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Learning Outcomes and Inclusive Character Among Elementary Students: A MANOVA Analysis Based on Visual, Auditory, and Kinesthetic Learning Preferences

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ABSTRACT

Learning outcomes and inclusive character are essential indicators of quality elementary education, yet their relationships across students with different learning preferences remain insufficiently understood. Previous studies have generally examined these variables separately, providing limited evidence within an integrated framework. This study analyzed the relationships between learning outcomes and inclusive character based on visual, auditory, and kinesthetic learning preferences among elementary school students. A quantitative cross-sectional comparative design was employed involving 54 fourth-grade students selected through saturated sampling. Learning outcomes were measured using essay tests, while inclusive character and learning preferences were assessed through questionnaires. PLS-SEM was used exclusively to evaluate instrument validity and reliability, whereas MANOVA examined group differences and hypothesis testing. The multivariate results showed no significant simultaneous effect of learning preferences on learning outcomes and inclusive character (Wilks' Lambda = 0.406–0.712, $p > 0.05$). However, auditory learning preference demonstrated a significant partial effect on learning outcomes ($F = 2.183$, $p < 0.05$), while visual and kinesthetic preferences showed no significant effects. These findings suggest that learning outcomes and inclusive character are influenced more by overall instructional quality than by learning preference classifications alone. The study extends understanding of learning preferences in inclusive elementary education and supports adaptive, student-centered instructional practices.

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1. INTRODUCTION

Student learning outcomes in elementary education represent the achievement of competencies across cognitive, affective, and psychomotor domains, serving as key indicators of successful classroom learning processes [1]. Learning outcomes are influenced

not only by students' intellectual abilities but also by internal factors such as character, motivation, and individual learning preferences [2]. Differences in students' learning characteristics reflect the diversity of ways in which learners receive, process, and understand information within elementary school settings [3]. Visual, auditory, and kinesthetic learning preferences are among the most widely used approaches for explaining variations in how students absorb and engage with learning materials [4]. The implementation of instructional strategies aligned with students' learning preferences has the potential to enhance learning effectiveness in the classroom [5]. At the same time, the assumption that instructional effectiveness can be improved solely by matching teaching approaches with students' visual, auditory, or kinesthetic learning preferences remains a subject of ongoing academic discussion. This debate suggests that learning preferences should be interpreted as one of several learner characteristics rather than as the only determinant of academic success. These conditions suggest that improving learning outcomes cannot rely solely on uniform instructional approaches but requires a deeper understanding of the diverse characteristics of individual learners.

Inclusive character has become an essential aspect of elementary education, emphasizing acceptance of diversity in students' abilities, backgrounds, and learning needs [6]. Strengthening inclusive character contributes to the creation of equitable, collaborative, and discrimination-free learning environments in elementary schools [7]. Social interactions within inclusive classrooms encourage students to respect differences and develop empathy throughout the learning process [8]. Inclusive-oriented educational practices play a significant role in fostering positive social attitudes that support students' academic development [9]. The integration of inclusive character into teaching and learning activities has therefore become an important strategy for establishing a school culture that values diversity and inclusion [10]. An inclusive character not only supports students' social development but also has the potential to create a conducive learning climate that promotes optimal academic achievement. Despite its recognized importance, the relationship between inclusive character and students' academic learning outcomes under different learning preference profiles has not yet been sufficiently clarified.

Visual learning preference refers to students' tendency to understand information through images, symbols, diagrams, and other concrete visual representations [11]. Auditory learning preference describes students' tendency to process information through listening activities, such as verbal explanations and classroom discussions [12]. Kinesthetic learning preference reflects students' inclination to learn through physical activities, hands-on experiences, and direct manipulation of learning objects [13]. These differences in learning preferences may lead to variations in students' learning outcomes and educational experiences [14]. Rather than assuming that one learning preference is inherently superior to another, these preferences may represent different ways in which students engage with learning experiences and inclusive classroom environments. Theoretical perspectives on learning outcomes, inclusive character, and learning preferences indicate that these variables are interconnected in shaping students' learning experiences. Understanding these relationships is essential for developing instructional strategies that are more responsive to the diverse needs of elementary school students.

Previous studies have examined learning outcomes, inclusive character, and learning preferences separately; however, research integrating these three variables within a single analytical framework remains limited. Many studies have primarily focused on the influence of learning preferences on academic achievement, while others have concentrated on the development of inclusive character in school environments. Consequently, existing evidence has predominantly explained these variables independently, providing only a limited understanding of how inclusive character is associated with learning outcomes when students are viewed according to their visual, auditory, and kinesthetic learning preferences. Moreover, comparative investigations across learning preference groups in elementary school settings remain relatively underexplored.

Accordingly, the present study addresses three specific gaps in the literature. First, previous research has rarely integrated learning outcomes, inclusive character, and learning preferences within a unified analytical framework. Second, limited attention has been given to comparing the relationship between learning outcomes and inclusive character across visual, auditory, and kinesthetic learning preference groups. Third, empirical evidence focusing on elementary school students remains insufficient, particularly in contexts that emphasize both academic achievement and inclusive character development simultaneously.

The novelty of this study lies in its integrated examination of learning outcomes and inclusive character across different learning preference groups within elementary education. Rather than investigating these variables independently, this study analyzes their relationship simultaneously, providing a more comprehensive understanding of how inclusive character and learning outcomes are associated among students with different learning preferences. This integrated perspective offers a broader foundation for developing instructional practices that accommodate learner diversity while strengthening inclusive education.

To address this gap, the present study investigates the relationship between learning outcomes and inclusive character across different learning preferences. This approach is expected to provide empirical evidence that can assist teachers in designing instructional practices that are more adaptive, inclusive, and responsive to students' individual characteristics. The objective of this study is to analyze the relationship between learning outcomes and inclusive character based on visual, auditory, and kinesthetic learning preferences among elementary school students. Accordingly, this study addresses the following research questions: (1) Is there a significant relationship between learning outcomes and inclusive character among elementary school students? (2) Does this relationship differ across students with visual, auditory, and kinesthetic learning preferences? The findings are expected to contribute to the theoretical development of elementary education research while providing practical implications for teachers and schools in designing learning strategies that enhance both student learning outcomes and inclusive character development. Theoretically, this study contributes to the integration of inclusive character and learning preference perspectives in explaining elementary students' learning outcomes. Practically, the findings may support teachers and schools in designing more adaptive instructional strategies that recognize learner diversity while fostering inclusive educational practices.

2. METHOD

This study employed a quantitative cross-sectional comparative design. A quantitative approach was selected because the study focused on collecting numerical data that were statistically analyzed to examine the relationships and differences among the investigated variables [15]. The cross-sectional design was considered appropriate because all variables were measured at a single point in time without manipulating participants or administering an experimental treatment [16].

The study was conducted at SD Negeri 066652 Helvetia, Medan City, Indonesia. The research was carried out during the 2025/2026 academic year. The research population consisted of all fourth-grade students, totaling 54 participants, including students from Class IV-A and Class IV-B. A saturated sampling technique was employed, meaning that all members of the population were included as research participants [17]. This technique enabled the researchers to obtain more comprehensive information because the entire accessible population was involved in the study.

Primary data were obtained directly from students through learning outcome tests and questionnaires measuring inclusive character and learning preferences.

The participants were subsequently classified according to their dominant learning preference. Each student completed the learning preference questionnaire consisting of visual, auditory, and kinesthetic dimensions. The dimension with the highest total score was considered the student's dominant learning preference and was used to classify participants into one of the three learning preference groups. Consequently, each participant belonged to only one learning preference category, which served as the grouping variable in the comparative statistical analysis.

Table 1. Research design

Grouping Variable	Measurement
Dominant learning preference (Visual, Auditory, Kinesthetic)	Learning outcomes and inclusive character

Table 1 illustrates that the study compared students according to their dominant learning preference after all research variables had been measured. No instructional treatment or intervention was administered because the study aimed to investigate naturally occurring differences among students based on their dominant learning preferences.

Data were collected using an essay test for the learning outcome variable. Closed-ended questionnaires were employed to measure inclusive character and learning preferences. The learning outcome instrument was developed based on the three major domains of learning proposed by Benjamin S. Bloom, namely cognitive, affective, and psychomotor domains [18].

Table 2. Aspects of learning outcome ability

Aspect	Ability
Cognitive	Remembering, understanding, applying, analyzing, evaluating, and problem-solving
Affective	Receiving, responding, valuing, organizing values, and demonstrating positive attitudes
Psychomotor	Observing, imitating, practicing, coordinating movements, and producing works or actions

The table indicates that learning outcomes encompass three major dimensions—cognitive, affective, and psychomotor—which collectively represent students' thinking abilities, attitudes, and skills. The learning outcome test consisted of 10 essay items assessed using a five-point scoring rubric to measure students' achievement levels quantitatively.

Table 3. Learning outcomes assessment rubric

Score	Category	Description
5	Very Good	The response is highly complete, accurate, and well-organized. It demonstrates an excellent understanding of concepts, the ability to analyze and solve problems correctly, appropriate positive attitudes and values, and the ability to explain or describe skills and actions accurately.
4	Good	The response is complete and generally accurate. It demonstrates a good understanding of concepts, the ability to apply knowledge to solve problems, positive attitudes and values, and the ability to explain skills or actions adequately.
3	Fair	The response is generally appropriate but contains some shortcomings or inaccuracies. It demonstrates a basic understanding of concepts, acceptable attitudes and values, and a simple ability to explain skills or actions.
2	Poor	The response is incomplete and contains several inaccuracies. Understanding of concepts is limited, the ability to apply or analyze knowledge is weak, positive attitudes and values are not clearly demonstrated, and explanations of skills or actions are inadequate.
1	Very Poor	The response is incomplete or irrelevant to the question. It does not demonstrate conceptual understanding, higher-order thinking skills, positive attitudes and values, or the ability to explain the expected skills or actions.

The rubric demonstrates that learning outcomes were assessed according to the quality of students' responses, reflecting their conceptual mastery, cognitive abilities, attitudes, and skills. Each category represents a different level of performance, ranging from very poor to very good. The maximum obtainable score was 50.

Inclusive character and learning preferences were measured using closed-ended questionnaires with predetermined response options. The inclusive character instrument was developed based on Thomas Lickona's character education framework, encompassing moral knowledge, moral feelings, and moral behavior [19]. The learning preferences instrument was constructed according to Fleming and Mills' framework, which includes visual, auditory, and kinesthetic learning preferences as the primary learning modalities of students [20]. Each questionnaire consisted of nine statements measured using a four-point Likert scale.

Table 4. Inclusive character and learning preferences assessment scale

Positive Statement		Negative Statement	
Criteria	Score	Criteria	Score
Strongly agree	4	Strongly agree	1
Agree	3	Agree	2
Disagree	2	Disagree	3
Strongly Disagree	1	Strongly Disagree	4

The study involved three variables. Learning outcome served as the dependent variable, inclusive character represented the independent variable, and dominant learning

preference (visual, auditory, or kinesthetic) functioned as the grouping variable in the comparative analysis. Learning preference scores obtained from the questionnaire were transformed into categorical groups by assigning each participant to the dimension with the highest score.

The test and questionnaire data were analyzed to assess validity and reliability using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach with SmartPLS 4.0 software. PLS-SEM was employed exclusively to evaluate the psychometric quality of the measurement instruments and was not used to examine structural relationships among the research variables. Measurement model evaluation focused on convergent validity and construct reliability. Convergent validity was assessed based on outer loading values greater than 0.70 and Average Variance Extracted (AVE) values exceeding 0.50. Construct reliability was evaluated using Composite Reliability (CR) and Cronbach's Alpha (CA), with values above 0.70 indicating satisfactory internal consistency [21].

Table 5. Convergent validity and construct reliability

Variable	Aspect	Item	Outer Loadings	AVE	CR	CA
Learning Outcome	Cognitive	LO1	0.960	0.930	0.975	0.962
		LO2	0.968			
		LO3	0.965			
	Affective	LO4	0.955	0.907	0.975	0.966
		LO5	0.963			
		LO6	0.952			
		LO7	0.939			
	Psychomotor	LO8	0.966	0.933	0.977	0.964
		LO9	0.967			
		LO10	0.965			
Inclusive Character	Knowledge	IC1	0.962	0.901	0.965	0.945
		IC2	0.936			
		IC3	0.950			
	Feelings	IC4	0.953	0.918	0.971	0.955
		IC5	0.955			
		IC6	0.966			
	Behaviour	IC7	0.956	0.914	0.970	0.953
		IC8	0.946			
		IC9	0.966			
Learning Preferences	Visual	LP1	0.952	0.891	0.961	0.939
		LP2	0.932			
		LP3	0.949			
	Auditory	LP4	0.960	0.887	0.959	0.937
		LP5	0.936			
		LP6	0.930			
	Kinesthetic	LP7	0.934	0.892	0.961	0.939
		LP8	0.948			
		LP9	0.951			

The results showed that all indicators of learning outcomes, inclusive character, and learning preferences exhibited high outer loading values ranging from 0.930 to 0.968. The AVE values ranged from 0.887 to 0.933, exceeding the recommended threshold of 0.50 and confirming adequate convergent validity for all constructs. Composite Reliability values

ranged from 0.959 to 0.977, indicating excellent internal consistency across all dimensions. Cronbach's Alpha values ranged from 0.937 to 0.966, further demonstrating the high reliability and stability of the measurement instruments. Overall, all constructs satisfied the recommended measurement criteria and exhibited strong psychometric properties. Therefore, the collected data were considered valid and reliable for subsequent analyses.

Following instrument validation, descriptive statistics were calculated to summarize the characteristics of each variable. Comparative multivariate analysis was then conducted to examine whether learning outcomes and inclusive character differed significantly across students with visual, auditory, and kinesthetic learning preferences. The grouping variable was the dominant learning preference category assigned to each participant because the total sample consisted of 54 students; all available participants were included in the analysis to maximize statistical information.

Ethical considerations were observed throughout the study. Permission to conduct the research was obtained from the school administration. Participation was voluntary, students' identities remained anonymous, and all collected data were used solely for research purposes while maintaining confidentiality.

3. RESULTS AND DISCUSSION

3.1. Results

This section presents the findings obtained from the statistical analyses conducted to address the research objectives. The results include assumption testing, descriptive statistics, multivariate analysis, and univariate analysis examining the relationship between learning preferences, learning outcomes, and inclusive character among elementary school students.

A total of 54 fourth-grade students participated in this study. As explained in the Methods section, all students completed the learning outcome test and questionnaires measuring inclusive character and learning preferences. The statistical analyses were subsequently performed to examine whether differences in learning preferences were associated with variations in learning outcomes and inclusive character.

The research findings are presented based on the analysis of the equality of covariance matrices across groups. This preliminary test was conducted to verify the assumption of covariance homogeneity before proceeding with further analyses. The results indicated that the data met the required assumptions for multivariate statistical analysis. Detailed results are presented in the following tables.

Table 6. Box's test of equality of covariance matrices[a]

Box's M	F	df1	df2	Sig.
4.661	0.572	6	243.395	0.753

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.[a]

a. Design: Intercept + Visual + Auditory + Kinesthetic + Visual * Auditory + Visual * Kinesthetic + Auditory * Kinesthetic + Visual * Auditory * Kinesthetic

The results of Box's Test revealed a Box's M value of 4.661 with a significance level of 0.753 ($p > 0.05$). This finding indicates that the covariance matrices of the dependent

variables were sufficiently equal across groups. Therefore, the assumption of homogeneity of covariance matrices was satisfied. Since the significance value exceeded the recommended threshold of 0.05, the null hypothesis of equal covariance matrices could not be rejected. These findings indicate that the covariance structure of the dependent variables was sufficiently homogeneous to proceed with the multivariate analysis.

Table 7. Levene's test of equality of error variances[a]

		Levene Statistic	df1	df2	Sig.
Learning Outcomes	Based on Mean	0.450	4	24	0.771
	Based on Median	0.160	4	24	0.956
	Based on Median and with Adjusted df	0.160	4	17.309	0.956
	Based on Trimmed Mean	0.368	4	24	0.829
Inclusive Character	Based on Mean	0.518	4	24	0.723
	Based on Median	0.427	4	24	0.787
	Based on Median and with Adjusted df	0.427	4	21.615	0.787
	Based on Trimmed Mean	0.503	4	24	0.734

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + Visual + Auditory + Kinesthetic + Visual * Auditory + Visual * Kinesthetic + Auditory * Kinesthetic + Visual * Auditory * Kinesthetic

The results of Levene's Test showed that all significance values exceeded the threshold of 0.05, ranging from 0.723 to 0.956. These findings indicate that there were no significant differences in error variances among the groups. The relatively low Levene statistics, ranging from 0.160 to 0.518, further demonstrate the stability of data dispersion across groups. Consequently, the assumption of homogeneity of variances was fulfilled, confirming the suitability of the data for further statistical analyses.

The results of both Box's Test and Levene's Test consistently demonstrated that the assumptions required for multivariate analysis were satisfied. Accordingly, the subsequent analyses were performed using the established statistical procedures.

Table 8. Descriptive statistics

Variable	Learning Preference	N	Mean	Std. Deviation	Minimum	Maximum	Skewness	95% Confidence Interval	
								Lower Bound	Upper Bound
Learning Outcomes	Visual	54	29.30	10.614	10	48	-0.175	26.40	32.19
	Auditory	54	29.30	10.614	10	48	-0.175	26.40	32.19
	Kinesthetic	54	29.30	10.614	10	48	-0.175	26.40	32.19
Inclusive Character	Visual	54	22.13	7.245	9	36	-0.290	20.15	24.11
	Auditory	54	22.13	7.245	9	36	-0.290	20.15	24.11
	Kinesthetic	54	22.13	7.245	9	36	-0.290	20.15	24.11

The analysis showed that the mean score for learning outcomes was 29.30, indicating a moderate level of student achievement. The standard deviation of 10.614 suggests a

moderate degree of variability, with scores ranging from 10 to 48. The distribution was approximately normal, as indicated by a skewness value of −0.175. The 95% confidence interval ranged from 26.40 to 32.19, reflecting a stable estimate of the population mean.

For inclusive character, the mean score was 22.13, with a standard deviation of 7.245, indicating relatively lower variability compared to learning outcomes. Scores ranged from 9 to 36. The skewness value of −0.290 suggests an approximately normal distribution. The 95% confidence interval ranged from 20.15 to 24.11, demonstrating a satisfactory level of precision in estimating the mean score.

Overall, the descriptive statistics indicate that both dependent variables were approximately normally distributed, as reflected by the relatively small skewness values and reasonably narrow confidence intervals. These findings provide an overview of students' learning outcomes and inclusive character prior to hypothesis testing.

Table 9. Multivariate tests[a]

Effect	Wilks' Lambda	F	Hypothesis df	Error df	Sig.
Intercept	0.042	264.197	2.000	23.000	< 0.001
Visual	0.592	1.151	12.000	46.000	0.346
Auditory	0.406	1.871	14.000	46.000	0.056
Kinesthetic	0.712	0.851	10.000	46.000	0.584
Visual × Auditory	1.000	–	–	23.500	–
Visual × Kinesthetic	1.000	–	–	23.500	–
Auditory × Kinesthetic	0.930	0.860	2.000	23.000	0.436
Visual × Auditory × Kinesthetic	1.000	–	–	23.500	–

a. Design: Intercept + Visual + Auditory + Kinesthetic + Visual * Auditory + Visual * Kinesthetic + Auditory * Kinesthetic + Visual * Auditory * Kinesthetic

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

The multivariate analysis was conducted using Wilks' Lambda to examine the simultaneous effects of learning preferences on the dependent variables. The results showed that Wilks' Lambda values ranged from 0.406 to 1.000 across the tested effects. The significance values for the main effects of visual, auditory, and kinesthetic learning preferences were all greater than 0.05, ranging from 0.346 to 0.584. These findings indicate that learning preferences did not exert a statistically significant multivariate effect on the combined dependent variables.

The obtained F values ranged from 0.851 to 1.871, suggesting relatively weak multivariate relationships. Furthermore, none of the interaction effects reached statistical significance. For several interaction terms, no F statistic was produced, indicating that these interaction effects were not estimated in the final multivariate model. Therefore, the interpretation of the multivariate findings focuses primarily on the estimated main effects.

Overall, the results demonstrate that the combination of visual, auditory, and kinesthetic learning preferences did not significantly influence learning outcomes and inclusive character simultaneously.

Table 10. Tests of between-subjects effects

Source	Dependent Variable	df	Mean Square	F
Corrected Model	Learning Outcomes	29	164.716	3.309*
	Inclusive Character	29	74.850	2.938*
Intercept	Learning Outcomes	1	21892.175	439.860*
	Inclusive Character	1	12372.430	485.627*
Visual	Learning Outcomes	6	62.604	1.258
	Inclusive Character	6	53.846	2.113
Auditory	Learning Outcomes	7	108.642	2.183*
	Inclusive Character	7	35.939	1.411
Kinesthetic	Learning Outcomes	5	55.158	1.108
	Inclusive Character	5	46.221	1.814
Visual × Auditory	Learning Outcomes	0	–	–
	Inclusive Character	0	–	–
Visual × Kinesthetic	Learning Outcomes	0	–	–
	Inclusive Character	0	–	–
Auditory × Kinesthetic	Learning Outcomes	1	28.000	0.563
	Inclusive Character	1	44.587	1.750
Visual × Auditory × Kinesthetic	Learning Outcomes	0	–	–
	Inclusive Character	0	–	–
Error	Learning Outcomes	24	49.771	–
	Inclusive Character	24	25.477	–
Total	Learning Outcomes	54	–	–
	Inclusive Character	54	–	–
Corrected Total	Learning Outcomes	53	–	–
	Inclusive Character	53	–	–

Description: Values in column F with an (*) sign indicate significant results ($p < 0.05$).

To further examine the individual effects of learning preferences on each dependent variable, univariate analyses were performed. The corrected model demonstrated a significant overall effect on learning outcomes ($F = 3.309$, $p < 0.05$) and inclusive character ($F = 2.938$, $p < 0.05$). These findings indicate that the overall statistical model explained a significant proportion of variation in the dependent variables. However, the significance of the corrected model should be interpreted together with the individual effects presented below.

Among the three learning preference dimensions, auditory learning preference was the only variable that significantly influenced learning outcomes ($F = 2.183$, $p < 0.05$). In contrast, visual and kinesthetic learning preferences did not show statistically significant effects on learning outcomes. Similarly, none of the learning preference dimensions significantly affected inclusive character. Interaction effects among the learning preference variables were also found to be non-significant for both dependent variables.

These results indicate that only the auditory learning preference exhibited a statistically significant association with learning outcomes, whereas visual and kinesthetic learning preferences were not significantly associated with either learning outcomes or inclusive character. Likewise, the interaction effects among learning preference dimensions did not provide statistically significant contributions to the dependent variables.

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In summary, the statistical analyses showed that the assumptions for multivariate analysis were satisfied before hypothesis testing. Descriptive statistics indicated moderate levels of learning outcomes and inclusive character among the participants. The multivariate analysis revealed no statistically significant simultaneous effects of learning preferences on the combined dependent variables. At the univariate level, auditory learning preference was the only dimension that showed a significant effect on learning outcomes, whereas visual and kinesthetic learning preferences, as well as their interaction effects, were not statistically significant. These findings provide the basis for the discussion presented in the following section.

3.2. Discussion

The present study primarily found that learning preferences did not exert a statistically significant multivariate effect on learning outcomes and inclusive character. At the univariate level, only auditory learning preference showed a significant association with learning outcomes, whereas visual and kinesthetic learning preferences, as well as all interaction effects, were not statistically significant. These findings suggest that learning preferences alone provide limited explanatory power for understanding students' academic achievement and inclusive character development in elementary education.

The fulfillment of multivariate statistical assumptions constitutes an essential prerequisite before interpreting relationships among variables. The results demonstrated that the assumptions of homogeneity of covariance matrices and homogeneity of variances were satisfied, indicating that the MANOVA procedure was appropriate for examining the relationships among the study variables. These findings confirm the equivalence of covariance matrices, which represents a fundamental requirement in multivariate educational research employing MANOVA [22]. The consistency of variances across groups further supports the assumption of homoscedasticity in quantitative educational studies involving group comparisons [23]. Consequently, the findings can be interpreted with confidence because no violations of statistical assumptions were detected that could potentially bias the results. The stability of variances also suggests that the distribution of scores was balanced across the different learning preference groups analyzed in this study [24].

The descriptive statistics revealed approximately normal distributions across all study variables. This pattern indicates that students' learning outcomes and inclusive character were relatively evenly distributed within the sample. The stable distribution of the data suggests that the respondents adequately represented the population characteristics relevant to examining the relationships among learning preferences, learning outcomes, and inclusive character. These findings are consistent with previous educational studies reporting that elementary school data commonly exhibit approximately normal distributions when collected from classroom-based samples [25]. Furthermore, the relatively narrow confidence intervals indicate stable mean estimates and satisfactory precision for both dependent variables [26].

The multivariate analysis revealed that visual, auditory, and kinesthetic learning preferences did not exert a significant simultaneous effect on learning outcomes and

inclusive character. These findings indicate that categorizing students according to visual, auditory, and kinesthetic learning preferences alone is insufficient to explain differences in academic achievement and inclusive character. This finding suggests that differences in learning preferences are not necessarily primary determinants of students' academic achievement or inclusive character development in elementary education. The results support the growing perspective that learning effectiveness is influenced more strongly by the overall quality of instructional processes than by alignment with a specific learning preference category. This finding is consistent with studies questioning the explanatory power of learning style classifications in contemporary educational settings [27]. In addition, none of the interaction effects among learning preference dimensions were statistically significant, indicating that combinations of learning preferences did not contribute meaningfully to variations in the dependent variables [28]. Accordingly, the present findings do not support the practice of rigidly grouping elementary school students according to learning preference classifications as the primary basis for instructional decision-making. Instead, learning preferences should be considered as only one of many learner characteristics that may inform instructional planning.

Although the multivariate effects were not significant, the univariate analysis demonstrated that auditory learning preference had a significant influence on learning outcomes. In contrast, visual and kinesthetic learning preferences did not show statistically significant effects. This finding suggests that students' ability to receive and process information through listening activities may contribute to academic achievement. Classroom learning in elementary education often relies heavily on verbal explanations, discussions, and teacher-guided instruction, which may explain the relatively stronger contribution of auditory learning preference. Nevertheless, this finding should be interpreted cautiously because the significant univariate effect did not translate into a significant multivariate effect. Therefore, the observed relationship may reflect the instructional characteristics of the participating classrooms rather than indicating that auditory learning preference is a dominant determinant of academic achievement. The magnitude of this effect was insufficient to produce a significant multivariate influence when analyzed together with the other learning preference dimensions. These results indicate that individual learning preferences may play a limited role compared with broader instructional factors in shaping academic achievement [29]. The influence of learning preferences appears less substantial than comprehensive pedagogical approaches designed to address diverse student needs [30].

An additional finding deserving particular attention is the absence of a significant relationship between learning preferences and inclusive character. Inclusive character reflects students' acceptance of diversity, empathy, cooperation, and respect for others, all of which are developed primarily through continuous social interaction and educational experiences rather than through preferred modes of information processing. Classroom culture, teacher modelling, collaborative learning activities, peer relationships, and school-wide character education practices are therefore likely to contribute more substantially to inclusive character development than individual learning preferences. This interpretation provides a plausible explanation for why differences in visual, auditory, and kinesthetic

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learning preferences were not associated with differences in inclusive character in the present study.

From a theoretical perspective, this study contributes to the growing body of literature suggesting that the relationships among learning preferences, learning outcomes, and inclusive character are neither linear nor deterministic. The findings demonstrate that learning outcomes and inclusive character cannot be adequately explained solely through classifications of visual, auditory, and kinesthetic learning preferences. This evidence expands the understanding of learning preference theory within elementary education by highlighting the possibility that pedagogical practices, social interactions, and learning environments exert stronger influences on students' academic and character development than individual learning preferences alone.

The stronger contribution of the overall model compared with interaction effects further emphasizes the importance of external instructional factors in shaping student outcomes. Student-centered learning approaches that address diverse needs and abilities appear to be more effective than instructional practices based exclusively on learning preference classifications [31]. Similarly, the development of inclusive character is likely influenced more by meaningful learning interactions and classroom experiences than by students' individual learning preferences [32]. These findings reinforce the argument that inclusive education is more effectively promoted through integrated pedagogical strategies that foster participation, collaboration, and respect for diversity rather than through grouping students according to learning style categories [33]. Practically, these findings suggest that elementary school teachers should prioritize the implementation of inclusive, student-centered, and collaborative learning environments instead of designing instruction solely according to students' visual, auditory, or kinesthetic learning preferences. Such an approach is more consistent with the multidimensional nature of learning and character development identified in this study.

Several limitations should be considered when interpreting the findings of this study. First, the cross-sectional design limited the ability to establish causal relationships among the investigated variables. Second, the study was conducted in a single elementary school, which limits the generalizability of the findings to broader educational contexts. Third, the analysis focused exclusively on learning preferences, learning outcomes, and inclusive character, without considering other potentially influential factors such as learning motivation, parental support, instructional quality, and school climate. Fourth, the use of self-report questionnaires with elementary school students may have introduced response bias because younger learners may experience difficulties in interpreting abstract statements related to inclusive character and learning preferences. Future research is therefore encouraged to involve larger and more diverse samples, examine additional contextual variables, employ more robust research designs, and utilize multiple sources of data, including teacher observations and classroom assessments, to obtain a more comprehensive understanding of the factors influencing learning outcomes and inclusive character development among elementary school students.

4. CONCLUSION

This study examined the relationship between learning outcomes and inclusive character across elementary school students with different dominant learning preferences. The findings revealed that learning preferences did not exert a significant multivariate effect on learning outcomes and inclusive character simultaneously. Although auditory learning preference demonstrated a significant association with learning outcomes at the univariate level, this finding should be interpreted cautiously because a significant multivariate effect did not support it. Overall, the results indicate that learning preferences alone are insufficient to explain variations in students' academic achievement and inclusive character. These findings contribute to the growing body of literature suggesting that visual, auditory, and kinesthetic learning preferences should be regarded as one of many learner characteristics rather than as primary determinants of educational outcomes, thereby extending understanding of the interaction between learning preferences, learning outcomes, and inclusive character in elementary education.

Practically, the findings suggest that teachers and schools should prioritize adaptive, student-centered, and inclusive instructional practices instead of relying solely on learning preference classifications when designing classroom instruction. Nevertheless, the findings should be interpreted in light of several limitations, including the cross-sectional design, the relatively small sample drawn from a single elementary school, and the use of self-report questionnaires for measuring learning preferences and inclusive character. Future research is therefore recommended to involve larger and more diverse samples, employ stronger research designs such as pretest–posttest or quasi-experimental approaches, establish clearer procedures for classifying dominant learning preferences, incorporate instructional strategy variables, utilize observation-based measures of inclusive character, and compare multimodal instructional approaches with learning preference-based instruction to provide more comprehensive evidence regarding factors influencing learning outcomes and inclusive character in elementary education.

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