

A Study on the Mediating Effects of Learning Motivation on the Influence of Teaching Strategies, Learning Environment, Student Grit, and Student Engagement on Student Performance in Aesthetic Education

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ABSTRACT:

Aesthetic education is an educational approach that promotes the well-rounded development of individuals and plays a crucial role in nurturing a new generation of citizens for the times. This study examines the factors influencing students' academic performance in aesthetic education programs at higher vocational colleges in Western Guangdong, China. The participants were aesthetic education instructors from seven higher vocational colleges in Western Guangdong. The study focused on six core variables, Teaching Strategies (TS), Learning Environment (LE), Student Engagement (SE), Student Grit (SG), Learning Motivation (LM), and Student Performance (SP). A questionnaire survey method was employed, and a total of 365 valid responses were collected. Data were analyzed using SPSS and AMOS software, and structural equation modeling (SEM) was employed to test the research hypotheses and mediating effects. The results indicate that the model fits well ($\chi^2/df = 1.318$, CFI = 0.985, TLI = 0.983, RMSEA = 0.030). Teaching strategies ($\beta = 0.262$, $p < 0.001$), learning environment ($\beta = 0.187$, $p = 0.002$), student grit ($\beta =$

COPYRIGHT STATEMENT: Copyright: © 2026 Authors. Open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).	0.193, $p < 0.001$), and student engagement ($\beta = 0.170$, $p = 0.003$) all had significant positive effects on learning motivation. Learning motivation had the most significant impact on students' academic performance ($\beta = 0.342$, $p < 0.001$) and partially mediated the relationship between individual variables and academic performance. The results indicate that both teaching strategies and the learning environment have a significant positive impact on learning motivation, with teaching strategies playing a more prominent role; student engagement and grit play key roles in the learning process and significantly promote the development of learning motivation; learning motivation, in turn, has a significant positive impact on student performance and plays an important mediating role between external contextual variables and student performance. Keywords: Aesthetic education; higher vocational colleges; learning motivation; student performance
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1. Introduction

Aesthetic education, commonly referred to as aesthetic training, arts education, or aesthetic cultivation is regarded as a vital component in promoting students' holistic development. Its educational impact is no longer confined to the traditional realm of arts training; it is generally recognized as playing a unique role in enhancing aesthetic sensibilities, fostering individual cognition, and shaping well-rounded personalities. Existing research indicates that aesthetic experiences enrich individuals' learning by integrating their cognitive and emotional dimensions, thereby promoting their comprehensive development (Dewey, 1934). Within the higher education system, particularly in the field of vocational education, aesthetic education not only helps enhance students' aesthetic literacy but also fosters the development of creativity, comprehensive qualities, and humanistic spirit, thereby elevating their overall level of development (Winner, Goldstein, & Vincent-Lancrin, 2013)(Chen, Wang & Xu, 2025). Related research further indicates that aesthetic education, through artistic experiences and

aesthetic practices, can effectively stimulate students' motivation to learn, increase their engagement in learning, and have a positive impact on academic performance (Ryan & Deci, 2000)(Chen, 2024). Furthermore, education scholars generally agree that integrating aesthetic education into the curriculum not only helps students construct a knowledge system but also enhances their sense of the meaning of learning from an emotional perspective, thereby shifting their motivation from external to internal drives. (Niemic & Ryan, 2009)(Zhang, 2024).

Currently, the educational value of aesthetic education has been widely recognized by society and the education community; however, in the teaching practices of higher vocational colleges in Western Guangdong, China, it still faces numerous practical challenges. On the one hand, the development of aesthetic education curricula remains in an exploratory phase, and traditional teaching strategies struggle to effectively stimulate students' interest and engagement, resulting in insufficient classroom participation and poor learning outcomes (Hattie, 2009)(Li, 2026); on the other hand, as the learning environment gradually

transitions toward greater intelligence and diversity, students' inability to adapt to new learning contexts also undermines learning outcomes to some extent. Furthermore, the evaluation system for aesthetic education courses remains imperfect, lacking uniformity and scientific rigor, making it difficult to effectively measure and provide feedback on teaching quality and learning outcomes. Collectively, these issues hinder the deep integration of aesthetic education into the vocational education system.

Of particular concern is that existing research on aesthetic education largely remains at the conceptual exploration stage, with a continued lack of systematic analysis of the intrinsic mechanisms underlying learning in aesthetic education contexts. No systematic empirical explanatory model has yet been established to account for how factors such as teaching strategies, learning environments, student engagement, and student grit interact in specific teaching practices and influence student performance through the psychological mechanism of learning motivation. Existing research indicates that scientifically sound teaching strategies and diverse learning environments can significantly enhance students' learning motivation (Pintrich, 2003)(Zeng & Tang, 2026), while student engagement and sustained commitment play a crucial role in the learning process and have a significant impact on learning outcomes (Fredricks, Blumenfeld & Paris, 2004)(Jiang, 2026). However, in the context of aesthetic education, how these variables exert their effects through the processes of generating and internalizing aesthetic experiences remains to be further explored through empirical research.

Based on this research background, this study adopts a mechanism-based analytical perspective to systematically examine the key factors influencing the learning outcomes of aesthetic education in higher vocational colleges and their underlying pathways. This study aims to construct an analytical framework comprising the external context, learning process, psychological

mechanisms, and learning outcomes, with a focus on analyzing how teaching strategies, the learning environment, student engagement, and student grit influence student performance through learning motivation, thereby addressing the gaps in existing research regarding mechanistic explanations. Through this study, we hope to provide a theoretical basis and empirical support for enhancing the quality of aesthetic education in vocational colleges.

Therefore, the research questions of this study are as follows:

- (1) Do teaching strategies, the learning environment, student engagement, and student grit able to predict student motivation and academic performance in the context of aesthetic education at higher vocational colleges?
- (2) Does learning motivation play a significant mediating role between the aforementioned variables and student performance?

2. Literature Review

2.1 Theoretical Framework

This study integrates Dewey's aesthetic theory, constructivist learning theory, and Self-Determination Theory (SDT) to construct a multi-level theoretical framework for exploring the relationships among teaching strategies, learning environments, student engagement, student grit, learning motivation, and student performance in the context of aesthetic education at higher vocational colleges. Unlike a single-theory perspective, this study emphasizes that learning is not a simple input-output process, but rather a dynamic system shaped by the interplay of context, process, and psychological mechanisms. Within this framework, learning is understood as a comprehensive developmental process achieved through experiential construction and motivational drive in specific educational contexts (Dewey, 1934; Ryan & Deci, 2000).

First, Dewey's aesthetic theory provides the theoretical foundation for the "contextual level" of

this study. Dewey (1934) pointed out that education is essentially a process of generating experience, and that aesthetic experience is a higher form of experience capable of integrating cognition, emotion, and action. In the context of aesthetic education, teaching strategies and the learning environment are no longer merely external instructional conditions, but rather “design mechanisms and contextual vehicles for the generation of aesthetic experience.” Research indicates that a well-designed learning environment and instructional design can significantly enhance students’ learning experiences and outcomes (Hattie, 2009)(Shan, Yu, & Hu, 2026). Therefore, this study posits that instructional strategies (IS) and the learning environment (LE), as external contextual variables, will influence students’ learning motivation and performance by affecting the process of aesthetic experience formation.

Second, constructivist learning theory provides this study with an interpretive perspective at the “process level.” This theory posits that knowledge is not passively received but is actively constructed through social interaction and contextual engagement (Vygotsky, 1978). In aesthetic education, student engagement and student grit are key manifestations of the learning process, reflecting the learner’s level of commitment and sustained effort within the context (Li, 2020). Relevant research indicates that students’ active participation and sustained engagement are key factors in promoting deep learning and learning outcomes (Fredricks et al., 2004; Duckworth et al., 2007)(Zhang & He, 2026). Therefore, this study incorporates student engagement and student grit into the model as critical process variables linking the external context to learning motivation, in order to reveal “how” learning occurs in the context of aesthetic education.

Finally, Self-Determination Theory (SDT) provides the core explanation at the “psychological mechanism level” for this study. This theory emphasizes that an individual’s learning motivation stems from the fulfillment of needs for autonomy,

competence, and relatedness (Ryan & Deci, 2000). In aesthetic education contexts, instructional strategies, learning environments, and learning process variables stimulate students’ intrinsic learning motivation by satisfying their basic psychological needs. Research indicates that learning motivation not only directly influences learning performance but also plays a key mediating role between external contexts and learning outcomes (Niemiec & Ryan, 2009)(Guo & Ji, 2026). Therefore, this study treats learning motivation (LM) as the core mediating variable to explore its mechanism of action in the process by which teaching strategies, learning environments, student engagement, and student grit influence student performance.

In summary, by integrating Dewey’s aesthetic theory, constructivist learning theory, and self-determination theory, this study constructs a theoretical framework encompassing external contexts, the learning process, psychological mechanisms, and learning outcomes, and concretizes these as variable relationships within a structural equation model. This theoretical integration not only overcomes the limitations of single-theory explanations but also provides a systematic interpretive pathway for understanding the mechanisms of learning in aesthetic education contexts.

2.2 Students’ Performance in Aesthetic Education

In this study, students’ performance (SP) is defined as a comprehensive outcome variable in the process of aesthetic education. Its scope is no longer limited to traditional academic achievement but is manifested as a multidimensional developmental outcome integrating cognitive, affective, and behavioral dimensions. This definition stems from the comprehensive nature of aesthetic education itself, wherein learning is not merely a process of knowledge acquisition but rather the result of the interaction among aesthetic experiences, emotional engagement, and

behavioral practice (Dewey, 1934). This study conceptualizes student performance as a multidimensional structure encompassing learning comprehension, aesthetic experience, learning attitudes, and behavioral engagement, thereby comprehensively reflecting students' learning outcomes in aesthetic education contexts. This definition transcends the limitations of the traditional, single-dimensional focus on grades, enabling student performance to more fully reflect the essential characteristics of aesthetic education and providing a theoretical foundation for subsequent structural equation modeling analysis.

2.3 Learning Environment

The learning environment refers to the overall context in which students find themselves during the learning process, encompassing multiple dimensions such as the physical environment, psychological atmosphere, and social interaction structures (Fraser, 2012). From the perspective of aesthetic education, the learning environment carries even more complex connotations. Dewey (1934) pointed out that learning is essentially a process of generating experience, and the environment is a key condition for the formation of that experience. In aesthetic education classrooms, the learning environment is not only a venue for knowledge transmission but also a contextual vehicle for the emergence of aesthetic experiences. Research indicates that a favorable learning environment can significantly enhance students' learning motivation, satisfaction, and academic performance (Hattie, 2009)(Zeng & Tang, 2026).

2.4 Teaching Strategies

Teaching strategies refer to the organizational approaches and instructional methods employed by teachers during the teaching process; their quality directly influences students' learning experiences and outcomes. In the context of aesthetic education, teaching strategies play an even more critical role. Unlike traditional knowledge-oriented instruction, aesthetic education

emphasizes experience, perception, and emotional engagement, making teaching strategies a core component of the "mechanism for designing aesthetic experiences." Through situational design, interactive guidance, and feedback mechanisms, teachers can effectively promote student participation and enhance their motivation to learn. Furthermore, positive teacher-student interaction has been shown to significantly enhance students' learning engagement and learning outcomes (Fredricks et al., 2004). Consequently, research indicates that effective teaching strategies can significantly boost students' learning motivation and participation (Pintrich, 2003)(Zeng & Tang, 2026). In higher education, teaching strategies involve not only the transmission of knowledge but also how to stimulate students' interest in learning, promote interaction, and guide deep learning.

3. Research Methodology

This study selected teachers of aesthetic education at seven higher vocational colleges in Western Guangdong as the research subjects and conducted a questionnaire survey using proportional stratified sampling to analyze the internal logic by which teaching strategies, the learning environment, student engagement, and grit, mediated by learning motivation, influence learning performance in aesthetic education classrooms. The study utilized structural equation modeling to construct an analytical framework encompassing the external context, learning process, psychological mechanisms, and learning outcomes, and employed quantitative analysis to empirically demonstrate the relationships among these variables.

Unlike studies that focus on students as research subjects, this study evaluates student learning from the teachers' perspective, resulting in greater data completeness and stability; A total of 400 questionnaires were distributed, with 365 valid responses collected. The participating teachers spanned a wide range of ages, years of teaching experience, professional titles, and institutional

types, ensuring broad coverage and sufficient representativeness of the sample. The survey was created using Questionnaire Star, distributed via WeChat, and administered in a self-administered format. The original questionnaire scale was in English and was localized into Chinese using the back-translation method to ensure accurate and consistent item meanings. Prior to the survey, teachers were informed of the research purpose and confidentiality requirements. The study adhered to academic ethics throughout, with participation being voluntary and all information processed anonymously.

The questionnaire is divided into two main modules: Part A covers demographic information, while Part B includes all questions related to the variables used in this study. Part B employs a 5-point Likert scale for scoring, where 5 represents “strongly agree” and 1 represents “strongly disagree.” Upon completion of data collection, this study will employ multivariate statistical analysis methods to systematically examine the correlations and statistical significance among the variables.

After data collection is complete, data analysis will be conducted using the statistical software packages SPSS 23.0 and AMOS. The analysis will proceed in two phases: Phase 1 will utilize SPSS to perform descriptive statistics and Pearson correlation analysis, providing a preliminary understanding of the relationships among the variables; In the second stage, AMOS will be used to construct a structural equation model (SEM) to verify each research hypothesis path individually, with a focus on analyzing the mediating mechanism of learning motivation among the latent variables. Through this analytical process, this study will not only test the structural relationships among the variables but also further reveal the mechanisms of action between context, process, psychological

mechanisms, and outcomes in the process of aesthetic education.

4. Reliability and Validity Testing

4.1 Reliability Analysis

Reliability analysis aims to examine the internal consistency of a measurement scale to ensure that all items within each construct consistently measure the same underlying concept. This study employed two widely accepted measures to assess reliability: Cronbach's alpha and composite reliability (CR), with a recommended threshold of >0.70 (Hair et al., 2019; Nunnally & Bernstein, 1994).

As shown in Table 1, the Cronbach's alpha coefficients for the six latent constructs ranged from 0.829 to 0.916, and the composite reliability (CR) values ranged from 0.879 to 0.918, both of which were well above the benchmark value of 0.70. Specifically, SG exhibited the highest reliability ($\alpha = 0.915$, $CR = 0.918$), followed by SP ($\alpha = 0.887$, $CR = 0.915$), indicating that these constructs possess excellent internal consistency. The Cronbach's α coefficient for SE was 0.829; its reliability coefficient (CR) was 0.879, which is still well above the acceptable threshold, confirming that this construct possesses satisfactory reliability (Fornell & Larcker, 1981). Removing any single item did not result in a significant increase in the Cronbach's α coefficient, further supporting the decision to retain all measurement items.

The comprehensive analysis of the results indicates that the scales used in this study covering teaching strategies (TS), learning environment (LE), student grit (SG), student engagement (SE), learning motivation (LM), and student performance (SP) meet academic research standards in terms of convergent validity and reliability, and can provide a reliable foundation of measurement data for subsequent structural equation modeling analyses.

Table 1: Results of Reliability and Validity Analysis

Variable	Item	Factor Loading	CR	AVE	Cronbach's Alpha	Cronbach's Alpha
TS	TS1	0.702	0.879	0.646	0.872	0.875
	TS2	0.904			0.802	
	TS3	0.815			0.837	
	TS4	0.782			0.842	
LE	LE1	0.635	0.899	0.645	0.901	0.897
	LE2	0.862			0.862	
	LE3	0.726			0.883	
	LE4	0.897			0.857	
	LE5	0.864			0.863	
SG	SG1	0.771	0.918	0.737	0.915	0.916
	SG2	0.908			0.878	
	SG3	0.846			0.893	
	SG4	0.902			0.879	
SE	SE1	0.860	0.879	0.594	0.829	0.876
	SE2	0.710			0.863	
	SE3	0.685			0.867	
	SE4	0.737			0.854	
	SE5	0.846			0.833	
LM	LM1	0.765	0.883	0.657	0.858	0.880
	LM2	0.880			0.823	
	LM3	0.691			0.878	
	LM4	0.889			0.820	
SP	SP1	0.857	0.915	0.684	0.887	0.913
	SP2	0.750			0.907	
	SP3	0.800			0.897	
	SP4	0.881			0.882	
	SP5	0.841			0.892	

4.2 Validity Analysis

Validity analysis aims to assess the extent to which a measurement scale accurately captures the

intended theoretical construct. Following established guidelines (Hair et al., 2019; Fornell & Larcker, 1981), this study systematically evaluated

validity from three complementary perspectives: the appropriateness of exploratory factor analysis, convergent validity, and discriminant validity.

Prior to conducting confirmatory factor analysis (CFA), this study performed the Kaiser-Meyer-Olkin (KMO) goodness-of-fit test and Bartlett's sphericity test. As shown in Table 2, the results indicate a KMO value of 0.926 and an approximate chi-square value of 6,689.587 for Bartlett's sphericity test, with 351 degrees of freedom and $p < 0.001$. This indicates that the correlation matrix deviates significantly from the identity matrix,

suggesting strong correlations among the variables; these results confirm that the survey data meet the statistical requirements for exploratory factor analysis (Hair et al., 2019).

Furthermore, the results of the convergent validity test in Table 1 above indicate that the factor loadings for all measurement indicators range from 0.63 to 0.91, all of which exceed the recommended threshold of 0.60 (Hair et al., 2019), thereby demonstrating that the scale possesses good convergent validity.

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.926
Bartlett's Test of Sphericity	Approx. Chi-Square	6689.587
	df	351
	Sig.	.000

Finally, Table 1 presents the interconstruct correlation matrix. The results indicate that the square root of the AVE for each construct (ranging from 0.771 to 0.858) is significantly higher than its corresponding interconstruct correlation coefficient (ranging from 0.344 to 0.563), thereby satisfying the Fornell-Larcker criterion. Furthermore, the correlation coefficients among all latent variables were well below the conservative threshold of 0.85 recommended by Kline (2011), which further confirms that these six constructs are empirically independent of one another and that there are no issues of multicollinearity or construct overlap.

In summary, the validity assessment yields the following key conclusions: (1) The data are highly suitable for factor analysis ($KMO = 0.926$); (2) Convergent validity is well established, with all average variance estimates (AVE) exceeding 0.50 and all factor loadings above the acceptable threshold; (3) Discriminant validity is rigorously confirmed by the Fornell-Larcker criterion, as all

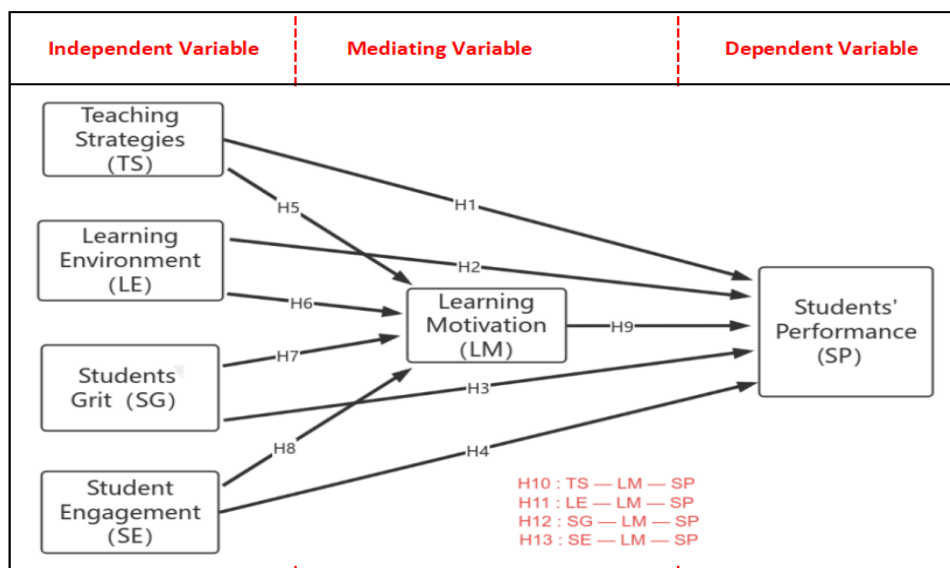
$\sqrt{AVE}$ values are greater than the intercorrelation coefficients between constructs; (4) The overall measurement model demonstrated excellent fit across all key metrics. Taken together, these results provide strong evidence that the measurement model possesses sound psychometric properties, confirming that all six latent variables are theoretically meaningful and empirically valid. This validated measurement model lays a solid foundation for subsequent structural equation path analysis and hypothesis testing.

4. Results

4.1 Structural Model Analysis

Before conducting the structural equation model analysis, this study first used Pearson correlation analysis to preliminarily examine the pairwise relationships among the six latent variables: teaching strategies (TS), learning environment (LE), student grit (SG), student engagement (SE), learning motivation (LM), and student performance (SP).

Figure 3.1: Conceptual Framework



The analysis results show that all latent variables exhibit significant positive correlations with one another (see Table 3). Specifically, TS, LE, SG, and SE are all significantly positively correlated with LM and SP, indicating that both external contextual factors and individual characteristics are positively associated with students' learning motivation and performance in aesthetic education. These findings provide preliminary support for the relationships posited in this study's hypotheses and lay an empirical foundation for subsequent structural model construction and hypothesis testing. Subsequently, this study used AMOS software to construct a structural equation model (SEM) and conduct path analysis to systematically test the proposed research hypotheses. The model fit test results (see Table 4) indicate that the structural model fits well and effectively explains the structural relationships among the variables.

The results of the path analysis further revealed the direct effects of each variable on student performance. All four independent variables and the mediating variable had significant positive effects on student performance (SP): teaching strategies significantly influenced student performance ($\beta = 0.177$, $p = 0.002$); the learning environment significantly influenced student performance ($\beta = 0.143$, $p = 0.009$); student grit

significantly influences student performance ($\beta = 0.136$, $p = 0.009$); student engagement significantly influences student performance ($\beta = 0.119$, $p = 0.023$); and learning motivation significantly influences student performance ($\beta = 0.342$, $p < 0.001$). A comparison of the path coefficients reveals that learning motivation has the most significant effect on student performance, indicating that it is a key determinant of academic achievement among students in vocational aesthetic education. At the same time, the model test results also indicate that all four independent variables have a significant positive effect on the mediating variable, learning motivation (LM): the effect of teaching strategies on learning motivation was the most pronounced ($\beta = 0.262$, $p < 0.001$), suggesting that effective teaching practices play a particularly important role in enhancing students' learning motivation in the context of aesthetic education; student grit ($\beta = 0.193$, $p < 0.001$), the learning environment ($\beta = 0.187$, $p = 0.002$), and student engagement ($\beta = 0.170$, $p = 0.003$) also exerted significant positive effects on learning motivation. These results indicate that both external contextual factors (teaching strategies, learning environment) and individual characteristics (student grit, student engagement) can effectively stimulate students' intrinsic motivation to learn.

Table 3: The Path Coefficients

path			Standardized coefficient	Unstandardized coefficients	S.E.	C.R.	P	Result
SP	<---	TS	0.177	0.220	0.072	3.042	0.002	supported
SP	<---	LE	0.143	0.186	0.071	2.620	0.009	supported
SP	<---	SG	0.136	0.146	0.056	2.596	0.009	supported
SP	<---	SE	0.119	0.112	0.049	2.273	0.023	supported
SP	<---	LM	0.342	0.344	0.060	5.719	***	supported
LM	<---	TS	0.262	0.324	0.078	4.169	***	supported
LM	<---	LE	0.187	0.243	0.077	3.147	0.002	supported
LM	<---	SG	0.193	0.205	0.061	3.383	***	supported
LM	<---	SE	0.170	0.159	0.053	2.978	0.003	supported

4.2 Analysis of Mediating Effects

Given that, in the results of the path analysis described above, learning motivation had the most significant impact on student performance ($\beta = 0.342$, $p < 0.001$), and that all four independent variables exerted a significant positive influence on learning motivation, this preliminarily suggests that learning motivation may serve as a mediator in the model, that is teaching strategies, the learning environment, student grit, and student engagement not only directly influence student performance but may also exert their effects indirectly through

learning motivation. To further verify this mediating mechanism, this study employed the Bootstrap method (with 5,000 repeated samples) to test for mediating effects, calculating bias-corrected confidence intervals for each indirect effect. If the 95% confidence interval does not include 0, the indirect effect is considered significant.

The results of the mediation tests for each path are detailed in Table 4, and the specific analysis is as follows.

Table 4: Results of the Mediating Effect Analysis

Path	Effect Type	Estimate	95% CI	p-value	Conclusion
TS → LM → SP	Indirect	0.09	[0.037, 0.172]	< .001	Significant
	Direct	0.177	[0.060, 0.304]	0.004	Significant
	Total	0.267	[0.147, 0.395]	< .001	Partial mediation
LE → LM → SP	Indirect	0.064	[0.022, 0.137]	0.001	Significant
	Direct	0.143	[0.020, 0.273]	0.025	Significant
	Total	0.207	[0.080, 0.333]	0.004	Partial mediation
SG → LM → SP	Indirect	0.066	[0.022, 0.132]	0.001	Significant
	Direct	0.136	[0.024, 0.240]	0.021	Significant
	Total	0.202	[0.093, 0.303]	0.001	Partial mediation
SE → LM → SP	Indirect	0.058	[0.017, 0.122]	0.004	Significant
	Direct	0.119	[0.005, 0.239]	0.039	Significant
	Total	0.178	[0.058, 0.294]	0.005	Partial mediation

First, the total effect of teaching strategies (TS) on student performance was 0.267, with a significant direct effect ($\beta = 0.177, p = 0.004$) and a significant indirect effect mediated by learning motivation ($\beta = 0.090, p < 0.001$, 95% CI does not include 0). This indicates that teaching strategies not only directly enhance student performance but also further promote learning outcomes by strengthening learning motivation, demonstrating a partial mediating effect.

Second, the learning environment (LE) had a total effect of 0.207 on student performance, with both the direct effect ($\beta = 0.143, p = 0.025$) and the indirect effect ($\beta = 0.064, p = 0.001$, 95% CI does not include 0) being significant. This indicates that the learning environment affects student performance both directly and indirectly through learning motivation, highlighting the importance of a supportive learning atmosphere in fostering student motivation.

Third, the total effect of student grit (SG) on student performance was 0.202; both the direct effect ($\beta = 0.136, p = 0.021$) and the indirect effect ($\beta = 0.066, p = 0.001$, 95% CI does not include 0) were significant. The results indicate that student grit not only directly promotes learning outcomes but also further enhances academic performance by stimulating learning motivation, thereby validating the positive role of grit in the context of aesthetic education.

Finally, the total effect of student engagement (SE) on student performance was 0.178, with both the direct effect ($\beta = 0.119, p = 0.039$) and the indirect effect ($\beta = 0.058, p = 0.004$, 95% CI excluding 0) being significant. This indicates that students who actively participate in classroom and extracurricular activities not only benefit directly from higher academic performance but also further enhance their learning outcomes through increased motivation.

In summary, all four predictor variables exhibit partial mediating effects on student performance; that is, they influence learning outcomes both

directly and indirectly through learning motivation. This result highlights the central role of learning motivation in aesthetic education, it serves as a crucial psychological mechanism linking teaching strategies, the learning environment, student grit, student engagement, and learning outcomes. This finding aligns with existing research, which posits that motivation is a key psychological variable influencing student performance in educational practice (Moreira et al., 2018; Zhang et al., 2024).

5. Discussion

This study constructed and validated a model of the mechanisms influencing the effectiveness of aesthetic education, with learning motivation serving as the mediating variable, and systematically examined the direct and indirect pathways through which teaching strategies, the learning environment, student grit, and student engagement affect student performance.

Direct Effects of Teaching Strategies and Learning Environment on Student Performance. The results indicate that both teaching strategies ($\beta = 0.177, p = 0.002$) and the learning environment ($\beta = 0.143, p = 0.009$) have significant positive direct effects on student performance. This finding is consistent with Hornstra et al.'s (2015) conclusion that student-centered instructional design can effectively enhance learning outcomes, and it also corroborates the core tenets of Deci & Ryan's (1985) self-determination theory: when instructional practices satisfy students' basic psychological needs—such as autonomy, competence, and relatedness—their academic performance improves significantly. In the context of aesthetic education, teachers who employ diverse instructional strategies—such as project-based learning, scenario-based learning, differentiated instruction, and the creation of a supportive learning environment—can effectively reduce students' anxiety and feelings of frustration, thereby encouraging them to engage more actively in aesthetic education activities.

The direct effects of student grit and student engagement on student performance. Student grit ($\beta = 0.136$, $p = 0.009$) and student engagement ($\beta = 0.119$, $p = 0.023$) also exert significant positive direct effects on student performance. This finding supports Duckworth's (2019) assertion that grit plays a critical role in achieving long-term learning goals and aligns with the research conclusions of Fredricks et al. (2004), which found that student engagement is a significant predictor of academic achievement. In the context of aesthetic education, students' grit manifests as persistence and focus when facing challenges in artistic practice, while student engagement reflects their level of involvement in classroom interactions, artistic creation, and aesthetic experiences. Together, these two factors constitute important individual sources of motivation that promote sustained learning and improved performance.

The mediating effect of learning motivation and its central role. While the findings regarding the direct effects mentioned above are certainly important, the core focus of this study lies in the mediating mechanism of learning motivation in the formation of aesthetic education outcomes. Compared with the four independent variables mentioned earlier, learning motivation had the highest coefficient of influence on student performance ($\beta = 0.342$, $p < 0.001$), explaining approximately 34.2% of the variance in the dependent variable. This result indicates that, among the many factors influencing students' academic performance in aesthetic education, learning motivation is the single variable with the greatest explanatory power. This finding aligns closely with the MUSIC motivation model proposed by Jones (2009), which posits that teachers stimulate students' learning motivation through effective teaching strategies and a supportive learning environment, thereby promoting improvements in students' academic performance. Specifically, the Bootstrap mediation analysis in this study further revealed that teaching strategies (indirect effect = 0.090, 95% CI does not include 0), the learning environment (indirect

effect = 0.064, 95% CI does not include 0), student grit (indirect effect = 0.066, 95% CI does not include 0), and student engagement (indirect effect = 0.058, 95% CI does not include 0) all exert significant indirect effects on academic performance via learning motivation. The coexistence of these indirect effects alongside direct effects, all of which reached statistical significance, indicates that learning motivation plays a partial mediating role in all four pathways. This implies that instructional strategies, the learning environment, student grit, and student engagement not only directly influence student learning outcomes but also indirectly enhance learning performance through the psychological mechanism of stimulating and sustaining learning motivation.

This finding corroborates the explanatory power of the interactive relationship between environment, individual, and performance as outlined in Bronfenbrenner's (1979) ecological systems theory. External contextual factors (teaching strategies, learning environment) and individual characteristics (student grit, student engagement) jointly shape the final learning outcomes by influencing the individual's internal psychological mechanisms (learning motivation). In the practice of aesthetic education, these findings suggest that educators should place greater emphasis on the central role of motivation in instructional interventions. While simply improving teaching strategies or optimizing the learning environment is certainly important, if these efforts fail to effectively translate into an increase in students' intrinsic motivation to learn, their potential to enhance learning outcomes may not be fully realized.

6. Theoretical and Practical Implications

6.1 Theoretical Implications

The theoretical contribution of this study lies in revealing a noteworthy finding: learning motivation plays only a partial mediating role in the formation of learning outcomes in aesthetic education.

Although learning motivation does mediate some of the indirect effects of teaching strategies, the learning environment, student grit, and student engagement on learning performance, these four independent variables still retain significant and undeniable direct effects on learning performance. This implies that learning outcomes in aesthetic education classrooms are not achieved solely through the pathway of motivating students; external contextual factors and individual characteristics each possess independent explanatory power. This finding contrasts with the conclusions of some existing studies that tend to view motivation as a “core mediator” or “key channel,” suggesting that theoretical models in this field may need to be further refined to distinguish the differing roles that motivation plays in various educational contexts.

Building on this, the present study further expands the application of Self-Determination Theory in the context of aesthetic education in vocational education through an empirical approach. The results confirm that supportive teaching practices and positive learning environments can enhance students’ intrinsic motivation, thereby improving their academic performance (Xu, 2024; Mendoza, Yan, & King, 2023). Previous empirical tests of Self-Determination Theory have largely focused on general education or academic disciplines; this study extends its application to the field of aesthetic education in vocational colleges, filling a relative gap in empirical evidence for this theory within the context of vocational education.

Second, this study validated the crucial role of student engagement in shaping learning outcomes, thereby enriching the explanatory power of constructivist learning theory in the field of aesthetic education. The significant relationships among student engagement, learning motivation, and academic performance (Wang & Zhang, 2024; Patierez, 2024) indicate that knowledge construction in aesthetic education is not a unidirectional transfer of knowledge, but rather a process in which students actively participate and

construct meaning. This finding reinforces the understanding that students are not passive recipients but active constructors of meaning in aesthetic education (Syamsuddin, 2024); in particular, students’ active participation is especially critical in disciplines such as aesthetic education, which are characterized by experiential and practice-oriented approaches.

Third, this study provides empirical support for Dewey’s aesthetic theory drawn from the context of Chinese vocational colleges. The significant impact of teaching strategies and the learning environment on learning motivation and student performance indicates (Zhang, Wang, & Li, 2024) that aesthetic education is deeply rooted in specific contexts and experiential processes. This aligns with Dewey’s view that “aesthetic experience is central to meaningful learning” (Wickman, Prain, & Tytler, 2025) and further confirms the role of experience in promoting students’ comprehensive development.

Finally, this study integrates external factors (teaching strategies, learning environment) and internal factors (student grit, student engagement) into a unified structural model and tests them using learning motivation as a mediating variable. Unlike previous studies, which often examined the aforementioned variables in isolation, this integrated model can more systematically reveal the complex mechanisms through which factors at different levels interact and jointly influence learning outcomes, thereby providing an analytical framework for research on learning mechanisms in the field of vocational aesthetic education.

6.2 Practical Implications

The findings of this study offer practical guidance for educators, administrators, and policymakers in vocational colleges, particularly in the context of aesthetic education reform in Western Guangdong. Given that this study found learning motivation to play only a partial mediating role, that is, each of the four independent variables retained a significant direct effect on learning performance—

the design of practical interventions should not focus exclusively on motivating students but should instead promote the synergistic advancement of multiple influence pathways.

First, the direct effect of teaching strategies ($\beta = 0.177$) is greater than their indirect effect mediated by learning motivation ($\beta = 0.090$). This implies that the intrinsic value of improving teaching methods should not be overshadowed by the indirect logic of “enhancing performance by stimulating motivation.” Educators should adopt more student-centered, highly interactive, and experiential teaching methods, such as project-based learning, cooperative learning, and aesthetic education to directly promote student engagement and improve academic performance (Xiong, 2025). Improvements in teaching strategies not only benefit direct learning outcomes but also generate complementary indirect effects through the motivation pathway (Nur’aini, 2025); however, the direct pathway represents their primary contribution.

Second, the direct impact of the learning environment deserves equal attention. Institutions should focus on creating supportive, resource-rich learning environments (Yeganeh et al., 2025), including optimizing classroom atmospheres, fostering positive teacher-student relationships, and integrating digital and smart learning tools to adapt to ongoing changes in the educational landscape. These environmental improvements not only exert an indirect effect through learning motivation but also directly provide students with favorable learning conditions, thereby enhancing their academic performance.

Third, the direct effects of student grit and engagement should not be overlooked. Educational interventions should consciously cultivate students’ grit, sustained effort, and sense of classroom participation through curriculum design, extracurricular activities, and ongoing feedback mechanisms. Strengthening these individual qualities not only indirectly improves

academic achievement through learning motivation but also possesses independent and significant explanatory power in its own right, a point that is particularly prominent in aesthetic education, which emphasizes long-term accumulation and practical experience.

Finally, the practical positioning of learning motivation must be handled with care. Since motivation plays only a partial mediating role in this study, at the practical level, motivation stimulation should be viewed as one of the key pathways for reforming aesthetic education, not the sole focal point. Institutions can establish more effective evaluation and feedback systems, incorporating motivation assessment into routine monitoring of teaching quality, while recognizing that the efficacy of motivation strategies is primarily manifested in contexts where they work in concert with other teaching interventions. Given the practical challenges in vocational schools’ aesthetic education, such as low student engagement and unclear learning objectives, relying solely on strategies to stimulate motivation may yield limited results. Instead, a coordinated approach is needed that advances all four pathways: teaching strategies, environmental optimization, character development, and motivation stimulation.

7. Research Limitations and Directions for Future Research

This study also has several limitations. First, the sample was limited to aesthetics teachers at seven higher vocational colleges in Western Guangdong, resulting in limited geographical coverage; the external validity of the study’s conclusions requires further verification through samples spanning different regions and institutional types. Second, student performance variables were collected through teachers’ subjective evaluations, which may be influenced by the teacher expectation effect and differences in individual assessment criteria. Future research could incorporate multi-source data, such as student self-assessments, peer

evaluations, and objective academic performance to enhance the objectivity and robustness of the measurement results. Furthermore, as this study employed a cross-sectional design, it is difficult to draw rigorous inferences regarding causal relationships among variables. Future research may consider adopting a longitudinal tracking design or an experimental intervention design to further examine the dynamic evolutionary process through which aesthetic education interventions influence academic performance via learning motivation.

8. Conclusion

This study systematically examined the relationships among teaching strategies (TS), learning environment (LE), student grit (SG), student engagement (SE), learning motivation (LM), and student academic performance (SP) in the context of aesthetic education at vocational colleges in Western Guangdong, China.

The findings highlight the significant roles of external factors (teaching strategies and learning

environment) and internal factors (student grit and student engagement) in shaping students' learning motivation and academic performance. Notably, learning motivation is the most important predictor of academic performance and serves as a key mediating variable linking instructional conditions to educational outcomes. These results underscore the importance of fostering students' learning motivation, which is central to achieving the intended goals of aesthetic education.

Overall, this study contributes to a deeper understanding of the underlying mechanisms of aesthetic education in vocational colleges and provides empirical evidence for optimizing teaching practices and learning environments. Future research is encouraged to further explore other influencing factors, such as school culture, individual differences, and digital learning environments. Additionally, longitudinal studies are particularly important for capturing the long-term effects of teaching and motivational processes on students' aesthetic education development.

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