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The Relationship Between VARK Learning Styles and Students' Perceptions of the Classroom Learning Environment

Alifia Dewi Hariyani[1)✉], Susy Budi Astuti[2)], Prasetyo Wahyudie[3)], Anggri Indraprasti[4)]

✉[1)] *Interior Design Department, Sepuluh Nopember Institute of Technology, Surabaya, Indonesia*
E-mail: 6029241019@student.its.ac.id
[2)] *Interior Design Department, Sepuluh Nopember Institute of Technology, Surabaya, Indonesia*
E-mail: susy@interior.its.ac.id
[3)] *Interior Design Department, Sepuluh Nopember Institute of Technology, Surabaya, Indonesia*
E-mail: prasetyo@interior.its.ac.id
[4)] *Interior Design Department, Sepuluh Nopember Institute of Technology, Surabaya, Indonesia*
E-mail: anggri@interior.its.ac.id

✉ Correspondence Author

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Abstract
This study examined elementary school students' learning style preferences based on the VARK (Visual, Aural, Reading/Writing, and Kinesthetic) model and aimed to explore how these preferences relate to students' perceptions of the classroom learning environment. A quantitative approach was used, involving 120 sixth-grade students at an elementary school in Pontianak. Data were collected through the VARK questionnaire and the classroom environment perception questionnaire. Data were analyzed using descriptive statistics and Welch's ANOVA to identify the distribution of learning styles and examine differences in students' perceptions of the classroom environment. The findings indicated that unimodal learning styles were more dominant, with kinesthetic as the most common preference among students. The analysis revealed no significant differences in students' perceptions of the classroom environment across the various learning style groups. These findings suggest that although students have different learning preferences, they tend to perceive the classroom environment in similar ways. Therefore, understanding students' learning styles can support the development of more responsive and inclusive learning environments in elementary schools.

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INTRODUCTION

Learning is a complex process influenced by various internal and external factors (Illeris, 2018; Schunk, 2020). One important internal factor is students' learning style, which reflects how individuals prefer to receive, process, and understand information (Newton & Miah, 2017). In

elementary education, understanding students' learning styles is particularly important, as it can help create more effective and engaging learning experiences (Husmann & O'Loughlin, 2019). However, in practice, many students are not fully aware of their own learning preferences, and classroom learning environments are often designed without considering these differences (Newton & Salvi, 2020). The VARK model, introduced by Fleming, categorizes learning styles into four modalities: visual, aural, read/write, and kinesthetic (Fleming, 2012). This model has been widely used to understand how students interact with learning materials and activities (Husmann & O'Loughlin, 2019). Each modality represents a different way of processing information, suggesting that students may respond differently to the same learning environment (Newton & Miah, 2017). Despite its relevance, the application of learning style theory, particularly VARK, is often limited to instructional strategies and rarely linked to the physical characteristics of the classroom (Newton & Salvi, 2020).

Students' perceptions of the classroom environment play a significant role in shaping their engagement and learning outcomes. Research has shown that students who perceive their learning environment as supportive and comfortable tend to demonstrate higher levels of participation and motivation (Fraser, 2012; Cheryan et al., 2014). In elementary education, these perceptions are particularly important, as younger learners are more sensitive to environmental conditions and rely heavily on physical and social cues within the classroom (Cleveland & Fisher, 2014). Furthermore, recent studies emphasize that classroom design and learning environments should not only support instructional delivery but also accommodate students' diverse learning characteristics (Kariippanon et al., 2019). Flexible and well-designed learning spaces have been shown to enhance collaboration, engagement, and overall learning experience among students (Byers et al., 2018; Kariippanon et al., 2019). Despite these findings, the integration between students' learning styles and their perceptions of classroom environments, particularly at the elementary level, remains underexplored. In the context of elementary education in Indonesia, classroom environment has been shown to significantly influence students' motivation and learning outcomes (Satriani et al., 2023; Mayasari et al., 2025). Students' perceptions of their learning environment also play an important role in shaping their engagement during the learning process (Sumarli, 2021).

The physical environment of a classroom, such as layout, visual elements, and spatial arrangement, can influence students' comfort, engagement, and overall learning experience (Barrett et al., 2019). Students' perceptions of their learning environment are therefore an important aspect to consider, as these perceptions can affect how they participate in and respond to learning activities (Cleveland & Fisher, 2014; updated discussions in Byers et al., 2018). Previous studies have explored learning styles and classroom environments separately. However, studies that examine the relationship between students' learning styles and their perceptions of the elementary classroom environment remain limited. This gap highlights the need to better understand how different learning preferences relate to how students experience their learning spaces. Based on this background, this study aims to analyze elementary school students' learning style preferences based on the VARK model and examine their relationship with students' perceptions of the classroom learning environment.

METHODS

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This study used a quantitative research approach to examine students' learning style preferences and their relationship to perceptions of the classroom learning environment. The study was conducted in one elementary school in Pontianak, Indonesia. Participants were selected using a total sampling technique, ensuring that all sixth-grade students in the selected classes were included in the study. A total of 155 students participated in the study. After data screening, 153 responses were deemed valid for the VARK questionnaire, while two responses were excluded due to incomplete data. Furthermore, only respondents who completed both the VARK questionnaire and the classroom perception questionnaire were included in the analysis, resulting in 143 valid cases. For the inferential analysis using Welch's ANOVA, only students classified into unimodal VARK learning style groups were included, resulting in 120 participants. Data were collected using two main instruments. The first instrument was the VARK questionnaire, which was used to identify students' learning style preferences across four modalities: visual, aural, reading/writing, and kinesthetic. The VARK questionnaire used in this study was adapted from the official VARK website (www.vark-learn.com). The second instrument was the classroom perception questionnaire, designed to capture students' perceptions of various aspects of their classroom, such as naturalness, individualization, and stimulation. These aspects were further divided into ten specific classroom environment components.

The classroom perception questionnaire used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The perception scores were calculated using the mean score of all questionnaire items for each respondent and then averaged to obtain the overall mean score. The interpretation of the mean scores was determined by calculating the interval width based on the scale range and the number of categories. The interval width was calculated as follows:

$$\text{Interval width} = (5 - 1) \div 5 = 0.8$$

The interpretation categories of the Likert scale are presented in Table 1.

Table 1. Interpretation of Likert Scale Mean Scores

Mean Interval	Category
1.00 – 1.80	Strongly Disagree
1.81 – 2.60	Disagree
2.61 – 3.40	Neutral
3.41 – 4.20	Agree
4.21 – 5.00	Strongly Agree

Prior to data collection, both instruments were reviewed to ensure their clarity and appropriateness for elementary school students. The questionnaires were then administered directly to participants during school hours with guidance to ensure all students understood the questions. The collected data were analyzed using descriptive and inferential statistical techniques with the assistance of Jamovi software. Descriptive statistics were used to determine the distribution of students' learning styles and the mean scores of classroom environment perceptions. Prior to hypothesis testing, the normality assumption was tested using the Shapiro-Wilk test, while the homogeneity of variance assumption was examined using Levene's test. Furthermore, Welch's

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ANOVA was employed to analyze differences in students' perceptions of the classroom learning environment across the four unimodal VARK learning style groups (visual, aural, read/write, and kinesthetic). This analysis aimed to identify whether different learning style preferences were associated with variations in how students perceived their learning environment.

RESULTS AND DISCUSSION

1. Distribution of Students' Learning Styles

The distribution of students learning styles based on the VARK model is presented in Table 2.

Table 2. Distribution of Students' VARK Learning Styles

	VARK Learning Style	Number of People	Percentage
Unimodal	V	10	
	A	38	
	R	34	
	K	47	
	Total	129	84.31%
Bimodal	VK	1	
	VA	3	
	VR	1	
	AK	6	
	AR	3	
	RK	6	
	Total	20	13.07%
Trimodal	VRK	2	
	VAR	1	
	Total	3	1.96%
Quadmodal	VARK	1	
	Total	1	0.65%
Total Number		153	100%

The results show that the majority of students exhibit a unimodal learning preference (84.31%), while 13.07% demonstrate bimodal preferences, 1.96% trimodal, and only 0.65% quadmodal learning styles. Among the unimodal categories, kinesthetic (30.72%) is the most dominant modality, followed by aural (24.84%), read/write (22.22%), and visual (6.54%). In the bimodal category, combinations such as AK and RK are the most frequent, each consisting of six students, while other combinations appear in smaller numbers. Trimodal and quadmodal learning styles are relatively rare, indicating that only a small proportion of students use multiple learning modalities simultaneously. These findings indicate that most students tend to rely on a single dominant learning style, with kinesthetic preference being the most prominent. This suggests that learning activities involving physical engagement and hands-on experience may be particularly relevant in supporting students' learning processes.

2. Students' Perceptions of the Classroom Learning Environment

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Students' perceptions of the classroom learning environment are presented in Table 3. The results are categorized into three main indicators: naturalness, individualization, and stimulation.

Table 3. Students' Perceptions of Classroom Learning Environment

Indicator	Mean	Category
Naturalness	3.44	Agree
Individualization	3.53	Agree
Stimulation	3.32	Neutral

The findings show that the individualization aspect has the highest mean score (M = 3.53 out of 5), which falls into the "agree" category. This indicates that students generally feel that elements such as classroom ownership, layout, and flexibility support their learning activities. The naturalness aspect, which includes lighting, air quality, temperature, sound, and the presence of natural elements, also received a positive response (M = 3.44 out of 5), suggesting that the physical conditions of the classroom are generally perceived as comfortable. In contrast, the stimulation aspect, which relates to color and spatial complexity, has a lower mean score (M = 3.32 out of 5) and falls into the "neutral" category. This suggests that visual and aesthetic elements in the classroom may not be fully optimized to support students' learning experiences. Overall, these findings indicate that while students tend to have positive perceptions of classroom conditions, certain aspects still require improvement to better support the learning process.

3. Relationship Between Learning Styles and Classroom Perceptions

The relationship between students' learning styles and their perceptions of the classroom learning environment was analyzed using Welch's ANOVA test. This test was employed because the study aimed to compare the mean perception scores across four independent unimodal VARK learning style groups (visual, aural, read/write, and kinesthetic). Prior to the analysis, the assumptions of normality and homogeneity of variances were tested to ensure the validity of the analysis. The normality test using the Shapiro-Wilk method indicated that all groups met the assumption of normal distribution, with significance values greater than 0.05 for each learning style category. The Shapiro-Wilk test was selected because it is considered appropriate and robust for small to moderate sample sizes. The Shapiro–Wilk normality test results are presented in Table 4. All groups showed significance values greater than 0.05, indicating that the data were normally distributed.

Table 4. Shapiro-Wilk Normality Test Results

Learning Style	W	P
Aural	0.962	0.252
Kinesthetic	0.953	0.075
Read/Write	0.975	0.664
Visual	0.967	0.860

In addition, the homogeneity of variances test using Levene's test showed a significance value of p = 0.950, indicating that the variances across groups were homogeneous. The homogeneity test results are presented in Table 5. The significance value was greater than 0.05, indicating that the assumption of homogeneity of variances was met.

Table 5. Homogeneity of Variances Test

F	df1	df2	P
0.117	3	116	0.950

The Welch's ANOVA results are presented in Table 6. The analysis showed no significant difference in students' perceptions of the classroom learning environment across different learning style groups ($p > 0.05$).

Table 6. Welch's ANOVA Results

Variable	F	df1	df2	P	Interpretation
Classroom Learning Environment Perception	1.04	3	36.5	0.385	No significant difference

4. Discussion

The findings of this study provide several important insights into students' learning styles and their perceptions of the classroom learning environment. First, the results show that kinesthetic learning style is the most dominant among students. This suggests that elementary school students tend to prefer learning through direct experience, physical activity, and active engagement. This finding may reflect students' preference for active and movement-based learning experiences, as previous studies have suggested that multimodal and interactive learning environments can enhance engagement and learning effectiveness (Firmansyah, 2021). Similarly, recent research on multimodal learning has shown that the integration of multiple sensory stimuli, such as visual, aural, verbal, and tactile elements, can improve cognitive performance, learning engagement, and students' sense of presence during classroom activities (Luo, 2023).

Such a tendency is consistent with the characteristics of young learners, who generally learn more effectively through hands-on activities rather than passive instruction. In terms of classroom perception, students generally reported positive responses, particularly in the aspects of individualization and naturalness. This indicates that elements such as classroom layout, flexibility, lighting, and overall physical conditions are considered supportive of the learning process. However, the stimulation aspect, which includes visual elements such as color and spatial complexity, received a relatively lower score. This finding suggests that the visual and aesthetic quality of the classroom environment may not yet be fully optimized to enhance students' learning experiences.

Interestingly, the results of the Welch's ANOVA indicate that there is no significant difference in classroom perception across different learning style groups. This suggests that, although students may have different preferred ways of learning, their overall perceptions of the classroom environment do not significantly differ. One possible explanation is that the classroom environment provides a relatively uniform experience for all students, regardless of their individual learning preferences. These findings highlight that while learning styles are important in understanding how students engage with learning activities, the overall quality of the classroom environment plays a broader role that affects all students in a relatively consistent manner. Recent studies have questioned the effectiveness of strictly matching instruction with students' learning

styles. A meta-analysis by Clinton-Lisell (2024) found limited empirical evidence supporting the learning styles hypothesis, suggesting that flexible instructional approaches may be more beneficial for diverse learners.

Therefore, instead of designing learning environments that cater exclusively to specific learning styles, it may be more effective to create flexible and inclusive classroom environments that can accommodate a range of learning preferences. This perspective aligns with previous studies on multimodal learning, which emphasize the importance of integrating diverse learning materials, digital media, physical environments, and interactive resources to support students' engagement and diverse learning needs in schools (Ekowati et al., 2024). It is further supported by Hutapea et al. (2026), who found that adaptive learning media based on Universal Design for Learning principles promote accessibility, active participation, and inclusive learning experiences through multimodal approaches.

Overall, this study emphasizes the importance of integrating both pedagogical and environmental considerations in designing effective learning spaces. By understanding students' learning characteristics and how they perceive their environment, educators and designers can work together to create classrooms that better support diverse learning needs.

CONCLUSIONS

This study examined students' learning style preferences based on the VARK model and their relationship with perceptions of the classroom learning environment. The results show that unimodal learning styles are more dominant, with kinesthetic being the most prevalent among elementary school students. In terms of classroom perception, students generally reported positive responses, particularly in the aspects of individualization (M = 3.53 out of 5) and naturalness (M = 3.44 out of 5), while stimulation received relatively lower evaluations (M = 3.32 out of 5). The findings of Welch's ANOVA indicate that there is no significant difference in students' perceptions of the classroom environment across different learning style groups ($F = 1.04$, $p = 0.385$). This suggests that, although students have different learning preferences, they tend to perceive the classroom environment in a similar way. Therefore, the findings indicate that learning style differences do not necessarily lead to different perceptions of the classroom learning environment. These results highlight the importance of designing classroom environments that are flexible and supportive for a wide range of learning preferences, rather than focusing on a single learning style. Future studies are recommended to explore more specific design interventions that can enhance classroom environments and better support diverse student needs.

CONFLICTS OF INTEREST STATEMENT

The author declares that there is no conflict of interest regarding the publication of this paper.

AUTHOR CONTRIBUTIONS

The first author was responsible for the research design, data collection, data analysis, and manuscript writing. The co-author provided academic supervision, conceptual guidance, and critical revisions to improve the quality of the manuscript.

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