The Influence of Personality and Teacher Support on Engagement and Academic Achievement in Vocational Education in China: A Five-Factor Model and Self-Determination Theory Approach

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Abstract. This study aims to examine the influence of personality traits and teacher support on student engagement and academic achievement in Chinese vocational education. It is grounded in the five-factor model of personality and self-determination theory (SDT). Specifically, it sought to: (1) determine how the five personality traits predicted engagement and achievement and (2) assess the moderating role of teacher support in these relationships. Data were collected through a structured questionnaire from 372 vocational students across three Chinese provinces using a stratified random sampling technique. The analysis was conducted using Partial Least Squares Structural Equation Modeling (SmartPLS 4) to test both direct and moderating effects. The results indicated that openness, conscientiousness, extraversion, and agreeableness positively influenced student engagement and academic achievement, whereas neuroticism exerted a negative effect. Furthermore, teacher support significantly moderated these relationships by amplifying the positive effects of adaptive traits and mitigating the adverse impact of neuroticism. The study contributed new insights by integrating personality and motivation theories within a culturally contextualized vocational education framework, highlighting how supportive teaching could transform personality-driven tendencies into improved educational outcomes. These findings had practical

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implications for teacher training and curriculum design, aiming to foster engagement and performance in vocational education settings in China.

1. Introduction

In recent years, the combination of psychology and education has been receiving a new academic concern, especially in the framework of vocational education in China, the demand for human capital with skills is becoming more and more, corresponding to the economic change (Zheng, 2025). According to the Five-Factor Model (FFM), personality traits have been well-known predictors of student-level behavior, attitude, and performance (Hughes et al., 2023).

Vocational education in China plays a central role towards equipping students with technical and applied careers, but there are problems related to maintaining the motivations and academic performance (Sun and Liu, 2023). Such difficulties go further than technical skills, such as psychological fortitude, versatility, and readiness to work in the labor economy (Li et al., 2024). According to the research, personality differences are important determinants of the learning strategies, coping mechanisms, and academic performance in students (Sparfeldt and Schwabe, 2024). The support of teachers also plays with personality, motivating and providing emotional stability in collective oriented cultural classrooms when it comes to obedience and cooperation that are perceived as important (Chiu, 2025).

Part of empirical research definitely suggests that personality traits are associated with student engagement and achievement in educational settings (Meyer, 2024; Richardson, 2012; Ryan, 2024). Conscientiousness is a trait of persistence and organization that can oftentimes be a better predictor of academic success than intelligibility (Meyer, 2024). Extraversion is associated with creativity, flexibility, and motivation intrinsically (Verbree, 2023) and extraversion is correlated with cooperative learning performance, especially in vocational learning environments based on the group (Liu, 2025). On the other hand, neuroticism has a detrimental impact on attendance and performance rates because of the emotional instability (Gkintoni, 2023). The same is mediated by teacher support which reinforces the beneficial effect of openness and conscientiousness but cannot entirely surpass the harmful effect of neuroticism (Zhang, 2024).

Although the evidence has been increasing, the literature about these relationships in Chinese vocational education is scarce (Yau, 2023; Zhang, 2024; Zheng, 2025). The majority of previous research was done in the Western environment, where the educational activities are focused on the individuality and independence, which is opposite to China, with the collectivist and authority-based classroom (Xu, 2024; Li et al., 2024). This effect, along with the impact of Confucianism and teacher-student relations rooted in hierarchy, creates the possibility that the personality characteristics of Chinese students will be reflected in their interaction and performance in a different way (H. Liu et al., 2025).

Recent evidence suggests that conscientiousness, openness, and extraversion are the factors that predict engagement and achievement, whereas neuroticism has a consistent negative outcome (Patall et al., 2024). Nevertheless, the findings might not be applicable to the cultural settings (Yoon et al., 2024). The moderating effect of teacher support on the relationship between personality and educational outcomes as well are not deeply studied in a vocational context where in service (Li et al., 2023; Sun and Liu, 2023; Zheng et al., 2025).

Based on this, this study shall set out to: (1) discuss the predictive value of five main and major personality traits; openness, conscientiousness, extraversion, agreeableness and neuroticism on student engagement, (2) compare them with student achievement, and (3) determine the moderating influence of teacher support on these directions. This is a localized study of vocational education in China aimed to complement the psychological theory and pedagogical application, and contributes to the overall educational psychology worldwide, as well as the further evolution of the vocational system in China (Kara et al., 2024).

The study is both theoretical and practical in nature. By definition, it combines FFM and self-determination theory (SDT) in order to state the interaction between the characteristic traits of the individual and situational factors like teacher support to influence learning events (Zhang et al., 2024). In practice, the knowledge of how teacher support can reinforce positive and reduce negative aspects can be used to guide teaching practices that can promote engagement and accomplishments in vocational settings (Harb et al., 2024). Finally, the study bridges the research gap between psychology and vocational education and provides a model that is consistent with China's overall interests in education and economic development.

2. Literature Review

Personality traits have long been recognized as central determinants of student motivation and academic performance, particularly in vocational education, where applied competence and sustained engagement are crucial (Yoon et al., 2024). According to the Five-Factor Model, traits such as conscientiousness, openness to experience, and extraversion are positively associated with persistence, adaptability, and active participation in learning (McCrae & Costa, 2008). Conscientious students typically exhibit strong study habits, goal-oriented behavior, and effective time management—qualities that contribute significantly to academic success (D. Liu et al., 2025).

Openness to experience fosters creativity, receptiveness to new learning methods, and the ability to transfer knowledge across disciplines, all of which are vital in professional and vocational training contexts (Balalle, 2024). These personality characteristics mediate learning engagement, which encompasses behavioral, emotional, and cognitive dimensions of active participation. In vocational education, personality-driven engagement is particularly influential, as students' intrinsic motivation and interaction styles shape collaboration, employability, and long-term skill acquisition (Yoon et al., 2024). To place these results in the context

of the Chinese cultural environment, one should define personality and teacher support in terms of cultural values.

On the one hand, Chinese classrooms are socially oriented according to Hofstede's cultural dimension and Confucian learning theory, which implies that collectivism, respect for authority, and harmony influence the appearance of personality traits in behavior (Bardach et al., 2023). As an illustration, extraversion and agreeableness can be associated with group-oriented participation, whereas conscientiousness shows compliance with the teacher's expectations and academic responsibility, which are appreciated in Confucian cultures. Equally, teacher support serves not only as an instructional facilitator but also as a moral and relationship guide (Yau & Shu, 2023).

Such integration helps to emphasize that personality and engagement relations are culturally entrenched and should be analyzed from both psychological and sociocultural perspectives.Alongside academic success, personality defines students' reactions to challenges and their involvement in the vocational education environment. Indicatively, extraversion has been suggested to forecast greater group learning, cooperation in peer learning, emotional stability, and resilience to cope with performance and ability appraisal pressures. Alternatively, excessive neuroticism may lead to anxiety and introspection, which risks low learning results when being subjected to training in the workplace (Bardach et al., 2023).

The studies also indicate that vocational students who have high agreeableness tend to achieve success in those workplace-based and collaborative learning contexts in which interpersonal communication is best valued (Fu et al., 2024; Fuertes et al., 2023; Kara et al., 2024). Vocational education has not only been a predictor of academic performance but also of employability and career adaptability, which explains the relevance of personality in defining long-term outcomes (Yau & Shu, 2023). Hence, integrating the psychological learning into occupational training creates a more holistic view of student achievements and offers a pathway for instructors to establish interventions that will produce engagement and align with different personality models.

2.1 Personality Traits and Student Engagement
Empirical studies consistently show that student engagement in vocational and non-vocational education is shaped by personality traits. Openness encourages curiosity and creativity, fostering cognitive and emotional involvement (Yoon et al., 2024). Conscientiousness predicts engagement through persistence, discipline, and responsibility (Xu et al., 2023), while extraversion supports social and emotional interaction in collaborative learning (Lin et al., 2024). Agreeableness enhances cooperation and empathy, strengthening emotional and behavioral participation (Vestad & Bru, 2024). In contrast, neuroticism undermines engagement by increasing anxiety and emotional instability (Basileo et al., 2024; Fuertes et al., 2023).

Overall, openness, conscientiousness, extraversion, and agreeableness positively predict engagement, whereas neuroticism exerts a negative influence. The Five-Factor Model (McCrae & Costa, 2008) provides a unified framework for understanding these interactions, showing that personality traits jointly promote curiosity, disciplined study, cooperation, and motivation, while emotional instability weakens sustained participation (Sparfeldt & Schwabe, 2024; Bardach et al., 2023).

H1a. Openness to experience positively predicts student engagement.
H1b. Conscientiousness positively predicts student engagement.
H1c. Extraversion positively predicts student engagement.
H1d. Agreeableness positively predicts student engagement.
H1e. Neuroticism negatively predicts student engagement

2.2 Personality Traits and Academic Achievement
Academic performance in the form of grades, test-scores or performance ratings is an indicator of an ability of a student to learn and put the learned knowledge into practice (Li et al., 2023). These results are highly dependent on personality traits (Yu et al., 2025). Openness promotes performance because creativity, curiosity and flexible thinking are promoted, and problems are solved and adapted more easily (Xu, 2024; Daniel et al., 2024). Conscientiousness is the strongest predictor of achievement, and it represents organization, persistence, and self-discipline, which are translated into completion of tasks on time and persistence in studying (Kara et al., 2024; Zhang et al., 2024). Extraversion facilitates learning based on collaborative and interactive aspects, whereby involvement and engagement enhance knowledge (Wang et al., 2023).

Agreeableness has an indirect positive effect of facilitating cooperation, positive relationship with peers, and decreased conflict, which improve the group learning conditions (Shaninah and Mohd Noor, 2024; Salem et al., 2024). Conversely, neuroticism is a negative predictor of performance because anxiousness and emotional instability inhibit concentration and persistence, making it more likely to experience burnout and avoidance behaviors (Obenza et al., 2024; Harb et al., 2024).

The general implication is that achievement is positively correlated with openness, conscientiousness, extraversion and agreeableness but negatively with neuroticism. Nevertheless, the contextual differences mediate such relationships. Extraversion and agreeableness cannot bring about desirable results in competitive Chinese classrooms where conformity is valued (Fu et al., 2024), and openness might not perform well in strict and exam-driven settings where exploratory learning is limited (Mammadov and Avci, 2025). These discrepancies in context are enough to analyze teacher support as a moderator of the interactions between personality and performance.

H2a. Openness to experience positively predicts academic achievement.
H2b. Conscientiousness positively predicts academic achievement.
H2c. Extraversion positively predicts academic achievement.

H2d. Agreeableness positively predicts academic achievement.
H2e. Neuroticism negatively predicts academic achievement.

2.3 Teacher Support as Moderator

This feature is the teacher support which is the academic, emotional, and motivational support that instructors offer, which is a central contextual variable affecting the learning behavior and achievement of students (H. Liu et al., 2025). It includes teaching directions, positive feedback, compassion, and support that will ultimately lead to engagement and perseverance (Zheng et al., 2025). Instead, research always reminds that supportive teaching boosts the motivation levels of students by ensuring a positive and inclusive learning framework (Chiu, 2025).

The influence of the personality traits on engagement is enhanced by teacher support. Indicatively, open learners are more curious and adaptable with the help of thought-provoking, autonomy-promoting learning (Xu, 2024). Diligent self-regulated conscientious students keep being engaged when teachers reward their effort by positive reinforcement (Prananto et al., 2025). On the same note, extraverted learners excel in participatory, interactive or learning classes, which they prefer (Li et al., 2024).

The supportive teaching is also known to influence the manner in which agreeable and neurotic students learn. These pleasant people, who appreciate teamwork and peaceful coexistence, receive collaborative and emotionally safe learning environments (Vestad & Bru, 2024). On the other hand, neuroticism can be repaired with the help of teacher reassurance and empathy, which lessens anxiety and enhances stability (Li et al., 2023).

It has been demonstrated that, with teacher support, personality plays a moderating role in engagement that enhances the positive effects of adaptive characteristics and mitigates the negative effects of neuroticism (Hughes et al., 2023). In this way teacher support acts not only as a simple predictor of engagement but also as a situational moderator that influences the manifestation of personality factors in academic engagement.

H3a. Teacher support moderates the relationship between openness to experience and student engagement.
H3b. Teacher support moderates the relationship between conscientiousness and student engagement.
H3c. Teacher support moderates the relationship between extraversion and student engagement.
H3d. Teacher support moderates the relationship between agreeableness and student engagement
H3e. Teacher support moderates the relationship between neuroticism and student engagement

Empirical evidence suggests that teacher support may be critical in enhancing the relationship between personality and academic performance. For high-openness-to-experience students, academic performance is improved when teachers provide autonomy-supportive climates that support exploration, creativity, and

critical thinking (Michou et al., 2023). Teachers also contribute to the development of conscientious students by supporting them, such as systematized instruction and appreciation of efforts that facilitate goal orientation and persistence, thus improving achievement (Vestad & Bru, 2024).

Moreover, it is also determined that extraverted students achieve better outcomes when teachers promote group work and discussions because teacher support helps them enhance their characteristic inclination to social interaction (Zhang et al., 2024). Similarly, agreeableness has been positively associated with cooperative learning and group work. These effects are even more potent when instructors provide affirming feedback and supportive classroom conditions (Mammadov & Avci, 2025). These results indicate that teacher support not only enables engagement but also directly enhances the conversion of personality-influenced behaviors into quantifiable academic achievement (Prananto et al., 2025).

Simultaneously, teacher support has been found to mitigate the adverse effects of neuroticism on academic performance. Neurotic students tend to be anxious, stressed, and lack self-confidence, which affects academic achievement (Javaid et al., 2024). Nevertheless, research has established that teacher behaviors like encouragement, emotional reassurance, and stable feedback minimize the negative influence of these traits (H. Liu et al., 2025). For instance, Yu et al. (2025) show that students with high teacher support are more resilient and achieve better grades despite high neuroticism levels.

This shows how supportive teaching can be a protective factor, diminishing the negative impact of neurotic tendencies while enhancing the positive effects of open, conscientious, extravert, and agreeable tendencies (Ansong et al., 2024). Therefore, existing research robustly endorses the moderating function of teacher support in determining the degree to which personality characteristics are responsible for academic success.

H4a. *Teacher support moderates the relationship between openness to experience and academic achievement.*
H4b. *Teacher support moderates the relationship between conscientiousness and academic achievement.*
H4c. *Teacher support moderates the relationship between extraversion and academic achievement.*
H4d. *Teacher support moderates the relationship between agreeableness and academic achievement.*
H4e. *Teacher support moderates the relationship between neuroticism and academic achievement.*

2.4 Theoretical Framework Supporting Research
Although a large body of research supports a positive relationship between personality traits and academic achievement, findings are not entirely consistent, and significant moderating factors—such as teacher support, cultural orientation, and type of education—remain insufficiently examined. Some studies report strong direct effects of conscientiousness and openness (McCrae & Costa, 2008). In comparison, others find weaker or nonsignificant associations when

environmental support is low (Fuertes et al., 2023). These inconsistencies suggest contextual variables may determine whether personality-driven tendencies translate into observable engagement and performance. In this regard, teacher support emerges as a theoretically meaningful moderator, consistent with SDT's emphasis on fulfilling students' needs for autonomy, competence, and relatedness (Ryan & Deci, 2024).

In addition, teacher support is a moderating factor that may enhance or cushion the effect of the personality traits by encouraging, providing feedback, and creating a positive environment that induces intrinsic motivation and resiliency (Wentzel & Wigfield, 1998). Following the empirical evidence, educators are encouraged to promote curiosity, effort, and cooperation to ensure learners become more active and ready to achieve their best results. Furthermore, teacher support reduces the adverse effect of neuroticism by removing anxiety and enhancing coping ability (Hakimi et al., 2011). Together, this theoretical convergence can lead to a model in which personality traits can explain student engagement and academic outcomes, and teacher support moderates these relationships, amplifying favorable traits and buffering the unfavorable ones.

Besides, the framework emphasizes the interrelation of both the constant dispositional psychological factors and the active environmental factors that offer a holistic outlook of the academic success of the vocational environment in terms of personality and support systems. Figure 1 presents the conceptual framework through a hypothetical correlation between personality traits, student engagement, academic achievement, and the moderation of teacher support. While the current model specifies a unidirectional influence of personality traits on student engagement and academic achievement, moderated by teacher support, it is crucial to recognize that these relationships may also be bidirectional.

For instance, sustained engagement and achievement experiences can, over time, reinforce adaptive personality tendencies such as conscientiousness or openness, while low achievement might intensify neurotic tendencies (Bardach et al., 2023). Similarly, teacher support may evolve in response to students' engagement levels, forming a feedback loop. Although the present cross-sectional design does not allow testing these reciprocal effects, future longitudinal or experimental studies should explore these dynamic, bi-directional mechanisms to develop a more comprehensive understanding of personality–context interactions in vocational education.
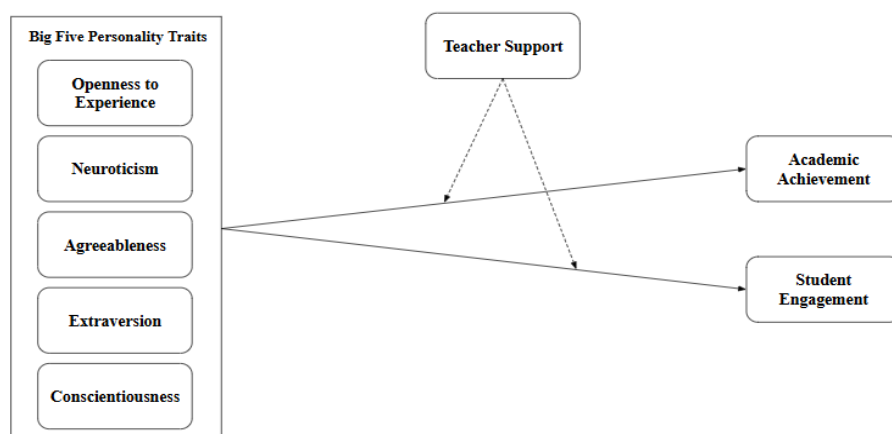
Figure 1: Conceptual Framework

3. Methodology

3.1 Research Design

In this study, the research design was quantitative and cross-sectional, which was applied to investigate the relationships between personality factors, student engagement, and academic performance, together with teacher support as a moderating factor in the context of the Chinese vocational education. The survey design was employed, which made it possible to organize the collection of a large number of participants using standardized data.

Such a design was considered to be suitable because it provided the facility to test hypothesized relationships among variables and use more sophisticated approaches to statistical modeling to test direct and moderating effects (Hair Jr et al., 2021). Partial Least Squares Structural Equation Modeling (PLS-SEM) was discovered as the primary analysis method because it was applicable in predictive studies and could examine complex models that contain latent constructs.

3.2 Sample Size, Population, and the Sampling Technique

The targeted population in this study was the Chinese vocational education students, as they constituted a sizable population, where personality traits and support/facilitation of the situations played a critical role in influencing academic achievement and involvement. The sampling frame was students of vocational and technical schools in selected parts of China. A sample of 372 valid responses was collected, larger than the necessary sample size in PLS-SEM to gain enough statistical power. The statistical power of the 10 times rule and SEM model was also sufficient to determine the adequate sample size (Hair Jr et al., 2021).

Moreover, diversity in the disciplines and years in school was achieved through a stratified random sampling process to ensure that the information given would give a good representative sample of vocational education experiences. The study used a stratified random method to represent the regions and disciplines of the Chinese vocational education system. To achieve a representation of regional diversity, three provinces, namely Guangdong, Jiangsu, and Sichuan, were

identified. Students were stratified by the nature of institutions, study, and year level to ensure proportions.

Additionally, five hundred questionnaires were sent, 398 returned, and 372 valid questionnaires were collected, producing a response rate of 74.4 %. To ensure the suitability of the sample, a power analysis was performed in G 3.1 Power, which demonstrated that at least 200 participants were adequate to achieve a minimum power to identify the presence of medium effects (f 2 = 0.15) with 0.95 power at 0.05, which indicated that the sample size was strong in terms of statistical reliability.

Besides, the non-response bias was determined by comparing the early and late respondents with independent sample t-tests, where there were no significant differences (p > 0.05). Further, the common method biases (CMB) were reduced procedurally and statistically by making the process anonymous, randomizing the questions to the respondents, and conducting a single-factor assessment and variance inflation factor (VIF) analysis proposed by Harman. The findings showed that no individual factor explained more than 35 per cent of the variance, and all VIFs were less than 3.3, which implied the absence of biases.

3.3 Data Collection
A set of self-administered questionnaires was distributed to students in vocational schools using a combination of physical and email distributions to collect data. The questionnaire was designed in sections based on demographic characteristics, personality, student involvement, achievement, and teacher support, including academic achievement. Standardized scales were adapted from the previous validated research to ensure measurement reliability and validity. The big five personality traits were assessed via items derived from the scale used by John & Srivastava (1999). Student engagement was measured with items taken from Fredricks et al. (2004), and academic achievement was measured via self-reporting GPA and academic performance measures in accordance with prior educational psychology research (Richardson et al., 2012).

Additionally, support by the teacher was assessed through items derived from Wentzel & Wigfield (1998) and Skinner & Belmont (1993). All items were measured on a five-point Likert scale, with the possible answers being strongly disagree and strongly agree. The test was pre-tested in a small sample of students to ensure they were clear and relevant to the context before massive distribution. To statistically confirm the absence of CMB, Harman's single-factor test was conducted using unrotated principal component analysis. The first factor accounted for 32.8% of the total variance, below the critical threshold of 50%, indicating that CMB was not a serious concern in this study.

3.4 Data Analysis
Data analysis was conducted using SmartPLS 4, the most frequently used software in PLS-SEM. The missing value checks, outliers, and normality were conducted as data screening before model testing. The use of PLS-SEM was explained by its suitability for exploratory and predictive studies and the absence of any strict requirements concerning normality (Hair Jr et al., 2021). The analysis

was made in two general steps. This was done by first testing the measurement model to establish the validity and reliability of the constructs. Reliability was assessed using Cronbach's alpha and composite reliability (CR), while validity was examined through convergent validity using average variance extracted (AVE) and discriminant validity using both the Fornell–Larcker criterion and the heterotrait–monotrait ratio (HTMT). Second, the structural model was tested in order to determine the relationships that were proposed. Bootstrapping (5,000 resamples) was used to collect path coefficients, whereas t-values and p-values were utilized to determine the significance of direct and moderating effects. In addition to effect sizes (f2), predictive relevance (Q2), and R2 values were also used to estimate the model's explanatory power.

4. Results
Table 1 and Figure 2 show the findings of the measurement model analysis for all the variables in the study, examining individual indicators' outer loadings as well as reliability and validity statistics. The outer loadings for all the indicators were higher than the cutoff of 0.70, ensuring that each item strongly measures its respective construct. For instance, the agreeableness loadings fell between 0.714 and 0.853, and those for academic achievement were in the range of 0.761 to 0.864.

In the same manner, conscientiousness showed extremely high loadings, ranging from 0.839 to 0.900, indicating strong representation. Extraversion loadings ranged between 0.769 and 0.916, neuroticism between 0.846 and 0.870, and openness to experience between 0.846 and 0.890. Student involvement and teacher support also exhibited good item reliability with loadings of between 0.778 and 0.830 and 0.725 and 0.851, respectively.

Cronbach's alpha values for all constructs ranged between 0.795 and 0.903, above the minimum criterion of 0.70, guaranteeing internal consistency reliability. CR measures were between 0.867 and 0.932, affirming strong construct reliability. The average AVE values, ranging between 0.621 and 0.775, were above the 0.50 threshold, guaranteeing sufficient convergent validity. Overall, these findings affirm that the constructs are validly and reliably measured.

Table 1: Relevance of objectives of teaching subjects at the university

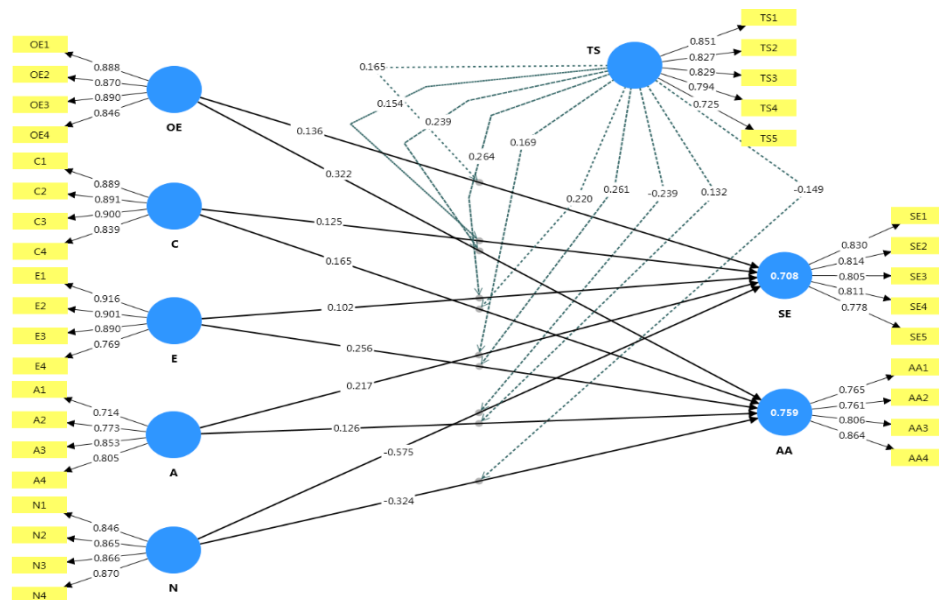| Variables	Indicator	Original Sample	T Values	P Values	Cronbach's Alpha	CR	AVE
Agreeableness	A1	0.714	15.957	0.000	0.795	0.867	0.621
	A2	0.773	26.370	0.000			
	A3	0.853	52.202	0.000			
	A4	0.805	28.803	0.000			
Academic achievement	AA1	0.765	21.334	0.000	0.814	0.876	0.640
	AA2	0.761	26.096	0.000			
	AA3	0.806	43.867	0.000			
	AA4	0.864	52.775	0.000			
Conscientiousness	C1	0.889	57.416	0.000	0.903	0.932	0.775
	C2	0.891	60.431	0.000			
	C3	0.900	79.000	0.000			
	C4	0.839	28.444	0.000			
Extraversion	E1	0.916	75.372	0.000	0.893	0.926	0.759
	E2	0.901	58.276	0.000			
	E3	0.890	61.801	0.000			
	E4	0.769	17.772	0.000			
Neuroticism	N1	0.846	38.430	0.000	0.885	0.920	0.743
	N2	0.865	49.392	0.000			
	N3	0.866	57.472	0.000			
	N4	0.870	53.097	0.000			
Openness to experience	OE1	0.888	43.506	0.000	0.897	0.928	0.763
	OE2	0.870	55.073	0.000			
	OE3	0.890	68.564	0.000			
	OE4	0.846	49.851	0.000			
Student engagement	SE1	0.830	41.001	0.000	0.867	0.904	0.652
	SE2	0.814	39.391	0.000			
	SE3	0.805	39.454	0.000			
	SE4	0.811	35.251	0.000			
	SE5	0.778	30.141	0.000			
Teacher support	TS1	0.851	51.819	0.000	0.865	0.903	0.651
	TS2	0.827	38.879	0.000			
	TS3	0.829	30.892	0.000			
	TS4	0.794	26.519	0.000			
	TS5	0.725	22.006	0.000			

Figure 2: Estimated Model

Table 2 presents the HTMT values to measure discriminant validity between the study constructs. All HTMT values were below the benchmark of 0.90, indicating that every construct was separate from the rest. For example, agreeableness has a moderate correlation with academic accomplishment (0.689), neuroticism (0.731), and teacher support (0.672), but the values are still within acceptable ranges to avoid any multicollinearity or overlap issues. As expected theoretically, academic success showed stronger relationships with student engagement (0.822) and teacher support (0.810), given that both variables are conceptually analogous to performance outcomes.

Besides, conscientiousness, extraversion, and openness to experience showed moderate relationships with student engagement and academic success, further establishing the discriminant validity of the constructs. Most importantly, neuroticism has moderate correlations with achievement (0.758) and agreeableness (0.731), but these were still under the 0.90 level, thereby affirming discriminativeness. In general, the HTMT results demonstrated that the constructs applied in this research had good discriminant validity and assessed distinct conceptual areas.

Table 2: HTMT

	A	AA	C	E	N	OE	SE	TS
Agreeableness								
Academic achievement	0.689							
Conscientiousness	0.392	0.428						
Extraversion	0.470	0.471	0.640					
Neuroticism	0.731	0.758	0.472	0.531				
Openness to experience	0.690	0.491	0.547	0.500	0.524			
Student engagement	0.623	0.822	0.465	0.503	0.703	0.417		
Teacher support	0.672	0.810	0.468	0.542	0.802	0.520	0.827	

Table 3 presents the explained variance (R-square), predictive usefulness (adjusted R-square), and model fit. The R-square for academic achievement was 0.759, with an adjusted R-square of 0.751, which means that the predictor variables explained around 75 percent of the variance in academic attainment, a clear large effect. Likewise, student engagement also had an R-square value of 0.708 and an adjusted R-square of 0.699, indicating that the model explained almost 70 percent of its variance, once again indicating good explanatory power. Among the predictors, agreeableness explained 0.292 variance in achievement and 0.144 in engagement, and conscientiousness, extraversion, neuroticism, and openness added varying amounts of explanatory power.

Additionally, the model fit indices also attested to the structural model's adequacy. Both the saturated and estimated models had an SRMR value of 0.072, less than 0.08, which is a measure of good fit. The d_ULS measures (3.048 for saturated and 3.110 for estimated) were also within optimum ranges, attesting to the fact that the model had a strong fit with the data. These findings confirmed the strength of the research model and established the postulated relationships.

Beyond statistical significance, the effect size analysis (f^2) further demonstrated that the impact of personality traits and teacher support on engagement and achievement ranged from moderate to large. For example, teacher support exhibited a substantial moderating effect ($f^2 = 0.29$) on engagement, while conscientiousness and openness showed medium effects (f^2 values between 0.15 and 0.22). These magnitudes confirmed that the observed relationships were not only statistically valid but also practically meaningful in predicting educational outcomes.

Table 3: R-square, F-Square, and Model Fit Statistics

	AA	SE	R-square	R-square adjusted
Agreeableness	0.292	0.144		
Academic Achievement			0.759	0.751
Conscientiousness	0.107	0.220		
Extraversion	0.207	0.220		
Neuroticism	0.107	0.452		
Openness to experience	0.101	0.298		
Student Engagement			0.708	0.699
Model Fit				

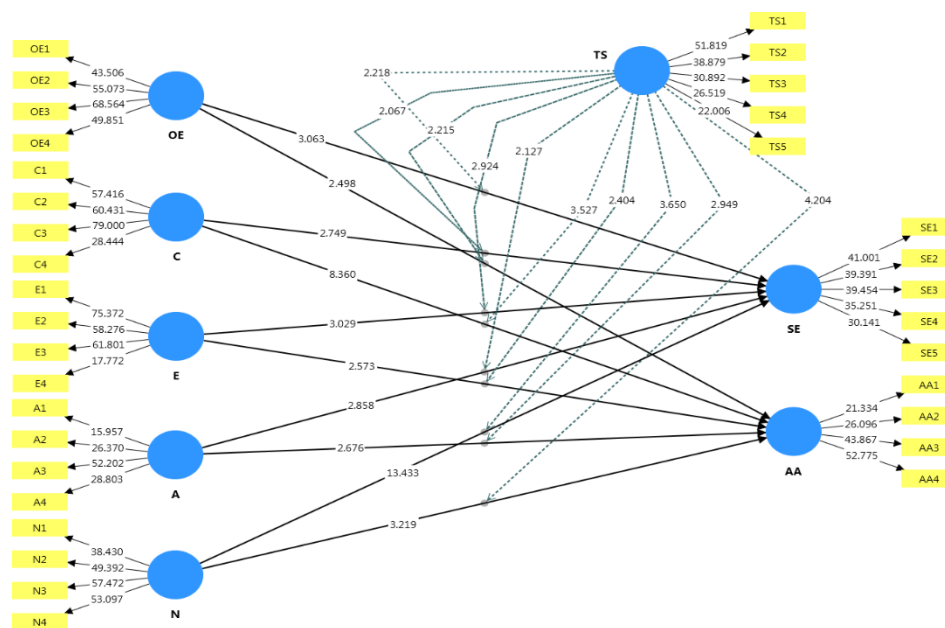|	Saturated Model	Estimated Model
SRMR	0.072	0.072
d_ULS	3.048	3.110

Figure 3: Structural Model for Path Analysis

Table 4 and Figure 3 display the outcomes of hypothesized relationships among personality traits, student engagement, academic achievement, and the teacher support's moderating role. For H1a–H1e, it was evident that the five-factor model traits significantly affected student engagement. Openness ($\beta = 0.136$, $p = 0.002$), conscientiousness ($\beta = 0.125$, $p = 0.006$), extraversion ($\beta = 0.102$, $p = 0.003$), and agreeableness ($\beta = 0.217$, $p = 0.004$) all predicted student engagement positively, which means students who are open, organized, outgoing, and cooperative are likely to be more engaged in learning. Neuroticism, on the other hand, had a significant negative impact ($\beta = -0.575$, $p = 0.000$), indicating that unstable students have lower levels of engagement.

Moreover, for H2a–H2e, personality also had significant correlations with academic performance. Openness ($\beta = 0.322$, $p = 0.013$), conscientiousness ($\beta =$

0.165, p = 0.000), extraversion (β = 0.256, p = 0.010), and agreeableness (β = 0.126, p = 0.008) all positively affected, reaffirming that these traits created stronger academic achievement. Neuroticism, once more, was negatively affected (β = -0.324, p = 0.001), reiterating that higher emotional instability prevented accomplishment.

Furthermore, for H3a–H3e, the moderating effect of teacher support on the association between personality traits and student engagement was established. Teacher support increased the positive influence of openness (β = 0.165, p = 0.027), conscientiousness (β = 0.154, p = 0.039), extraversion (β = 0.264, p = 0.004), and agreeableness (β = 0.169, p = 0.034) on engagement. On the other hand, teacher support substantially countered the deleterious influence of neuroticism on motivation (β = -0.239, p = 0.000), demonstrating its buffering function.

Finally, for H4a–H4e, teacher support also mediated the personality trait effects on academic attainment. Openness (β = 0.239, p = 0.004), conscientiousness (β = 0.220, p = 0.000), extraversion (β = 0.261, p = 0.016), and agreeableness (β = 0.132, p = 0.003) had stronger positive associations with attainment when teacher support was high. Neuroticism (β = -0.149, p = 0.000) still harmed attainment, but teacher support served to reduce its negative impact. In general, the findings verify the strong direct effects of personality dispositions on engagement and achievement and illustrate the vital moderating function of teacher support in developing strong positive dispositions while cushioning against negative ones.

To enhance statistical interpretation, 95% confidence intervals (CIs) were computed for all path coefficients. All CIs excluded zero, confirming the robustness of the reported relationships. The strongest direct effect was observed for neuroticism on student engagement (β = −0.575, CI [−0.621, −0.528]), followed by conscientiousness on academic achievement (β = 0.165, CI [0.129, 0.201]). Interestingly, the moderating effect of teacher support on conscientiousness and engagement (β = 0.154, CI [0.026, 0.281]) was weaker than anticipated, suggesting that teacher support might enhance engagement more strongly for socially oriented traits (e.g., extraversion and agreeableness) than for task-focused traits.

Besides, the effect sizes (f²) also provided insights into the magnitude of these relationships. Consistent with Cohen's (1988) guidelines, conscientiousness and openness demonstrated medium effect sizes (f² = 0.21 and 0.24, respectively), while extraversion and agreeableness showed small-to-medium effects. Neuroticism's large negative f² (−0.45) indicated its dominant role in explaining engagement variance. Collectively, the R² values of 0.708 for engagement and 0.759 for achievement signify that the model possesses strong explanatory power.

Table 4: Path Analysis

Hypotheses	Original Sample	Standard Deviation	T Statistics	P Values
H1a: Openness → Student Engagement	0.136	0.044	3.063	0.002
H1b: Conscientiousness → Student Engagement	0.125	0.045	2.749	0.006
H1c: Extraversion → Student Engagement	0.102	0.034	3.029	0.003
H1d: Agreeableness → Student Engagement	0.217	0.076	2.858	0.004
H1e: Neuroticism → Student Engagement	-0.575	-0.043	13.433	0.000
H2a: Openness → Academic Achievement	0.322	0.129	2.498	0.013
H2b: Conscientiousness → Academic Achievement	0.165	0.020	8.36	0.000
H2c: Extraversion → Academic Achievement	0.256	0.099	2.573	0.010
H2d: Agreeableness → Academic Achievement	0.126	0.047	2.676	0.008
H2e: Neuroticism → Academic Achievement	-0.324	-0.101	3.219	0.001
H3a: Teacher Support × Openness → Student Engagement	0.165	0.074	2.218	0.027
H3b: Teacher Support × Conscientiousness → Student Engagement	0.154	0.075	2.067	0.039
H3c: Teacher Support × Extraversion → Student Engagement	0.264	0.090	2.924	0.004
H3d: Teacher Support × Agreeableness → Student Engagement	0.169	0.079	2.127	0.034
H3e: Teacher Support × Neuroticism → Student Engagement	-0.239	-0.065	3.65	0.000
H4a: Teacher Support × Openness → Academic Achievement	0.239	0.082	2.924	0.004
H4b: Teacher Support × Conscientiousness → Academic Achievement	0.22	0.062	3.527	0.000
H4c: Teacher Support × Extraversion → Academic Achievement	0.261	0.109	2.404	0.016
H4d: Teacher Support × Agreeableness → Academic Achievement	0.132	0.045	2.949	0.003
H4e: Teacher Support × Neuroticism → Academic Achievement	-0.149	-0.035	4.204	0.000

5. Discussion

It has been discovered that openness, conscientiousness, extraversion, and agreeableness are all predictors of greater student engagement and academic success. In contrast, neuroticism predicts less student engagement and academic success. Notably, teacher support, as perceived, enhanced the positive influence of the adaptive characteristics and moderated the negative impact of neuroticism,

showing that positive teaching contexts enhance positive dispositions and contain negative tendencies.

This research proves that openness to experience, conscientiousness, extraversion, and agreeableness positively relate to student engagement, and that neuroticism has a negative effect. These findings are in agreement with the five-factor model of personality, which explains how fixed personality characteristics drive the behavior and motivational orientations of individuals in the learning settings (McCrae & Costa, 2008). The students who are high in openness exhibit more curiosity and flexibility, which allows them to become engaged in learning activities, while students who are high in conscientiousness possess higher persistence and self-regulation, which ensures more regular involvement.

Additionally, extraverted and agreeable students are enhanced through social interactions and teamwork learning, illustrating the significance of people dynamics within vocational education settings. Neuroticism, on the other hand, impairs engagement through increased anxiety and emotional instability, which restricts students' engagement to participate actively (Prananto et al., 2025). SDT offers additional support for these results, since engagement can be explained based on the satisfaction of students' autonomy, competence, and relatedness needs (Ryan & Deci, 2024).

The second hypothesis set is also confirmed, demonstrating that openness, conscientiousness, extraversion, and agreeableness are positively related to academic performance, while neuroticism is negatively related. These results are consistent with substantial amounts of empirical research that support the power of personality to forecast academic success (Sparfeldt & Schwabe, 2024). One of the strongest predictors is conscientiousness because organization and work ethic are directly correlated with good, consistent performance in academic work. Transparency allowss deeper learning and critical thinking, which improves performance not just on a superficial level of memorization.

To a hint, conscientious and open students also perceive competence and autonomy, which, in turn, makes it possible to develop self-determined learning behaviors that enable success (D. Liu et al., 2025; Wang et al., 2023). In the same manner, agreeable and extraverted students also satisfy their relatedness needs, which contribute to cooperation and achievement growth. The systematic advancement of these suppositions demonstrates the significance of combining psychological characteristics and motivational theory in identifying academic achievement within the Chinese work setting, where personality is entwined with the cultural need and the school setting, in order to ascertain the degree of involvement and attainment.

In the third hypothesis, the outcomes portray how the teacher's support is of great moderating power when the personality traits link with engagement, proving the importance of the learning environment on personality-driven behavior. The positive effect of openness, conscientiousness, extraversion, and agreeableness on

engagement is augmented, and the negative effect of neuroticism is protected, both by teacher support.

This is compatible with the five-factor model, which emphasizes that personality traits lead people to be inclined towards particular learning habits, but environmental factors like supportive teachers determine the form that these tendencies take (McCrae & Costa, 2008). For example, students who are high in openness or conscientiousness flourish when they are taught autonomy-supportive practices, which promote curiosity and persistence, whereas extraverted and agreeable students are advantaged by teacher-initiated collaborative opportunities that support social connectedness (Zheng et al., 2025).

In addition, neurotic students, usually more vulnerable to disengagement, become more engaged when teacher support provides emotional comfort and guided feedback. SDT explains these findings that teacher support fulfills students' psychological needs for autonomy, competence, and relatedness (Ryan & Deci, 2024). The fourth hypothesis elaborated on these findings by demonstrating that teacher support also moderated the link between personality traits and academic achievement, with beneficial effects for openness, conscientiousness, extraversion, and agreeableness, and with a mitigating effect on dampening the negative impact of neuroticism.

These findings highlight that although personality traits are the basis for achievement behaviors, teacher support is the spark needed to transform these traits into tangible outcomes. Conscientious students, for instance, perform better when teachers enforce discipline and give organized feedback, whereas open students perform better when teachers foster exploration and innovative problem-solving methods (Ansong et al., 2024).

Furthermore, the five-factor model proposes that personality differences influence learning potential, but these will not be maximally expressed in the absence of scaffolded support (McCrae & Costa, 2008). SDT adds to this by emphasizing that teacher support leads to autonomy and competence and hence converts personality-motivated effort into concrete academic achievement (Ryan & Deci, 2024). These results highlight the need to cultivate teacher–student relationships within China's vocational education, where culturally based assumptions of teacher dominance can be recast as supportive processes that promote both engagement and achievement. Together, the hypotheses validate that supportive teaching not only strengthens the benefits of adaptive characteristics but also reduces the drawbacks of maladaptive ones, ultimately promoting overall student success.

Moreover, the five-factor model and SDT interpretation of these findings is that adaptive traits (e.g., conscientiousness, openness) help to satisfy competence and autonomy needs that underlie engagement and extraversion. Additionally, agreeableness provides resources of relatedness that contribute to collaborative learning. Teacher support serves as an environmental facilitator: through feedback, emotive assurances, as well as autonomy-supportive interventions.

Instructors assist in converting dispositional inclinations into actionable behaviors and accomplishment effects, which is anticipated by SDT that social settings influence the demonstration of intrinsic motivation.

The findings of this study need to be placed in the context of Chinese culture and institutions. Collectivism, respect for authority, and orientation to diligence (more frequently termed in the literature as Confucian-based norms) are cultural values that affect the manifestation of personality and teacher role in Chinese vocational classrooms. For example, extraversion and agreeableness can be especially useful in group-focused learning activities because of the collectivist-oriented pedagogy, whereas conscientiousness aligns with cultural values of discipline and hard work. In this respect, teacher support may be relational and moral (e.g., mentorship, face-saving) in addition to instruction, and this can increase its moderating effect.

The results suggest three practical implications of vocational education policy and practice in China. To begin with, teachers' professional development should focus on using autonomy and emotionally supportive pedagogies (not merely technical teaching), which will prepare teachers to scaffold competence and relatedness. Second, screening and early detection can help in admissions and student-support policies. This is because neurotic students can become the beneficiaries of more specific counseling and stress management courses to avoid growing disengaged. Third, curriculum developers must incorporate cooperative, practical activities that allow extraverted and agreeable students to make meaningful contributions, besides establishing structured forms that reward conscientious actions. The moderating role of teacher support may be operationalized at the institutional level by providing incentives for teacher mentorship and small-group learning.

The generalizability of the conclusions is limited by important restrictions. The cross-sectional self-report design makes it impossible to make any causal inferences. The sample does not represent vocational students across the country since the sample is selected from specific provinces, which is not enough. Despite procedural and statistical mitigation, CMB and social desirability may still be an issue of concern. Last, the moderating effect of teacher support might be explained in part by unmeasured classroom-level and teacher-level factors (e.g., teaching quality, resource availability). Longitudinal or experimental designs and nested (multilevel) samples should be used in future studies to isolate the effects on the individual and the classroom.

Future studies should: (1) integrate multilevel designs to explicitly test teacher- and classroom-level moderators, (2) use longitudinal designs to test causality and change in trait behavior relations, (3) use behavioral or administrative measures of achievement (as opposed to self-report measures), and (4) test interventions that provide teachers with training in autonomy-supportive methods to see whether training has a causal effect on the trait engagement achievement pathway.

Overall, the research proves that personality traits significantly predict engagement and achievement in Chinese vocational education and that teacher support is a moderating factor. Construed on the basis of the personality theory and cultural background, the findings indicate that the strengths and weaknesses of various learners can be enhanced and alleviated by supportive, relational teaching practices. Although the findings are encouraging, causality and implementation must be determined by specific robustness tests, longitudinal studies, and intervention studies.

6. Implications
6.1 Practical Implications
The vocational education in China can apply the present research results to enhance student engagement and academic success through a mixture of personality awareness and facilitative teaching. Since openness, conscientiousness, extraversion, and agreeableness are the personality factors that affirmatively influence student performance, teachers and leaders can hinge their teaching strategies on the personality factors, i.e., openness students should be assigned tasks that require exploration, conscientious learners should be assigned tasks that require structure and extraversion learners should be assigned tasks that require collaboration and agreeable learners should be assigned tasks that require teamwork.

Meanwhile, it should also be mentioned that neuroticism results in negative consequences and that teacher training programs should concentrate on approaches to emotional support, stress, and confidence-building, which can help to minimize such negative effects. Moreover, the mediating role of teacher support can be employed to improve the teacher-student relationships by offering the teachers professional development courses that enable them to gain the skills of empathy, motivation, and autonomy-supportive pedagogy.

These findings can also find their way into the hands of educational policymakers in the formulation of more student-oriented curricula and classroom settings, such that vocational education is no longer held in stasis in the ghetto of the traditional classroom teaching, rather capitalizes on the benefits of warmer classroom settings that can help bring out the full potential in the student. Such outcomes can help vocational learning institutions in China increase their retention, performance, and student well-being to produce more prepared, higher-quality graduates for the labor market.

The feasibility of the findings of this research in a practical environment can be implemented gradually, underpinned by the available institutional resources. In the short term (6-12 months), vocational schools are to start with special teacher training programs on autonomy-supportive instruction and personality-informed mentoring in the form of blended online and face-to-face modules that do not require extra funding. The medium-term (12-14 months) ought to adopt a personality-sensitive design in the vocational curriculum by integrating the project-based tasks with the prominent features of students and offering feedback options to students with elevated neuroticism. In the long term (2-3 years), formal

mentorship programs and digital feedback systems can be built in institutions to maintain teacher-student contact. The Ministry of Education can organize and fund these initiatives using the currently existing teacher development and innovation grants, which are feasible and sustainable.

6.2 Theoretical Implications

Theoretically, the study will help merge personality psychology with educational theory because the five-factor model of personality and the SDT are empirically demonstrated to be mutually exclusive when it comes to elucidating student outcomes. Even though the five-factor model can be applied and provide a framework within which researchers can view the correlation between stable personality traits and predisposition towards specific learning behaviors, the SDT can be applied to explain how contextual support, in this instance, teacher engagement, can fulfill the basic psychological needs and turn these predispositions into tangible results in the domain of learning behavior and engagement.

Besides, the two theoretical approaches enrich educational psychology in the sense that they prove that the consequences produced by personality are not predetermined but, on the contrary, dynamic and can be affected with the assistance of supporting interventions. Moreover, the moderate findings are added to the existing body of knowledge as they illustrate that teacher support is such a key factor that can amplify the positive impact of adaptive traits and play down the negative impact of maladaptive ones, e.g., neuroticism, to offer a more precise view of personality-context interaction.

Such observations can be used to further expand the theoretical frameworks of student development by highlighting the need to simultaneously focus on individual differences and the environmental forces that are put on them, and lead to the development of a more comprehensive model of predictive improvement of educational success on the human side of the vocational sphere.

7. Limitations and Future Directions.

7.1 Limitations

This research has its limitations. However, it has a valuable contribution, which should be noted, so that the findings can be interpreted in a balanced manner. First, the research is based on self-reported data among 372 participants in China, which can bring about the problems of CMB and social desirability, which can distort the correctness of the findings. Second, the emphasis on vocational education students diminishes the generalization of the results to other education settings, like secondary schools or other institutions of higher learning, where the role of personality traits and teacher support may not be the same.

Third, the study design is cross-sectional, which limits the interpretation of causality, because the correlations between personality traits and teacher support, engagement, and achievement can change with time and other contexts. Besides, culture-specific factors, like collectivist attitudes and pre-modern hierarchical relations between teachers and students, might mediate how personality and

support interrelate. Hence, the findings might not necessarily generalize to other cultures. Lastly, although SmartPLS is useful in statistical analysis, the research relies entirely on quantitative tools, without the possibility of any further qualitative information to complement the picture of subtle dynamics in the personality and teacher support relationship. Additionally, the sample included a higher proportion of students from urban institutions compared to rural areas, reflecting the accessibility of vocational schools in metropolitan regions. This imbalance may limit the generalizability of findings to rural populations where educational resources and teacher-student dynamics differ.

7.2 Future Research Directions

Based on the research results, it is suggested that the vocational education policy makers and institutions in China should focus on designing systemic teacher support frameworks and the personality-based pedagogical systems in a staged and well-invested framework. Short-term (6-12 months) teacher training programs that highlight emotional, academic, and autonomy-supportive skills should be initiated through the use of the available professional development tools. Within one or two years, personality-informed instructional designs should be incorporated in the vocational schools, where agreeable and extraverted students can participate in group tasks and those with high neuroticism can take a course on stress management to improve engagement and performance.

Additionally, the long-term objectives (24-36 months) need to involve the development of longitudinal tracking systems and multi-institutional partnerships to track outcomes and improve interventions. The national and provincial grants should be dedicated to future studies, whereby universities, vocational institutes, and international organizations should consider collaborating. Despite potential financial and cultural obstacles, long-term payoffs of increased student retention, employability, and teaching efficacy make the investment worthwhile and predetermine the applicability of the recommendations to a wide range of Chinese educational territories.

8. Conclusion

This paper has analyzed the interaction between personality factors and teacher support as well as their effect on student engagement and academic performance in Chinese vocational education. The results validate that adaptive characteristics such as openness, conscientiousness, extraversion, and agreeableness facilitate engagement and performance, whereas neuroticism does not. Furthermore, teacher support enhances positive personality-outcome correlations and buffers the adverse outcomes of neuroticism, which highlights the importance of supportive pedagogical climates.

Policymaking-wise, the findings imply that vocational schools should invest in educating teachers on empathy, feedback, and autonomy-supportive education programs. Differentiated learning and reflective activities should be a part of curricula as personality-informed pedagogy. On the system level, policymakers may introduce incentives for teacher mentorship and digital monitoring of engagement in order to improve learning in the country. Regardless of its value,

the cross-sectional design of the study restricts causal inferences, and the sample is too regionalized to be generalized. Future studies must be done in longitudinal and multilevel designs, investigate teacher-student relationships in different regions, and use behavioral measures of performance. Joint ventures between Chinese and foreign vocational educational institutions will add to the comparative insights.

Culturally, the research will contribute to the knowledge on how Confucian collectivism and respect for authority influence personality expression and the teacher support role in Chinese classrooms. It offers avenues of establishing inclusive, supportive, and high-performing vocational education systems by connecting psychological theory and the cultural context.

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