrument is the Classroom Seating Rating Scale for Students (CSRS-S), which is used to assess students' perceptions of the seating arrangement in the classroom (Harvey & Kenyon, 2016). This scale provides an overview of how students evaluate the comfort, involvement, and impact of seating positions on their learning experiences. The questionnaire is administered to all students involved in the study before and after the seating arrangement treatment to measure changes in their learning motivation.

Table 1. Learning motivation instruments

Component	Indicator	Description
Value	Intrinsic Goal	Goals or motivations that are oriented from within the student.
	Extrinsic Goal Orientation	Goals or motivations that are oriented towards external factors, such as the environment, both social and physical, or needs provided by other people.
	Task Value	Understanding the importance of understanding the tasks or material being taught.
Expectancy	Control Beliefs about Learning	The belief that understanding of the material can be controlled by oneself through the effort put into learning.
	Self-Efficacy for Learning and Performance	Confidence in the abilities and skills possessed to achieve the desired learning outcomes
Affective	Anxiety	Student anxiety in facing assignments, understanding material, and exams

Table 2. Instrumental Classroom Seating

Indicator	Description
Comfort and Space	The comfort of the seat in terms of material, spaciousness, and other things that are based on the seat itself and the location of the seat itself.
Learning Engagement	How the seating position on the chair or table occupied can affect the quality of student learning
Interactivity	Ease of interaction between students and teachers and other students when occupying these seats.

This questionnaire is administered to all students involved in the study, before and after the seating arrangement treatment, to measure changes in their learning motivation. The data obtained from the questionnaire will be analyzed through several stages of statistical testing to ensure the validity and reliability of the instruments and test the research hypotheses. The data analysis techniques used include: validity test, this test is conducted to measure the extent to which the instrument used in this study can measure what it is intended to measure. Validity is determined if the correlation coefficient (r -count) $>$ r -table for the degree of freedom (df) = $n - 2$, where n is the sample size. If r -count $<$ r -table, the item is considered invalid. The r -table value of 0.220 is obtained from the r -table at $df = 78$ and a significance level of 0.05. reliability test. This test aims to assess the instrument's consistency and reliability in measuring the same variables. The questionnaire's reliability will be tested using Cronbach's Alpha coefficient with a significance level of 5% or 0.05. A Cronbach Alpha coefficient more significant than 0.60 or 60% indicates that the instrument is reliable, while a coefficient less than 0.60 indicates that the instrument is unreliable.

Normality test this test determines whether the data distribution is normal or not. It is essential to decide on the appropriate statistical analysis method. Normality will be tested using the Kolmogorov-Smirnov Test with a significance level 0.05. Linearity test: This test ensures that the relationship between the independent variable (seating arrangement) and the dependent variable (learning motivation) is linear. The Linearity Test uses Curve Fit, where if the significance value for the linear model is $<$ 0.05 and the significance value for deviation from linearity is $>$ 0.05, the independent variable has a linear relationship with the dependent variable. Hypothesis testing hypothesis testing will be conducted to examine whether the seating arrangement significantly affects students' learning motivation. Two types of hypothesis tests will be used: a Simple regression test. This test examines the effect of the independent variable (seating arrangement) on the dependent variable (learning motivation) by assessing how much change in learning motivation can be explained by changes in the seating arrangement. The decision rule is that if the t -calculated value $>$ t -table and the significance value $<$ 0.05, the independent variable significantly affects the dependent variable. Conversely, if t -calculated $<$ t -table and the significance value $>$ 0.05, the independent variable does not significantly affect the dependent variable. Coefficient of determination (R^2), this test determines how much of the variance in learning motivation can be explained by the effect of the seating arrangement. It provides an overview of the strength of the relationship between the two variables. Through this analysis, the study aims to identify the significant influence of seating arrangement on students' learning motivation and provide a clear understanding of the mechanisms involved in this process.

3. FINDINGS AND DISCUSSION

The research results used several components as benchmarks for studying students' learning motivation. These components were adopted from the Motivation Strategy Learning Questionnaire (MSLQ). Based on these components and indicators, there are 30 items from the MSLQ scale, which the researcher then adapted to 28 items. The adaptation of the items was done to adjust the language and culture so that respondents could understand each item. In addition to the language and cultural adaptation, the researcher conducted validity and reliability tests to ensure that the adapted items were suitable for research measurement tools. The data obtained was then processed using SPSS 24, resulting

in the highest score of 115, the lowest score of 71, an average score of 94.35, and a standard deviation of 6.

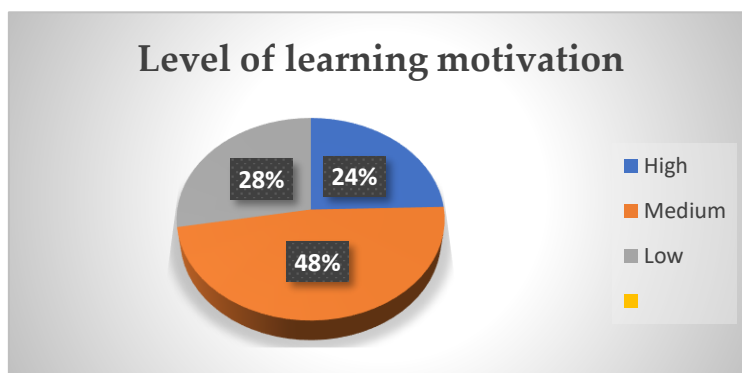


Figure 1. Categorization of learning motivation levels

Based on Diagram 1 above, the results show that 24% of students are in the high category, with a frequency of 18 students, 48% are in the medium category, with a frequency of 43 students, and 28% are in the low category, with a frequency of 19 students. This indicates that the frequency and percentage of students' learning motivation in grade IV mostly fall into the medium category. Based on several dimensions used as benchmarks for studying classroom seating, these were adopted from the Classroom Seating Rating Scale for Students (CSRS-S). There are 15 items from the CSRS-S scale, which were then adapted by the researcher, with the number of items remaining the same. The items were adapted to adjust the language and culture so that the respondents could understand each item. The data obtained were then processed using SPSS 24, resulting in a highest score of 60, a lowest score of 33, an average score of 46.8, and a standard deviation of 4.25.

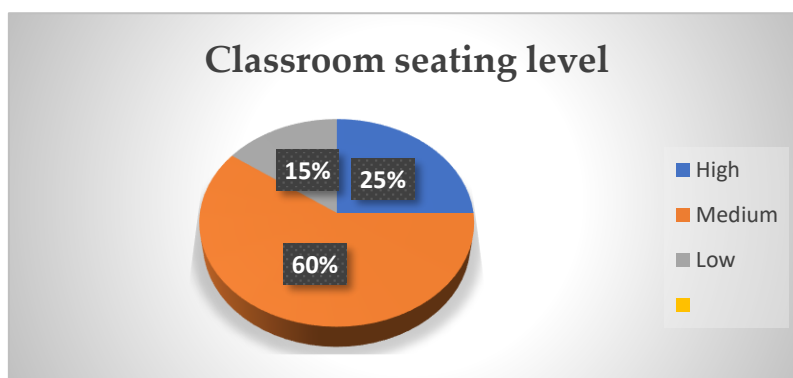


Figure 2. Classroom seating level categorization

Based on Diagram 2 above, the results show that 25% of students are in the high category, with a frequency of 20 students, 60% are in the medium category, with a frequency of 48 students, and 15% are in the low category, with a frequency of 12 students. This indicates that the frequency and percentage of classroom seating levels in grade students mostly fall into the medium category.

Table 3. Reliability test results

Variable	Koef. Alpha	Information
Motivation to learn	0.854	Reliable
Classroom Seating	0.744	Reliable

The normality test determines whether the data population follows a normal distribution. In this study, the normality test was conducted using the Kolmogorov-Smirnov Test and a probability plot, assisted by SPSS 24. The data is usually distributed if the significance probability is > 0.05. This study showed that students sitting in the front and middle rows showed higher motivation levels than students sitting in the back rows. This finding suggests that seating position can significantly affect

students' level of engagement and attention in learning. Several potential factors that can influence students' motivation in the classroom need to be considered. One of them is teacher-student interaction. Teachers closer to students in the front and middle rows have more opportunities to provide individual attention, clarify material, and encourage active student participation. This can increase students' sense of engagement and boost their motivation to contribute to learning. In contrast, students in the back rows may feel less involved in direct interaction with the teacher, which can reduce their motivation. In addition, peer support can also play a role in increasing learning motivation. Students who sit close to their peers, especially in group settings, often feel more encouraged to participate and discuss. This social support, more readily available to students in the front and middle rows, can facilitate more active learning and increase self-confidence. Students who sit further away from their peers, such as in the back rows, may feel more isolated, which can reduce their motivation.

Table 4. Normality Test Results

		Unstandardized Residual
N		80
Normal Parameters	Mean	.000000
	Std. Deviation	8.333167
Most Extreme Differences	Absolute	0.96
	Positive	0.54
	Negative	-0.96
Kolmogorov-Smirnov Z		.870
Asymp. Sig. (2-tailed)		.550

Based on the table above, the Kolmogorov-Smirnov Test statistic value is 0.870 with a probability (p) = 0.550. The data is usually distributed based on the decision rule for significance (p) being $0.450 > 0.05$. Therefore, it can be concluded that the normality assumption is met.

Table 5. linearity test results

Variables	Sig. (p)	Sig. Deviation from linearity	Information
X to Y	.000	0.675	Linear

Based on the data above, the significance value of the linear model is $0.000 < 0.05$, and the significance value of the deviation from linearity is $0.675 > 0.05$. Therefore, classroom seating has a linear relationship with students' learning motivation. Furthermore, the researcher uses a partial t-test to determine whether the independent variable has a significant partial effect on the dependent variable. The decision rule is that if the calculated t-value $>$ t-table value and the significance value $<$ 0.05, the independent variable significantly affects the dependent variable. The formula for determining the t-table value is $(\alpha/2; n-k-1)$, where α is the confidence level, typically set at 0.05 for non-scientific fields, n is the number of respondents, and k is the number of independent variables. Therefore, $(0.025; 78)$ from the t-distribution table gives a t-table value of 1.885.

Table 6. Simple regression test results

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig
	B	Std. error			
1 (constant)	54.734	7.665		7.556	.000
Classroom Seating	.729	.144	.521	5.421	.000

Based on the table above, the significance value of the effect of classroom seating (CSRS) on learning motivation (MSLQ) is $0.000 < 0.05$, and the calculated t-value is $5.421 > 1.885$, with no negative sign found in the results of the analysis. This means that classroom seating has a positive and significant effect on the learning motivation of 4th-grade students. Therefore, the null hypothesis (H_0), which states that classroom seating has no significant positive impact on students' learning motivation, is rejected. Conversely, the alternative hypothesis (H_1), which states that classroom seating has a significant positive effect on students' learning motivation, is accepted.

Table 7. Determination test results

Model	R	R Square	Adjusted R-squared	Std. Error of the Estimate
1	.519	.277	.284	8.161

Based on the analysis results, the coefficient of determination (R^2) value obtained is 0.277. This indicates that 27.7% of the variation or diversity in students' learning motivation can be explained by the independent variable used in the research model, classroom seating. In other words, 27.7% of the influence on students' learning motivation can be attributed to the impact of classroom seating arrangement. Conversely, the remaining 72.3% is influenced by other factors outside the scope of this study, which are not explained within the model.

Discussion

Various factors, including effective classroom management, can strengthen student motivation. Classroom seating is one aspect of classroom management that prioritizes comfort and flexibility, particularly regarding seating arrangements that enhance students' enthusiasm during lessons. Students can focus better on their studies and complete their tasks with proper seating arrangements. This aligns with (Strijbos & Wichmann, 2018) statement that appropriate classroom environment arrangements positively impact students' engagement and participation in the learning process. Moreover, seating arrangements influence the amount of time students spend on tasks. Classroom management aims to create an environment conducive to supporting the learning process. Thus, seating arrangements, as part of classroom management, can help create a learning environment aligned with educational goals. Improper seating arrangements, lack of flexibility, or difficulty in movement during lessons may lead to disengaged students, even if teachers frequently change or move students' seats (Schmäing & Grotjohann, 2024).

In addition, peer support can also play a role in increasing motivation to learn. Students who sit close to their peers, especially in group settings, often feel more encouraged to participate and engage in discussions. This social support, more readily available to students in the front and middle rows, can facilitate more active learning and boost their self-confidence. Students who sit farther away from their peers, such as in the back rows, may feel more isolated, which can reduce their motivation. Classroom distractions are another factor that can affect motivation. The front and middle rows are typically closer to the lecture, while the back rows tend to be more exposed to external distractions, such as sounds from outside the classroom, noise from other students, or a lack of visibility of the material being taught. These distractions can affect the concentration of students in the back rows and reduce their motivation to learn. The finding that students in the front and middle rows are more motivated can be explained by several mechanisms. One primary reason is better teacher interaction. Students who sit closer to the teacher have a greater opportunity to participate in class discussions, receive direct feedback, and ask questions if they are struggling with the material. In contrast, students in the back rows may feel left out or have difficulty following instructions due to their greater distance from the teacher (Al-Ramahi, Iranmanesh, & Denerel, 2023; Kassab, Al-Eraky, El-Sayed, Hamdy, & Schmidt, 2023).

In addition to quantitative data, qualitative insights from student feedback provide a deeper understanding of the reasons behind these findings. Many students sitting in the front and middle rows reported feeling more "connected" to instruction because they could see the teacher clearly and found it easier to ask questions or provide feedback. On the other hand, students in the back rows reported difficulty hearing or seeing the material clearly and feeling more awkward interacting directly with the teacher. Several students also noted that they felt more motivated when they were able to interact with peers, which was easier to do if they were sitting near their friends. However, while there was a clear trend toward students in the front and middle rows being more motivated, it is essential to note that personality factors and individual preferences also play a role. Some students preferred sitting in the back rows because they felt more comfortable or preferred working independently without too many social distractions.

Furthermore, this study shows that significant motivation differences are influenced by the physical distance from the teacher and the social setting within the classroom. In classrooms with more flexible and dynamic seating arrangements, where students can choose their seats, motivation tends to be higher, especially among students who are more proactive in interacting with the teacher and their peers (Goagoses et al., 2024; Weinstein, 2023). This highlights the importance of social interaction in enhancing students' engagement in the learning process (Rance, Dowell, & Tomlin, 2023). This research contributes significantly to existing theories in educational psychology and learning environment theories. Theoretically, the findings strengthen the view that student engagement is a key factor in learning motivation (Tao et al., 2023; Zhang, 2023). Engagement occurs not only in terms of active participation in learning but also through external factors that affect students' comfort and accessibility to the teacher and material. Therefore, theories that consider motivation as the result of the interaction between internal and external factors in the classroom receive further support from these findings.

Practically, the results of this study provide substantial implications for classroom designers and educational managers in determining optimal seating arrangements. Schools and educational institutions should consider that seating arrangements near the teacher can encourage student motivation and engagement. Implementing this strategy will benefit students with high learning abilities and those who require more attention and support. Therefore, the design of more flexible and dynamic classroom spaces, which allows for rearranging seats according to students' needs and learning styles, is highly recommended. This approach will create a more inclusive and adaptive learning environment that can improve overall educational quality. On the other hand, this study opens opportunities for further development in teaching practices. For instance, teachers can evaluate the most suitable seating positions for individual students' needs and adjust classroom arrangements to facilitate more effective group discussions. This may also involve utilizing technology, such as software-based applications, to monitor student engagement and provide more immediate and personalized feedback.

One of this study's unique contributions is its emphasis on the more specific effects of seating position in the elementary classroom and the impact of social interactions in group versus individual seating arrangements. While previous studies have focused on other variables, such as instructional quality or more general environmental factors (Mills et al., 2015), few have explored in depth how a time-limited change in seating position may impact students' motivation to learn, particularly in terms of physical proximity to instruction and peers.

In addition, this study offers a more holistic view by including external moderator variables, such as student gender and personality. This contributes to the broader literature, which primarily considers seating factors without considering students' factors that may influence their responses to particular seating arrangements. These findings on differences in motivation based on seating arrangement are further strengthened by qualitative insights that suggest that students who feel more connected to their teachers and peers (both physically and socially) tend to report higher levels of motivation. This study also focuses on elementary classrooms, a population often overlooked in general studies of seating arrangements and motivation to learn. Therefore, this study not only enriches our understanding of the factors influencing motivation in the classroom but also provides practical recommendations for classroom design that better supports students' motivation at the elementary level, which is a critical stage of education in shaping students' learning habits and attitudes towards education.

This study also has important social and ethical implications, especially in the context of educational policy and classroom design. One issue is that seating arrangements prioritizing proximity to the teacher may create disparities in attention and access to education for specific student groups. Therefore, ensuring optimal seating arrangements do not discriminate or marginalize students seated at the back of the classroom is essential. Fair and inclusive policies must be applied to ensure that all students, without exception, have equal access to engage in the learning process. Furthermore, using technology to monitor seating positions and student engagement may raise ethical concerns regarding privacy and data collection. While technology can provide valuable insights, it is important to balance

the use of technology to enhance learning experiences with protecting student privacy. Future research should address these privacy issues and ensure that all collected data is used ethically and complies with regulations. In conclusion, this study's findings offer valuable insights into how physical classroom arrangements affect student motivation and can help shape more effective and inclusive educational policies. However, to ensure that implementing these findings benefits all stakeholders, it is crucial to address the potential social and ethical challenges that may arise.

4. CONCLUSION

This study revealed that students' seating position in the classroom has a significant influence on their level of learning motivation. Students sitting in the front and middle rows showed higher motivation levels than those sitting in the back rows. This finding is consistent with previous studies emphasizing the importance of students' physical proximity to instruction and direct interaction with the teacher as factors supporting student engagement and motivation. Factors such as teacher-student interaction, peer support, and classroom distractions also influence motivation levels, with students in the front and middle rows tending to experience fewer distractions and having more opportunities to interact with the teacher. Using a controlled experimental design, this study adds to the strong evidence that the physical arrangement of classrooms influences student motivation, which can be applied in designing more effective learning environments, especially at the elementary school level. To deepen our understanding of the influence of seating arrangement on learning motivation, further research can involve a broader and more diverse sample, considering differences in culture, age, and more specific educational contexts.

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